Technology and standards

ICAO has been considering to what extent technology can help, through improved engine or airframe design, to achieve reductions in greenhouse gas emissions.

The present ICAO Standards for emissions certification of aircraft engines (contained in Volume II of Annex 16 to the Convention on International Civil Aviation) were originally designed to respond to concerns regarding air quality in the vicinity of airports. As a consequence, they establish limits for emissions of oxides of nitrogen (NO_x), carbon monoxide, unburned hydrocarbons and smoke for a reference Landing and Take-off (LTO) cycle below 915 metres altitude. These limits are expressed in terms of mass of emissions per unit of engine thrust.

While these Standards are expressed in terms of an aircraft's LTO cycle, they also help to limit emissions at altitude. Of particular relevance in this context is the Standard for NO_x, which is a precursor for ozone. At ground level, ozone takes part in the smog chemistry, whilst at altitude it is a greenhouse gas. The Standard for NO_x was first adopted in 1981, then made more stringent in 1993, when the Council of ICAO reduced the permitted levels by 20% for newly certificated engines, with a production cut-off on 31 December 1999. More recently, in April 1998, CAEP recommended a further tightening of about 16% on average for engines newly certificated from 31 December 2003 and, following consultation with States, this was adopted by the Council of ICAO in February of this year. This represents an important development on an issue that had proved difficult in the past.

CAEP is now carrying out assessments of technological advances with a view to further developing the ICAO Standards to specifically address emissions of greenhouse gases. In particular, it is studying alternate emissions methodologies that will encompass all phases of flight (climb and cruise emissions, as well as LTO cycle). In addition to considering the types of emissions already covered by ICAO Standards, the new methodologies will take into account fuel efficiency and productivity of the whole aircraft, which would have a direct bearing on CO_2 emissions. CAEP will also follow developments in the characterization and measurement of other emissions such as particulates that could be relevant to contrail production and additional cirrus cloud formation. This is a very complex task requiring close cooperation with industry and scientific experts, and recommendations for new methodologies are not expected to be completed until 2001. Definition of relevant standards, if appropriate, would follow.

Operational measures

ICAO is considering to what extent operational measures might help to reduce the amount of emissions of greenhouse gases produced, for example through more direct routings, or to reduce their impact.

In April 1998, CAEP established a new working group with two primary tasks. The first is to identify the best operating practices to achieve near-term reductions in aircraft emissions of greenhouse gases together with potential actions to facilitate their broader application. The second task is to evaluate the potential impact of satellite-based Communication, Navigation, Surveillance and Air Traffic Management (CNS/ATM) systems enhancements and recommended actions to facilitate implementation on a regional and global basis.

The working group has focused its efforts in three key areas: