ICA 2013 Montreal
Montreal, Canada
2 - 7 June 2013

Noise
Session 2aNSb: Distinguished Lecture

2aNSb1. The work of the Committee on Aviation Environmental Protection and the Development of International Noise Standards

Jane Hupe*

*Corresponding author's address: International Civil Aviation Organization, Montreal, H3C 5H7, QC, Canada, jhupe@icao.int

Environmental Protection is one of the Strategic Objectives of ICAO. The overall aim is to minimize the adverse environmental effects of global civil aviation activity. One of the key objectives is to establish noise Standards to limit and reduce the number of people affected by aircraft noise. This mandate is carried out by the Committee on Aviation Environmental Protection (CAEP) which, as a technical committee of the ICAO Council, is a recognized international forum of environmental experts from both member and observer States, intergovernmental organizations, including airlines, aircraft and engine manufacturers, airports, environmental non-governmental organizations and UN bodies.

ICAO has set International Standards for aircraft noise certification since the 1970s and the purpose of this talk is to describe the process of developing these Standards while providing some details on recent developments, including the key outcomes of three years' worth of research leading up to the ninth meeting of the CAEP.

Published by the Acoustical Society of America through the American Institute of Physics
INTRODUCTION

The International Civil Aviation Organization (ICAO) was created in 1944, as the United Nations specialised agency to promote the safe and orderly development of international civil aviation throughout the world. ICAO sets the standards and regulations necessary for aviation safety, security, efficiency and regularity, as well as for aviation environmental protection. The organization works to achieve its vision of safe, secure and sustainable development of civil aviation through the cooperation of its 191 Member States [31].

Improving the environmental performance of aviation is a challenge ICAO takes very seriously. In fulfilling its responsibilities, the Organization has developed a range of Standards and Recommended Practices (SARPs), policies and guidance material for the application of integrated measures to address aircraft noise and engine emissions, embracing technological improvements. The current environmental activities of ICAO are largely undertaken through the Committee on Aviation Environmental Protection (CAEP), which was established by the ICAO Council in 1983, superseding the Committee on Aircraft Noise (CAN) and the Committee on Aircraft Engine Emissions (CAEE). CAEP is the technical committee of the ICAO Council that assists in formulating new policies and adopting new standards on aircraft noise and emissions [2].

COMMITTEE ON AVIATION ENVIRONMENTAL PROTECTION

CAEP supports ICAO to deliver three major environmental goals [2], which aim to:

a. limit or reduce the number of people affected by significant aircraft noise;

b. limit or reduce the impact of aviation emissions on local air quality; and

c. limit or reduce the impact of aviation greenhouse gas emissions on the global climate.

In support of these goals and in its role as international aviation’s leading environmental body, CAEP has adopted a structured approach to developing and delivering solutions to the air transport sector - initially by quantifying related environmental impacts and then by establishing practical mitigation measures to address them. Over 400 world renowned experts whose expertise spans environmental and technical issues related to aviation are involved in the work of CAEP. The current CAEP working structure includes three specialized working groups and four support groups, as illustrated in Figure 1. This structure also includes dedicated Independent Expert groups on noise and fuel technologies, and operational goals.

FIGURE 1: Structure of the CAEP during the ninth cycle of the CAEP (CAEP/9) [4].
The CAEP working groups report their progress to a CAEP Steering Group meeting which is held on an annual basis, and during which the CAEP Members and observers review and provide guidance on the progress of the activities. Subsequently, every three years, the CAEP meets in order to account for the work undertaken and to make specific recommendations for the consideration of the ICAO Council. Thus far, CAEP has held eight formal meetings: in 1986 (CAEP/1), 1991 (CAEP/2), 1995 (CAEP/3), 1998 (CAEP/4), 2001 (CAEP/5), 2004 (CAEP/6), 2007 (CAEP/7) and 2010 (CAEP/8). At the time of writing this paper, the ninth meeting of the CAEP (CAEP/9) was due to take place in Montreal between 4 and 15 February 2013. By the time of the June 2013 joint meeting of the International Congress on Acoustics (ICA), Acoustical Society of America, and Canadian Acoustical Association, the results of CAEP/9 will be known. It is expected that a summary report of the outcomes of CAEP/9 will be available for presentation at the time of the ICA2013 meeting. An overview of the summary report will be given to ICA2013, focusing on aircraft noise related issues.

AIRCRAFT NOISE OVERVIEW

Aircraft noise is the most significant cause of adverse community reaction related to the operation and expansion of airports, both in developed and developing countries. The noise resulting from aircraft operations in and around an airport depends upon a number of factors including: the types of aircraft using the airport, the overall number of daily take-offs and landings, general operating conditions, the time of day that the aircraft operations occur, the runways that are used, weather conditions, topography, and airport-specific flight procedures [5].

Aircraft coming off the production line today are about 75% quieter than they were 40 years ago and aircraft manufacturers are working to reduce this even more. These developments are reflected in ICAO Certification standards and ICAO’s continuing promotion of the implementation of noise reduction technologies [5].

ICAO has been addressing the issue of aircraft noise since the 1960s. The first set of SARPs for aircraft noise certification were published in 1971, and are contained in Annex 16 to the Convention on International Civil Aviation (Volume I - Environmental Protection — Aircraft Noise). These standards have since been updated since then to reflect improvements in technology. Newly manufactured aircraft must comply with the Noise standards set out in ICAO Annex 16 - Volume I. Aircraft noise certification involves measuring the noise level of an aircraft in Effective Perceived Noise Level (EPN) dB at three certification points [6]:

1. **Fly-over**: 6.5 km from the brake release point, under the take-off flight path;
2. **Sideline**: the highest noise measurement recorded at any point 450 m from the runway axis during take-off; and
3. **Approach**: 2 km from the runway threshold, under the approach flight path.

Cumulative levels are defined as the arithmetic sum of the certification levels at each of the three points. A schematic of the certification points is shown in Figure 2.

![FIGURE 2: Aircraft noise certification reference points [5]](image-url)
Certification of jet aircraft is addressed in Annex 16, Volume I, Chapters 2, 3 and 4. Chapter 4 is the most recent addition and is applicable to aircraft types certificated after January 2006. The Annex also contains provisions for the certification of propeller driven aeroplanes and helicopters. Environmental standards are developed to be technologically feasible, environmentally sustainable, and economically reasonable. Trade-offs between noise and emissions are also taken into consideration [6].

Most of the work in developing international aviation noise standards is performed by CAEP Working Group 1 (WG1). The activities of WG1 are intended to fulfill a work programme laid out with every three-year CAEP cycle. The majority of the members of WG1 are expert volunteers, taking time away from their usual jobs to participate in the development and revision of noise standards. The contributors include those from CAEP Member and observer states, international organizations, airlines, aircraft and engine manufacturers, airports, environmental non-governmental organizations, and UN bodies.

At the CAEP/9 meeting, WG1 and the CAEP support groups, will report on the significant amount of work conducted on noise stringency. The CAEP/9 meeting will discuss environmental and economic assessments on future noise stringency options for a number of cumulative noise levels (across the three certification points) below Annex 16, Volume I, Chapter 4. The CAEP will also discuss various amendments to Annex 16, Volume I and the guidance material contained in the Environmental Technical Manual (ETM), Volume I with regard to keeping the Annex and ETM up to date, technically robust and relevant for use by the international community.

CLOSING PERSPECTIVE

Twenty four hours a day, 365 days of the year, every few seconds an aeroplane takes off or lands somewhere around the globe. Every one of these flights is handled in the same, uniform manner, whether by air traffic control, airport authorities or pilots at the controls of their aircraft. Behind the scenes are millions of employees involved in manufacturing, maintenance and monitoring of the products and services required in the never-ending cycle of flights. In fact, modern aviation is one of the most complex systems of interaction between human beings and machines ever created.

This clock-work precision in procedures and systems is made possible by the existence of universally accepted standards and regulations, which cover all technical and operational aspects of international civil aviation, such as safety, personnel licensing, operation of aircraft, aerodromes, air traffic services, accident investigation and the environment. Without SARPs, our aviation system would be at best chaotic and at worst unsafe.

CAEP and its Working Groups exist to develop environmental standards and regulations and this highlights the importance that ICAO puts on the protection of the environment. There are many experts from around the world that contribute to this work, and the public should be aware that it is through the dedication of these experts that has allowed ICAO to deliver comprehensive and robust environmental standards. All possible measures are needed to address aviation’s environmental impacts, and it is important that CAEP continues to work on all fronts exploring the technical feasibility, potential environmental benefits and economic reasonableness of future standards and regulations.

REFERENCES

2. ICAO Environmental Report 2010, Aviation and Climate Change, ICAO, 2010