International Civil Aviation Organization

A38-WP/25
EX/20
18/07/13

WORKING PAPER

ASSEMBLY — 38TH SESSION

EXECUTIVE COMMITTEE

Agenda Item 17: Environmental protection

DEVELOPMENTS IN CIVIL AVIATION AND THE ENVIRONMENT

(Presented by the Council of ICAO)

EXECUTIVE SUMMARY

This paper reports on progress made by ICAO since the 37th Session of the Assembly on issues related to civil aviation and the environment. The paper is based mainly on the activities of the Committee on Aviation Environmental Protection (CAEP), including its ninth meeting (CAEP/9). It also includes related activities of the Secretariat as well as its cooperation with other organizations.

Action: The Assembly is invited to:

a) support the continued work of the CAEP and ICAO Secretariat on issues relating to civil aviation and the environment; and
b) consider the information in this paper as a reference for the update of Assembly Resolutions A37-18 and A37-19.

Strategic Objectives:	This working paper relates to Strategic Objective C – *Environmental Protection and Sustainable Development of Air Transport.*
Financial implications:	No additional resources required. The work involved for the Secretariat is expected to be undertaken within the resources included in the draft Regular Programme Budget 2014 – 2016.
References:	A38-WP/26, *Present and Future Trends in Aircraft Noise and Emissions* A38-WP/27, *Consolidated statement of continuing ICAO policies and practices related to environmental protection – General provisions, noise and local air quality* A38-WP/32, *Environmental Protection - Developments in Other United Nations Bodies and International Organizations* A38-WP/34, *Consolidated statement of continuing ICAO policies and practices related to environmental protection – Climate change* Doc 10012, *Report of the Ninth Meeting of the Committee on Aviation Environmental Protection*

1. INTRODUCTION

1.1 The Organization's environment-related technical activities continue to be undertaken by the Council largely through the Committee on Aviation and Environmental Protection (CAEP). This Committee assists the Council in formulating policies, and developing and updating Standards and Recommended Practices (SARPs) on aircraft noise and aircraft engine emissions. Additionally, it has the mandate to undertake specific studies, as approved by the Council, related to control of aircraft noise and emissions from aircraft engines. CAEP is currently composed of Members from 23 Member States and Observers from 16 Organizations and States.

1.2 The Committee has held one formal meeting (CAEP/9 in February 2013) since the 37th Session of the Assembly (*Report of the Ninth Meeting of the Committee on Aviation Environmental Protection*). CAEP pursues its work programme by means of formal meetings, through working groups, focal points and annual meetings of its Steering Group.

1.3 During the 199th Session in June 2013, the Council considered the recommendations from CAEP/9 including the proposals for amendments to Annex 16 — *Environmental Protection*, Volume I — *Aircraft Noise*, and Volume II — *Aircraft Engine Emissions*. A State letter on the proposed amendments was sent on 12 July 2013 for comments by States and international organizations. Adoption of the new SARPs is expected by March 2014. In addition to updating current SARPs, significant progress was made, *inter alia*, on the ICAO CO_2 Standard through the development of an Annex 16, Volume III certification requirement. A list of all publications produced as a result of the CAEP/9 meeting is available in the Appendix.

2. MODELLING ACTIVITIES

2.1 During the CAEP/9 cycle, a significant amount of modelling analysis was conducted to investigate stringency options for a new noise standard for jet and turboprop aircraft. Future projections of aircraft noise and emissions are developed by CAEP to support the development of new Standards and policies for the Organization.

2.2 Leading to the CAEP/9 meeting, the CAEP completed the development of new traffic and fleet forecasts to be used to support all environmental analyses. The forecasts build upon the forecasts developed by ICAO and other organizations through a peer review. This is a consensus-based process that considers the input of a broad range of stakeholders. The CAEP/9 meeting recommended that the forecasts be used as the basis for all environmental analyses undertaken during the CAEP/10 cycle. In particular, the updated forecasts support the analysis of stringency options for the new CO_2 Standard, and are used to generate updated trends of fuel consumption and net CO_2 emissions to inform the ICAO Assembly (see A38-WP/26, *Present and Future Trends in Aircraft Noise and Emissions*).

3. AIRCRAFT NOISE AT SOURCE

3.1 The amendments to Annex 16, Volume I included a new noise Standard for Jet and Turboprop aircraft. This consists of an increase in stringency of 7 EPNdB relative to the current Chapter 4 cumulative levels. This resulted in the recommendation of a new Chapter 14 noise Standard that will have an applicability to new aircraft types submitted for certification on or after 31 December 2017, and 31 December 2020 for aircraft less than 55 tonnes. As an addition to the new Standard, States were urged not to introduce operational restrictions on aircraft that comply with the noise certification Standard of Annex 16 Volume I, Chapter 4 and/or 14. Further amendments include a new Annex 16, Volume I,

Chapter 13 which is a noise certification Standard for Tilt-rotor aircraft, developed in cooperation with airworthiness, operations and legal experts.

3.2 In addition, the *Environmental Technical Manual on the use of Procedures in the Noise Certification of Aircraft* (Doc 9501) was updated and will be published as an amendment to the current Doc 9501, Volume I.

3.3 For noise reduction technologies, an Independent Expert (IE) Panel established by CAEP developed medium- (2020) and long-term (2030) technology goals. This was an update to the noise goals defined in 2010 and the table below shows the long-term technology goals for four aircraft categories. The goals are shown as relative reductions to the Annex 16, Vol. I, Chapter 4 noise limits.

Aircraft Category	Long Term Noise Goal (EPNdB)
Regional Jet (RJ)	
40 tonnes (nominal)	**21.5±4**
50 tonnes (max)	**17±4**
Short Medium Range Twin (SMR2)	
Turbofans: 78 tonnes (nominal)	**30±4**
98 tonnes (max)	**26.5±4**
CROR: 78 tonnes (nominal)	**13.5+2/-6**
91 tonnes (max)	**10.5+2/-6**
Long Range Twin (LR2)	
230 tonnes (nominal)	**28±4**
290 tonnes (max)	**24.5±4**
Long Range Quad (LR4)	
440 tonnes (nominal)	**27±4**
550 tonnes (max)	**20.5±4**

3.4 In a further update to the 2010 goals, new mid-term goals for large turboprop aircraft were also provided, and these are 12±4 EPNdB (45 tonnes) and 9.5±4 EPNdB (53 tonnes).

Aircraft noise curfews

3.5 In response to the decision of the last ICAO Assembly, and the subsequent action approved by the ICAO Council, the Secretariat has developed a scope of work for a global analysis of the effects of night curfews. This analysis would consider environmental and economic issues, in line with CAEP recommendations, as well as among other factors, the impact of time zones, airline economics and passenger demand in the context of the growth of the aviation sector. India has offered to support this activity. The Sixth Worldwide Air Transport Conference (ATConf/6) in March 2013 also considered this issue and recommended that States should respect and follow the ICAO Balanced Approach principle in regulatory action on aircraft noise management at airports.

4. AIRCRAFT ENGINE EMISSIONS AT SOURCE

4.1 The CAEP made significant progress on the development of an ICAO CO_2 Standard, by unanimously approving a mature ICAO Annex 16, Volume III CO_2 emissions certification requirement. This approval built upon a substantial amount of work that included the development of measurement

methods, procedures, and a CO_2 metric system aimed at representing the CO_2 emissions produced by an aircraft, while equitably rewarding advances in technology and differentiating between generations of aircraft. To take stock of the significant progress made, the CO_2 certification requirement will be published as an ICAO Circular.

4.2 The key work items remaining to complete the CO_2 Standard include: the definition of a no-change criteria; applicability requirements; regulatory limit; and applicability date for limit. The CAEP reviewed a comprehensive CO_2 standard setting work plan and agreed on a late-2015 deliverable date to complete the technical analysis work with the aim of delivering the CO_2 Standard to the CAEP/10 meeting in 2016.

4.3 Aimed at the establishment of a certification requirement on Particulate Matter (PM), CAEP worked with SAE International to prove the non-volatile PM (nvPM) sampling system to measure behind aircraft engines. A working draft Aerospace Recommended Practice (ARP) is nearly complete. Additional full scale testing is needed for engines of all sizes, yet insufficient funding has prevented these tests from being conducted. Measurement campaigns and finalization of the ARP will continue as a prelude to the nvPM emissions certification requirement and new Standard. The CAEP also informed that significant research progress is advancing the understanding of volatile PM formation.

4.4 The *Environmental Technical Manual on the use of Procedures in the Emissions Certification of Engines* (Doc 9501) was updated and will be published as an amendment to Doc 9501, Volume II.

5. OPERATIONAL MEASURES

5.1 A new manual entitled *Operational Opportunities to Reduce Fuel Burn and Emissions* that replaces Circular 303 was developed and recommended by CAEP for publication. The manual contains information on current practices followed by States, aircraft operators, aircraft manufacturers, airport operators, air navigation service providers (ANSPs) and other industry organizations. This includes information on: airport operations; maintenance; weight reduction; the effect of payload on fuel efficiency; air traffic management; flight and route planning; and other aircraft operations.

5.2 Furthermore, a new guidance document called *Environmental Assessment Guidance for Proposed Air Traffic Management Operational Changes* was also developed and recommended by CAEP for publication. This document focuses on environmental impacts assessment (including both engine emissions and noise) related to proposed operational procedures changes, airspace redesigns, and other similar operational aspects.

5.3 Through an Independent Experts on Operation Goals (IEOGG) review, the CAEP developed challenging and aspirational operational environmental goals in the form of fuel consumption and emissions reduction relative to 2010 (3.25 per cent in 2020, 6.75 per cent in 2030, and 9.00 per cent in 2040). These goals represent savings that can be achieved by new operations that require technology investments and changes in policies by eliminating inefficient operational practices. The fuel burn operational goals were included in the CAEP environmental trends analysis as a new scenario (see A38-WP/26, *Present and Future Trends in Aircraft Noise and Emissions*).

Aviation System Block Upgrades

5.4 A key challenge for the aviation community in recent years has been associated with prioritizing and developing consensus around the latest technologies, procedures and concepts of operations, due to the progress of various and many national and regional ATM modernization programmes worldwide. The multidisciplinary and interrelated aspect of these modernization efforts requires intense collaboration between stakeholders representing every aspect and component of the global civil aviation system. In an effort to address this need, ICAO developed, along with its industry partners and with extensive feedback from States, the Aviation System Block Upgrade (ASBU) strategy, which now forms a critical element and serves as the implementation planning mechanism of the ICAO Global Air Navigation Plan (GANP).

5.5 Analysis is currently underway, in coordination with key stakeholders, to quantify the fuel burn savings associated with the implementation of the ASBU, Block 0. ICAO will also develop a compendium of illustrated "best practice" environmental assessment case studies that demonstrate the application of *Environmental Assessment Guidance For Proposed Air Traffic Management Operational Changes*.

6. RELATIONS WITH OTHER ORGANIZATIONS

6.1 Since the last Session of the Assembly, liaison has continued with other UN bodies, with a view to obtaining a better understanding of the environmental impact of aircraft engine emissions at a global level and to exploring policy options to limit or reduce emissions (see A38-WP/32, *Environmental Protection - Developments in other United Nations bodies and international organizations)*. For example, ICAO has worked with the World Meteorological Organization on technical matters of mutual interest and has cooperated with SAE International in the development of technical guidance related to the measurement/modelling of aircraft noise and emissions. The environmental Standards in Annex 16 make reference to documentation from International Standards Organization (ISO) and International Electro-technical Commission (IEC) and ICAO continues to work with these organizations to ensure that the referenced information remains up-to-date.

7. RECENT ICAO ENVIRONMENTAL DEVELOPMENTS

7.1 ICAO held its third Environmental Symposium from 14 to 16 May 2013 in Montreal. This Symposium provided a forum on aviation and climate change and shared information on recent developments with the view to facilitating environmental-related discussions and high-level decision making at the 38th Session of the ICAO Assembly. It focused on strategies and programmes of ICAO, industry, academic/research institutions and international organizations to harness technological, scientific and economic solutions in the global fight against climate change.

7.2 ICAO's third Environmental Report, also focusing on the issue of aviation and climate change, was published in August/September 2013. It provides a comprehensive account of the work of CAEP, including a synthesis of key developments emerging from CAEP/9. In addition, it provides an effective mechanism to acknowledge and publicise the work of the CAEP experts, aviation industry and academia. The Environmental Report is available on the ICAO website.

8. CONCLUSION

8.1 In order to attain the objective of minimizing the adverse environmental effects of civil aviation activities, ICAO and its stakeholders must find an appropriate balance between the future growth of air transport and the quality of the environment.

8.2 As the global forum for pursuing aviation environmental issues, ICAO brings together the best technical expertise, viewpoints of Member States, representatives from the aviation and aerospace industries and environmental non-governmental organizations (NGOs). This process ensures that the latest developments, findings and trends are considered in ICAO's deliberations on how best to address aviation's environmental impacts.

8.3 Data and analyses remain an important element of the decision-making process at ICAO. As a result, it is important to have information derived through the robust analyses undertaken by the Organization, available to facilitate consensus-based decisions. This highlights the relevance and value of the technical and analytical work. States are encouraged to provide data and models for environmental analyses and to continue to actively participate in the analytical work being undertaken by ICAO.

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APPENDIX

LIST OF CAEP/9 STUDIES AND GUIDANCE MATERIAL

This Appendix contains a list of studies and guidance material on aircraft noise and aircraft engine emissions. ICAO's non-saleable publications developed by CAEP/9 are accessible on the ICAO public website.

GENERAL

- Report of the Ninth Meeting of the Committee on Aviation Environmental Protection (Doc 10012) (New)

NOISE

- Annex 16 to the Convention on International Civil Aviation — Environmental Protection, Volume I — Aircraft Noise
- Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft (Doc 9501, Volume I)
- Report of the Second Independent Experts on Noise Reduction Technologies Review and the Associated Medium and Long Term Goals (New)

EMISSIONS

- Annex 16 to the Convention on International Civil Aviation — Environmental Protection, Volume II — Aircraft Engine Emissions
- Environmental Technical Manual on the Use of Procedures in the Emissions Certification of Aircraft Engines (Doc 9501, Volume II)
- Circular on the CO_2 Standard Certification Requirement (New)

OPERATIONS

- Environmental Assessment Guidance for Proposed Air Traffic Management Operational Changes (New)
- Operational Opportunities to Reduce Fuel Burn and Emissions (New)
- Operational Fuel Burn Goals (New)

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