ICAO’s Response to Global Challenges

Member States confirm their longstanding commitment to ICAO leadership in limiting or reducing aviation GHG emissions, working in collaboration with the air transport industry.

This booklet describes the actions that have been taken, the outcomes achieved thus far and the further commitment by States working through ICAO.
Most of the environmental activities of the Organization continue to be undertaken by the ICAO Committee on Aviation Environmental Protection (CAEP). CAEP addresses $CO_2$ emissions from international aviation, by developing ICAO’s Standards and Recommended Practices and related guidance material, using technological improvements (reduction at source), operational measures and market-based measures.

More information on ICAO’s work on the environment is available on the ICAO website (http://www.icao.int/env/).
As the UN specialized agency for international civil aviation, ICAO has succeeded for more than 40 years in bringing the world together around increasingly stringent regulations for aircraft noise and engine emissions, leading to air transport operations today being 70% more fuel efficient than 40 years ago.

ICAO’s three environmental goals are:

1) limit or reduce the number of people affected by significant aircraft noise;

2) limit or reduce the impact of aviation emissions on local air quality; and

3) limit or reduce the impact of aviation greenhouse gas (GHG) emissions on the global climate.

All 190 ICAO member States recognize the critical importance of ICAO in providing continuous leadership in limiting or reducing GHG emissions from international aviation.
Programme of Action on International Aviation and Climate Change

A High-level Meeting on International Aviation and Climate Change was convened in October 2009 to review a Programme of Action as an important first step to address GHG emissions from international aviation, and reaffirmed ICAO’s leading role in matters involving international civil aviation. The Meeting successfully approved a Declaration as well as Recommendations regarding further work by the Council on international aviation and climate change. In summary, ICAO and its member States:

1) agreed on a global annual fuel efficiency improvement of 2% for the medium-term (up to 2020) and an aspirational global annual fuel efficiency improvement of 2% for the long-term (up to 2050);

2) recognized that these goals are unlikely to deliver the level of reduction necessary to stabilize and subsequently reduce aviation’s absolute emissions contribution to climate change, and that more ambitious goals will need to be considered to deliver a sustainable path for aviation;

3) declared that ICAO and its member States, along with relevant organizations will keep working together to undertake further work on medium and long-term goals, including exploring the feasibility of more ambitious goals, including carbon-neutral growth and emissions reductions, for consideration by the 37th Session of the ICAO Assembly;

4) agreed on the development of a global CO$_2$ Standard for aircraft;

5) strongly encouraged wider discussions on the development of alternative fuel technologies and the promotion of the use of sustainable alternative fuels in aviation;

6) agreed to facilitate the implementation of operational changes and the improvement of air traffic management and airport systems aiming to reduce emissions from international aviation;

7) agreed that ICAO will establish a process to expeditiously develop a framework for market-based measures in international aviation;

8) agreed to further elaborate on measures to assist developing States as well as facilitate access to financial resources, technology transfer and capacity building; and

9) in order to monitor progress towards reaching the goals, States are encouraged to submit their action plans, outlining their respective policies and actions, and annual reporting on international aviation CO$_2$ emissions to ICAO.

In November 2009, the ICAO Council fully accepted the outcome of the High-level Meeting, including its Declaration and Recommendations approved by the Meeting, and decided on further action, for consideration by the 37th Session of the ICAO Assembly in September 2010 and beyond.
Global Solutions for a Global Activity

To address the challenge of climate change, arguably one of the greatest challenges of this century, a clear path forward aimed at reducing and stabilizing emissions of CO$_2$ at a level that does not endanger the earth’s climate is essential. Negotiations in the United Nations Framework Convention on Climate Change are intended to reach the necessary agreements on the best way to proceed for all parties involved.

Under ICAO authority, States are fully engaged to achieve a global solution to address emissions from international civil aviation. Total CO$_2$ emissions from the aviation sector (domestic and international operations) currently account for approximately 2% of total global CO$_2$ emissions (IPCC 4th Assessment Report in 2007), approximately 60% of which are from international aviation.

Scheduled aviation traffic grew at an average rate of 4% between 2001 and 2008. Global air traffic, expressed in terms of passenger-kilometres performed (flying one passenger one kilometre), is projected to decline by approximately 4% in 2009. This forecast reflects the worsening of world GDP, which is projected to shrink by approximately 1.7%. As the economy improves, a moderate recovery in scheduled aviation traffic is forecast for the year 2010 with a positive growth rate of about 3.3% and continued growth of 5.5% in 2011. Scheduled traffic is anticipated to grow at an average annual rate of 4.6 per cent through 2025.

Although the contribution of aviation emissions to total global CO$_2$ emissions is relatively small, forecasted traffic growth raises questions on the future contributions of aviation activity to climate change and on the most effective way of addressing those emissions in a future climate agreement.
The High-level Meeting on Aviation and Climate Change affirmed that addressing GHG emissions from international aviation requires the active engagement and cooperation of States and the air transport industry. Further, it acknowledged the commitments of the air transport industry to achieve carbon neutral growth by 2020 and to reduce its CO₂ emissions by 50% by 2050 compared to 2005 levels.

All ICAO member States, working in collaboration with the air transport industry, will further explore global solutions to address GHG emissions from international aviation.

Further work by ICAO and Stakeholders

• Development of a global CO₂ Standard

• Facilitate the development and deployment of sustainable alternative fuels for aviation

• Operational improvements including air traffic management and airport systems to reduce emissions from international aviation

• Framework for market-based measures in international aviation

• Explore the feasibility of more ambitious goals, including carbon-neutral growth and emissions reductions, for consideration by the 37th Session of the ICAO Assembly

Concrete Actions....Tangible Global Results

ICAQ: UNITING AVIATION ON CLIMATE CHANGE
www.icao.int/act_global
Aircraft are required to meet the environmental certification Standards, developed by the ICAO’s Committee on Aviation Environmental Protection (CAEP) and adopted by the Council. These are contained in Annex 16 (Environmental Protection) Volume I: Aircraft Noise and Volume II: Aircraft Engine Emissions to the Convention on International Civil Aviation. These certification Standards have been designed and are kept up to date in order to respond to concerns regarding environmental impact of aviation on communities in the vicinity of airports as well as society at large.

More recently, CAEP has undertaken an effort to establish medium and long-term environmental goals relating to technologies in three areas (noise, NOx, and CO2 (fuel burn)). This process is being led by panels of independent experts to ensure transparency and involvement from all stakeholders. The purpose of this goal setting exercise is to provide aggressive but reasonable targets for industry R&D to aim at.

Reducing Aviation Emissions at Source

The Annex 16 Volume II was 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 (NOx), carbon monoxide and unburned hydrocarbons, for a reference landing and take-off (LTO) cycle below 915 metres of altitude (3000 ft). There are also provisions regarding smoke and vented fuel.

While these Standards are based on an aircraft’s LTO cycle, they also help to limit emissions at altitude. Of particular relevance is the Standard for NOx, a precursor for ozone, which at altitude is a greenhouse gas. The Standard for NOx was first adopted in 1981, then made more stringent in 1993, when ICAO reduced the permitted levels by 20% for newly certificated engines, with a production cut-off on 31 December 1999. In 1999, the Council further tightened the Standard by about 16% on average for engines newly certificated from 31 December 2003. The latest ICAO NOx Emissions Standards became applicable in November 2005 and is being applied to engines newly certified after December 2007.

In light of the direction given by ICAO Assembly and its Council, CAEP has continued to explore the development of an aviation CO2 Standard. Key necessary steps toward a CO2 Standard have been identified and this systematic approach is expected to culminate in the adoption of a CO2 Standard within the next CAEP cycle (2010-2013).

The independent expert review for NOx reduction technologies was completed in 2006 and is being updated at present. Similarly, a workshop to consolidate the knowledge base for fuel burn improvements (CO2 reduction) through weight reduction, aerodynamic improvement, engine fuel efficiency improvement, and aircraft system optimization was conducted in 2009. The results of these reviews and workshop will be presented to the CAEP/8 meeting in February 2010.
2. Mitigation - Operational Measures

ICAO’s main strategy for operational measures is contained in the Global Air Navigation Plan (ICAO Doc 9750) which provides a planning strategy aimed at achieving benefits of Air Traffic Management (ATM) to assist member States and regional planning groups in identifying the most appropriate operational improvements and to support their implementation. This plan requires environmental aspects to be taken into account from the outset, when designing, developing and operating ATM systems. Emissions-related aspects covered in the plan include the flexible use of airspace; air traffic flow management; dynamic and flexible route management; terminal area design and management; aerodrome design and management; and performance based navigation.

ICAO guidance to achieve fuel efficiency through operational measures is also provided in Operational Opportunities to Minimize Fuel Use and Reduce Emissions (ICAO Circular 303). It identifies and reviews various operational opportunities and techniques for minimizing fuel consumption, hence CO₂ emissions, in civil aviation operations. It includes, among other items, opportunities for improvements at airports followed by the identification of fuel-saving opportunities during ground-based activities before flight, including both maintenance and the reduction of aircraft mass. The possibilities for in-flight fuel saving are then considered, with particular focus on the input from airlines and air traffic services providers. The potential for increased efficiency through load factor improvement is also reviewed. ICAO’s Committee on Aviation Environmental Protection (CAEP) is now preparing new guidance that will contain new and updated information on current initiatives relating to fuel burn reduction.

ICAO has a central role to play in planning for the implementation of operational improvements. In addition to developing the necessary Standards and guidance material, ICAO has developed a global ATM Operational Concept that was widely endorsed and used as the basis for regional planning. Every ICAO region has identified performance objectives and has developed work programmes to bring near- and medium-term benefits, while integrating those programmes with the extensive work already accomplished.
ICAO’s Committee on Aviation Environmental Protection (CAEP) has continued its work on mitigation measures, including the market-based measures to reduce aviation emissions. ICAO developed in 2004 a template for voluntary agreements between aviation industries and public organizations, and collected and shared information on voluntary measures to reduce aviation GHG emissions by member States and various stakeholders in 2007. In the same year, ICAO also published guidance for States for incorporating international aviation emissions into their trading schemes (The Guidance on the Use of Emissions Trading for Aviation, ICAO Doc 9885). In addition, guidance on local emissions-related charges (Guidance on Aircraft Emissions Charges Related to Local Air Quality, ICAO Doc 9884) had earlier been published.

Currently CAEP is conducting a study on issues related to linking open emissions trading systems involving aviation. With the implementation of different emissions trading schemes throughout the world, the increased harmonization of features and processes may facilitate the linkage of such schemes, thus enabling the creation of a global scheme. CAEP is also developing a study on the potential for carbon offset measures to mitigate the impact of aviation on climate change recognizing its potential for implementation in the short term. In this regard, the ICAO Carbon Emissions Calculator is an internationally accepted tool for estimating CO₂ emissions per passenger, that could be used in aviation offsetting schemes. The Calculator is available on the ICAO website (www.icao.int), allowing passengers to estimate CO₂ emissions attributed to their air travel. It is simple to use and requires only a limited amount of information from the user. The methodology applies the best publicly available industry data to account for various factors such as aircraft types, route specific data, passenger load factors and cargo carried. The Calculator was adopted by the United Nations (UN) as the official tool for all UN bodies to quantify their air travel CO₂ footprint in support of the UN Climate Neutral Initiative.

The High-Level Meeting on Aviation and Climate Change in October 2009 agreed that ICAO will establish a process to expeditiously develop a framework for market-based measures in international aviation.
In support of the requests from the Council and Committee on Aviation Environmental Protection (CAEP), ICAO organized the **Workshop on Aviation and Alternative Fuels** in February 2009. Approximately 150 participants from 114 States and International Organizations attended. The objective of the workshop was to explore potential options, challenges to development and deployment as well as initiatives to promote international cooperation in alternative aviation fuels. The workshop featured 39 presentations from policy makers, regulatory and certification authorities, international airlines, NGO's, aerospace and fuel industry representatives. All of the presentation materials are available on the workshop website (http://www.icao.int/waaf2009/).

There was general agreement that aviation alternative fuels can be a win-win solution for reducing aviation’s dependence on fossil fuels and a key element to help reduce the impact of aviation on climate change. It was also noted that alternative fuels should be part of a comprehensive aviation energy strategy that includes technology, operational measures, and market-based measures.

The introduction of sustainable alternative fuels for aviation will help address issues of environment, economics, and supply security. Today, there is very limited availability of qualified alternative fuels for aviation. It has been demonstrated that sustainable alternative fuels for aircraft can be produced from a wide variety of feedstocks for use in global aviation, suggesting that many regions are candidate production locations. Those sustainable alternative fuels may offer reduced lifecycle CO$_2$ emissions compared to conventional aviation fuels.

ICAO held a **Conference on Aviation and Alternative Fuels** in November 2009 (http://www.icao.int/CAAF2009/) as an important step by ICAO to promote improved understanding of the potential use and emission effects of sustainable alternative fuels and to facilitate its development and deployment. The Conference endorsed the use of sustainable alternative fuels for aviation, particularly the use of drop-in fuels in the short to medium-term, as an important means of reducing aviation emissions. The Conference Declaration and Recommendations affirmed the commitment of States and industry to develop, deploy and use sustainable alternative fuels to reduce aviation’s emissions. To facilitate, on a global basis, the promotion and harmonization of initiatives that encourage and support the development of sustainable alternative fuels for aviation, the Conference established an ICAO Global Framework for Aviation Alternative Fuels (GFAAF). The GFAAF will be a living document that will be made available on the ICAO website and updated whenever new information is provided by member States and International Organizations. ICAO will facilitate the development and deployment of sustainable alternative fuels for aviation.