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EXECUTIVE COMMITTEE

Agenda Item 21: Environmental protection

CIVIL AVIATION AND THE ENVIRONMENT

SUMMARY

This paper reports on the Council's progress on aircraft noise and engine emissions, based on the report of the fourth meeting of the Committee on Aviation Environmental Protection (CAEP/4). The Assembly is invited to note this progress report.

REFERENCES

A32-WP/22
A32-WP/23
A32-WP/35
Annex 16 — *Environmental Protection*, Volume I — *Aircraft Noise* and
Volume II — *Aircraft Engine Emissions*
Assembly Resolutions in Force (as of 4 October 1995) (Doc 9662)
Report of the Executive Committee (Doc 9659)

1. INTRODUCTION

1.1 The Council is presenting four papers to the Assembly on environmental protection. This paper is the principal one and provides a progress report on the Organization's activities in the field of environmental protection. The three other environment-related papers cover environmental charges and taxes (A32-WP/35), a proposed revision to Assembly Resolution A31-11: Consolidated statement of continuing ICAO policies and practices related to environmental protection (A32-WP/22) and ICAO's relationship with other United Nations (UN) policy-making bodies in the environmental field (A32-WP/23).

1.2 The Organization's current environment-related activities are largely undertaken by the Council through its Committee on Aviation Environmental Protection (CAEP) which focuses primarily on aircraft noise and the environmental impact of aircraft engine emissions. The committee has held two meetings (CAEP/3 in December 1995 and CAEP/4 in April 1998) since the 31st Session of the

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Assembly. CAEP has established several working groups and focal points to pursue its work programme between formal meetings and it also meets annually as a Steering Group to co-ordinate activities. All the proposals for amendment of Annex 16 have a specific economic impact analysis to assess its costs and environmental benefits.

2. AIRCRAFT NOISE

2.1 Noise amendments

2.1.1 On 19 March 1997, the Council adopted Amendment 5 to Annex 16 — *Environmental Protection*, Volume I — *Aircraft Noise*, which arose from the recommendations of CAEP/3. CAEP/4 made further recommendations for the amendment of the Annex which have since been subjected to a preliminary review by the Council and sent to all Contracting States and interested international organizations for comment.

2.1.2 CAEP has continued to apply a balanced programme of noise reduction, comprising reduction of noise at source, operational measures and land-use planning.

2.2 Reduction of noise at source

2.2.1 Jet and large propeller-driven aeroplanes

2.2.1.1 The CAEP/3 and CAEP/4 Meetings did not make any proposals for increasing the stringency of the noise requirements for these types of aeroplanes. However, CAEP/4 recognized that the subject should now be pursued more actively once again. To assist it in this work, CAEP will be reviewing a model for estimating the world-wide impact of changes to the noise performance of aircraft. The committee will also be reviewing the operational procedures used for noise certification measurements which were specified many years ago and which, in many cases, no longer represent normal operating procedures.

2.2.1.2 CAEP/3 recommended changes to Annex 16, Volume I, which subsequently appeared in Amendment 5, concerning the lateral noise measurement procedures for large propeller-driven aeroplanes.

2.2.2 Light single engine, propeller-driven aeroplanes

2.2.2.1 CAEP/4 has proposed a significant increase in the stringency of the noise limits for these aeroplanes. The increased stringency would only apply to future designs and is intended to ensure that the best available noise reduction technology is used.

2.2.3 General

2.2.3.1 Amendment 5 to Annex 16, Volume I included several detailed changes to the Annex, especially in the noise certification measurement procedures. CAEP/4 has recommended further changes in this regard. A number of these are aimed at simplifying the procedures for noise measurements and also aligning them with national/multi-national noise regulations.

2.3 Operational measures

2.3.1 CAEP/3 recommended new generic noise abatement procedures for inclusion in the *Procedures for Air Navigation Services — Aircraft Operations* (PANS-OPS, Doc 8168). Following comments by States, these procedures have been referred to a group of operational experts for a review of the safety-related aspects. CAEP is continuing to examine other operational measures related to noise reduction such as noise abatement approach procedures.

2.3.2 CAEP has developed guidance material aimed at the reduction of noise nuisance from small single-engine propeller-driven aeroplanes which it has recommended that ICAO publish to support the proposed increase in noise certification stringency for these aeroplanes.

2.4 Land-use planning

2.4.1 Following CAEP/3, ICAO sent a letter to all Contracting States reminding them of the need to control land-use near airports to reduce future complaints about aircraft noise. CAEP/3 also developed a proposed amendment to the *Airport Planning Manual*, Part 2 — *Land-Use and Environmental Control* (Doc 9184). Contracting States were requested to provide information on their national procedures relating to land-use for inclusion in this amendment and the information received is in the process of being reviewed by CAEP prior to publication by ICAO.

3. AIRCRAFT ENGINE EMISSIONS

3.1 General

3.1.1 While there has been significant progress in defining the atmospheric impact of aircraft engine emissions, considerable uncertainty remains. To provide a comprehensive information base for assessing and addressing the impact of aircraft engine emissions, the Intergovernmental Panel on Climate Change (IPCC) in September 1996 agreed to prepare a special report on aviation and the global atmosphere, in collaboration with the Montreal Protocol's Scientific Assessment Panel and with ICAO's involvement. The first drafts have been written and are currently being reviewed, and the final report is scheduled to be completed in March 1999.

3.1.2 On 20 March 1997, the Council adopted Amendment 3 to Annex 16 — *Environmental Protection*, Volume II — *Aircraft Engine Emissions*, which arose from the recommendations of CAEP/3. The amendment introduced changes to the equipment calibration and test gas criteria.

3.1.3 As it had previously done in the case of noise, at its fourth meeting the committee developed a balanced programme for the reduction of emissions, particularly oxides of nitrogen (NO_x). Action on the elements of this programme is described in the following paragraphs.

3.2 Reduction of NO_x at source

3.2.1 At CAEP/3, the committee developed a recommendation which was supported by most, but not all members, for increased stringency of the NO_x emissions limits. Following consultation with States, the Council concluded that there was insufficient support for this proposal and consequently did not adopt the proposed amendment to Annex 16, Volume II. Instead, it requested CAEP (in March 1997) to review the recommendation and report back to the Council within one year.

3.2.2 In response to this request, the CAEP/4 Meeting was held in April 1998 and developed a new recommendation on the subject. This proposes a slightly less stringent requirement for NO_x emissions for engines with higher pressure ratios, compared with that proposed at CAEP/3. The CAEP/3 proposal would have been applicable to future production of existing engine types (after the year 2007) and this was a major concern for some States which feared that it would result in local operational restrictions and a consequent loss of fleet asset values. The CAEP/4 proposal seeks to overcome this fear by making the new Standard applicable to new engine designs only (after the year 2003). Although they did not oppose this recommendation, a few CAEP members were not completely satisfied with it, considering that it would have been technically feasible and environmentally desirable to increase the stringency further. The Council has made a preliminary review of the recommendation and it has now been sent to all Contracting States and interested international organizations for their comments.

3.3 Implementation of CNS/ATM system procedures

3.3.1 CAEP/4 noted the considerable fuel savings that should accrue from the more efficient use of airspace following the introduction of the new CNS/ATM systems. This reduction in fuel burned would translate directly into a saving in emissions produced and, from the environmental point of view, there are advantages to be gained by introducing CNS/ATM systems as soon as possible. Initial estimates suggest that such potential fuel savings might be in the range of about 6 to 12 per cent, with some regional variations.

3.3.2 In response to recommendations by CAEP/4 on this subject, the Council has agreed to draw the attention of all Contracting States to the environmental benefits as one of the benefits that would accrue from the early introduction of CNS/ATM systems and recognized the need to ensure that due consideration is given to environmental aspects.

3.4 Operational practices

3.4.1 CAEP/4 was of the view that the best fuel saving/emissions reduction procedures were not necessarily in universal use by the world's airline operators. The committee is therefore co-operating with the International Air Transport Association (IATA) in collecting and disseminating information on the best practices in use in the industry.

3.5 New emissions control parameters

3.5.1 CAEP/3 and 4 noted that the original objective of Annex 16, Volume II, was the control of emissions near airports by the use of an engine certification scheme. This led to the development of a compound emissions control parameter based upon a notional landing and take-off (LTO) cycle. However, while low level emissions control was still important, the emphasis had in recent years shifted to emissions control in the upper atmosphere, mainly as a result of fears of ozone depletion and global warming. For the purpose of controlling high altitude emissions, it was becoming doubtful whether a parameter based on the LTO cycle was appropriate.

3.5.2 Moreover, of the three gaseous emissions covered by Annex 16, Volume II, the aircraft emissions of NO_x were considered a main concern in the upper atmosphere. Other emissions, particularly carbon dioxide (CO₂) and possibly water vapour (H₂O) were however of concern and were not covered by Annex 16 at present. Finally, the present scheme involves the certification of engines

and it is based upon engine thrust and, as such, it takes no account of the efficiency of the airframe in which the engine is fitted or the overall productivity (in terms, for instance, of seat kilometres performed) of the engine/airframe combination.

3.5.3 In view of the potential shortcomings of the present system, the Council has agreed that CAEP should begin work on developing a new emissions control parameter for high altitude use. This does not imply that use of the present LTO cycle-based parameter will be discontinued for low level emissions control.

3.6 ICAO's follow-up to the outcome of the Kyoto Conference on Climate Change

3.6.1 These recommendations (sub-paragraphs 3.2 to 3.5) are in line with the Kyoto Protocol to the United Nations Framework Convention on Climate Change, which recognized ICAO as the global instrument for developed countries to pursue the limitation or reduction of greenhouse gas emissions from aviation bunker fuels. CAEP's future work includes the development of special items that will compose an action plan to respond to the responsibilities arising from the Kyoto Protocol in relation to the control of aviation atmospheric emissions (see A32-WP/23 - ICAO's relationship with other UN policy-making bodies in the environmental field).

3.7 Relations with other international bodies concerning atmospheric pollution

3.7.1 The 31st Session of the Assembly requested the Council to examine all aspects of ICAO's relationship with other UN policy-making bodies in the environmental field. Accordingly, in May 1996 the Council reviewed relations with several of these bodies, gave guidance to the Secretariat in this regard and has subsequently monitored developments. In addition to the policy-making bodies of the UN Framework Convention on Climate Change, ICAO has developed relations with those policy-making bodies associated with the Montreal Protocol on Substances that Deplete the Ozone Layer and the Convention on Long Range Transboundary Air Pollution (see A32-WP/23).

3.8 Emission-related charges

3.8.1 The discussions on aircraft engine emissions-related charges started in 1991. The Conference on Airport and Route Facility Management (CARFM) recommended that ICAO study whether charges could be an effective means of reducing adverse environmental consequences of aircraft emissions, and an initial study was undertaken by CAEP in 1995 on the subject. The 31st Session of the Assembly subsequently requested the Council to study the subject of environmental charges and taxes and to report to the next ordinary session of the Assembly (Doc 9659, A31-EX, para 20:12).

3.8.2 Further work has since been undertaken by a CAEP Focal Point on Charges, who reported to CAEP/4. The Council considered this report to be a valuable contribution to the discussion of this subject and agreed on the need for additional work by CAEP (more details are contained in A32-WP/35 — Environmental charges and taxes).

3.9 Consolidated statement of continuing ICAO policies and practices related to environmental protection

3.9.1 At its 31st Session, the ICAO Assembly adopted Resolution A31-11, entitled "Consolidated statement of continuing ICAO policies and practices related to environmental protection" (Doc 9659, A31-EX, paras 20:14 to 20:16).

3.9.2 As envisaged in Resolution A31-11, the Council is presenting in A32-WP/22 a new draft consolidated statement of continuing policies and practices related to environmental protection. This is based on Resolution A31-11 with revisions in the light of developments since the 31st Session.

4. CONCLUSION

4.1 Since the 31st Session of the Assembly a considerable effort has been made to address difficult questions associated with aircraft noise and aircraft engine emissions. Two CAEP meetings have been held (CAEP/3 in 1995 and CAEP/4 in 1998) and some amendments to SARPs have been proposed and adopted.

4.2 Regarding noise, Amendment 5 to Annex 16 — *Environmental Protection*, Volume I — *Aircraft Noise* proposed by CAEP/3 was adopted by the Council (150/16) in March 1997, and CAEP/4's proposal for a more stringent limit for propeller-driven aeroplanes was sent to States for comments. Concerning the future work of CAEP, a decision has been made to re-visit the question of increasing the stringency of the noise standards for jet and large propeller-driven aeroplanes.

4.3 Regarding emissions, the Council adopted Amendment 3 to Annex 16 — *Environmental Protection*, Volume II — *Aircraft Engine Emissions* which arose from CAEP/3 in March 1997, but returned the recommendation for a more stringent parameter of NO_x engine emissions to CAEP for further consideration. CAEP was successful in reaching a consensus on this subject, and after re-considering some controversial aspects of the original proposal recommended at CAEP/4 that the NO_x emission limits in Annex 16, Volume II be made more stringent, States are being consulted on this matter. Taking into consideration the outcome of the climate change negotiations in Kyoto in December 1997, CAEP's new work programme contains a strong emphasis on addressing greenhouse gas emissions. An important element of this work is the need for a better understanding of the environmental impact of aircraft engine emissions. Some progress has been made in this regard and further progress is expected when a special report on aviation and the global atmosphere that is being prepared at ICAO's request becomes available next year.

4.4 In both the noise and emissions fields, decisions taken can have far-reaching implications for international civil aviation. Therefore, policies should be developed with great care, balancing environmental benefits against the costs involved. Nevertheless, it is to be expected that international civil aviation will need to continue to address difficult environmental issues for the foreseeable future. To face these environmental challenges, suitable international standards for aviation as well as balanced and proactive approaches will need to be established to maintain the safe, orderly, efficient and sustainable development of the air transport system.

5. ACTION BY THE ASSEMBLY

5.1 The Assembly is invited to note this progress report on environmental protection.