Air Transport Symposium – Abuja, Nigeria

28 to 30 April 2008

# ICAO activities in the field of emissions from aviation

ICAO - International Civil Aviation Organization

Jane Hupe, Chief Environmental unit

# ICAO Environmental Goals for aviation emissions

- Limit or reduce the impact of aviation emissions on local air quality; and
- Limit or reduce the impact of aviation greenhouse gas emissions on the global climate.

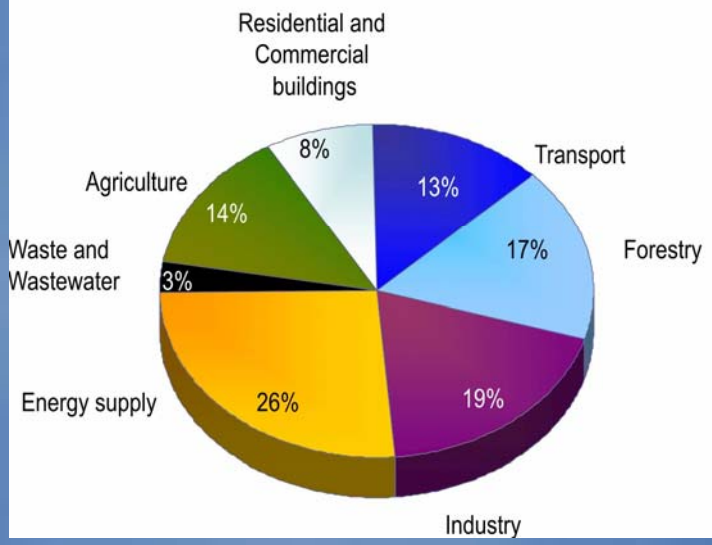
# Trends

Future Air Traffic Growth (2005–2025):

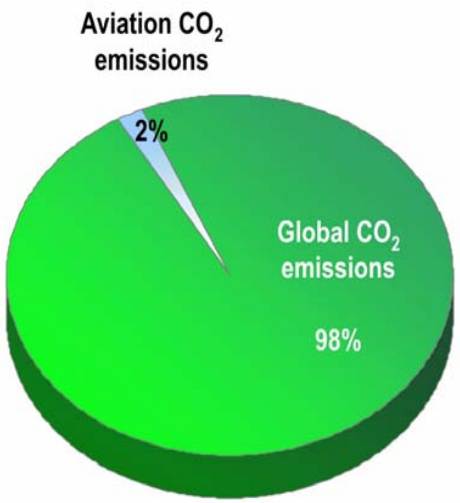
- Total scheduled passenger traffic worldwide is forecast to increase at an average annual rate of 4.6 per cent for the period 2005–2025

Aviation contributes about 2% of globally produced $CO_2$ and accounts for 13% of fossil fuels consumed by transport

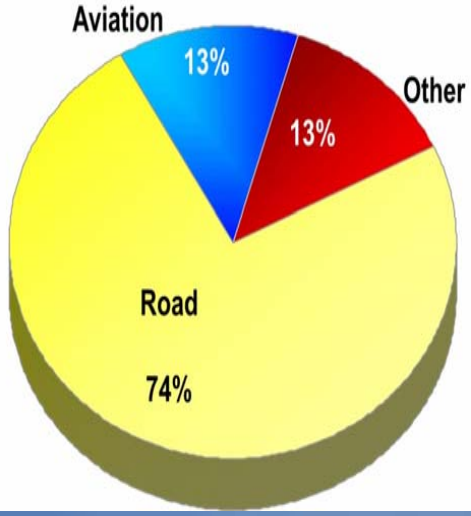
**Global GHG by Section, 2004 (IPCC)**




**Part of Aviation Global $CO_2$ Emission**




**Global $CO_2$ emissions per transport (%)**



# Trends

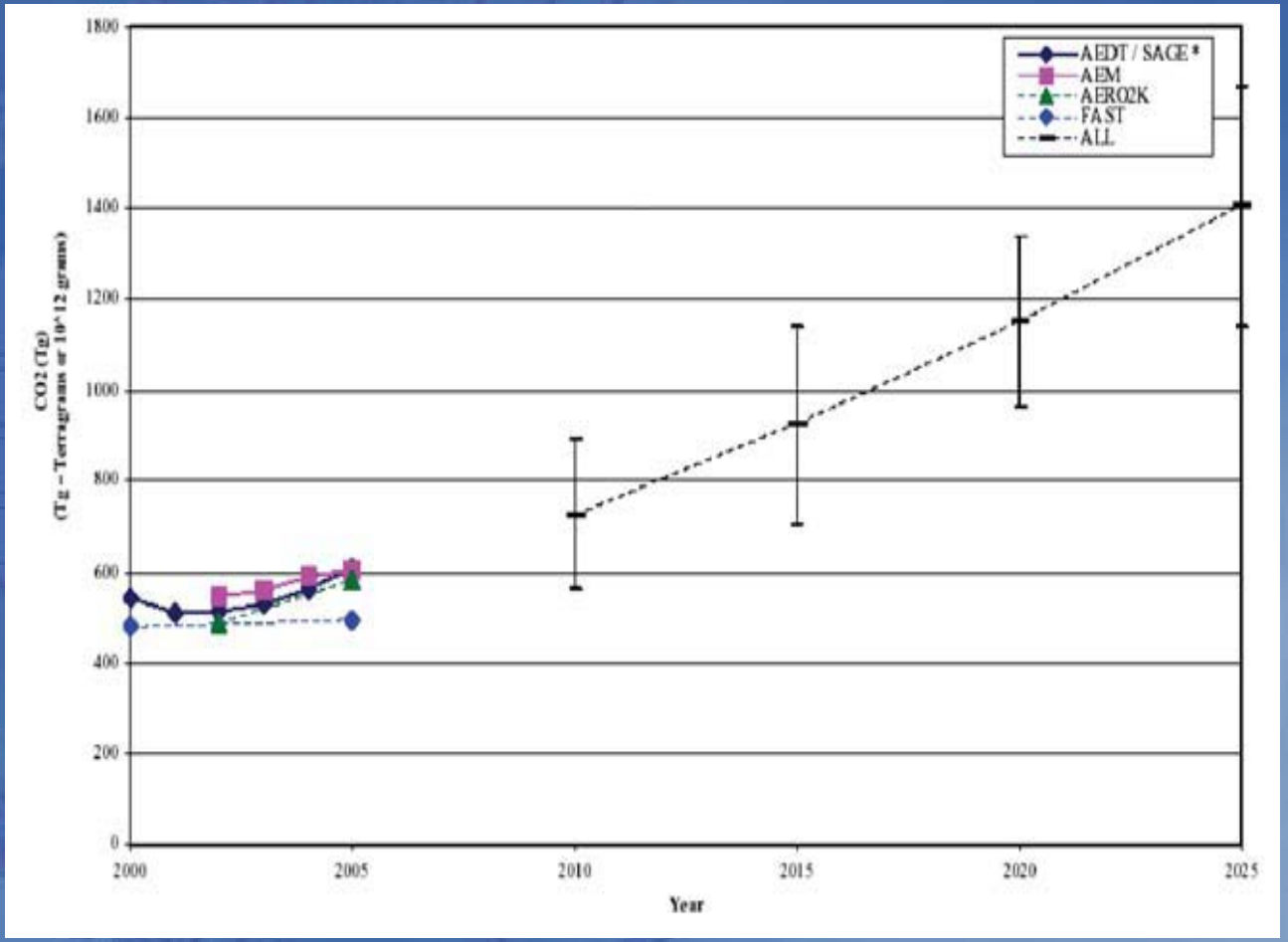
- Total amount of aviation $CO_2$ emissions - about 600 million tones in 2005
- Fuel consumption ($CO_2$-Emissions) in global aviation grew from 1990 – 2004 by 2 to 3 % / year.
- For the near future, further growth of global fuel consumption and global emissions of $CO_2$ and NOx by aviation is to be expected.

# Trends

- CAEP MODELLING RESULTS

  -Initial assessment of available models

  -Initial trends for $CO_2$ (ICAO Goals Assessment)




·Total aviation CO2 emissions model results (2000-2025).

·Note: AEDT / SAGE (2000-2004) results have been adjusted down by 5% to account for the revised modelling assumptions resulting from migration from SAGE Version 1.5 to AEDT / SAGE in 2005. Projections of future technology developments are not included in this assessment

# A36-22

- Appendix H: Aviation impact on local air quality
- Appendix I: Aviation impact on global climate – Scientific understanding
- Appendix J: Aviation impact on global climate – Cooperation with UN and other bodies

New

New

New

# A36-22

- Appendix K: ICAO Programme of Action on international aviation and climate change

New

- Appendix L: Market-based measures, including emissions trading

New

# Emissions Work Programme resulting from A36

- Regularly assess the impact of aviation emissions and develop the appropriate guidance and tools for that purpose;
- collect, monitor and disseminate data on the contribution of aviation emissions to local air quality and climate change;
- develop appropriate indicators, and parameters to measure performance;

# Emissions Work Programme resulting from A36 (Cont'd)

- develop appropriate policies, guidance and measures to minimize aviation emissions under:
  - technology (SARPs and goals);
  - new operational procedures, including air traffic planning and management; and
  - economic instruments including open emissions trading, voluntary measures, local air quality charges
  - Other: carbon-offsets, CDMs

# Emissions Work Programme resulting from A36 (Cont'd)

- actively cooperate with scientific and UN bodies, notably the IPCC and the UNFCCC;
- develop policy options to reduce the environmental impact of aircraft engine emissions and concrete proposals and provide advice to the UNFCCC.

# Programme of action on International Aviation and Climate change

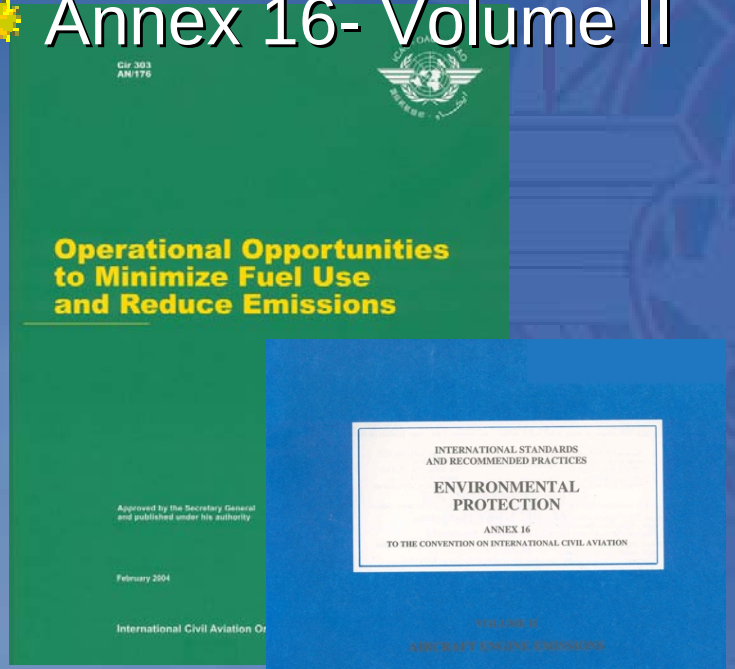
- **Group on International Aviation and Climate Change - GIACC**
  - **Senior Government Officials**
  - **Aggressive Program of Action**
  - **Implementation Framework: strategies and measures that States can use to achieve emissions reductions**
    - **Voluntary measures**
    - **Effective dissemination of technology**
    - **More efficient operational measures**
    - **Improvements in air traffic management**
    - **Positive economic incentives**
    - **Market-based measures**

# ICAO modelling activities

- ICAO is currently evaluating several models to estimate aviation emissions, among which:
  - AERO2K (European Union)
  - SAGE (US FAA)
  - AEM (Eurocontrol)
  - FAST (UK)
- ICAO and member States are in the process of improving these models in order to achieve:
  - better accuracy and more detailed results.
- RADAR DATA and other projects – Access to information

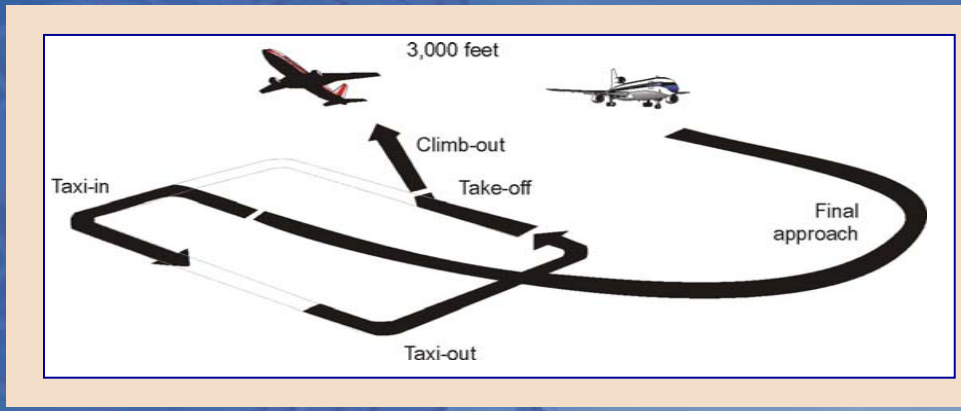
# Technology and Standards

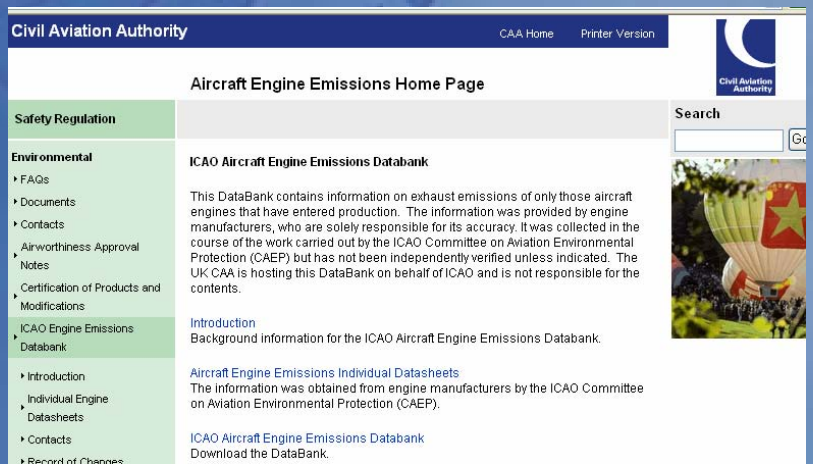
- Emissions database available from ICAO website
- Emissions standards: NOx, HC, CO and smoke number
- Annex 16- Volume II









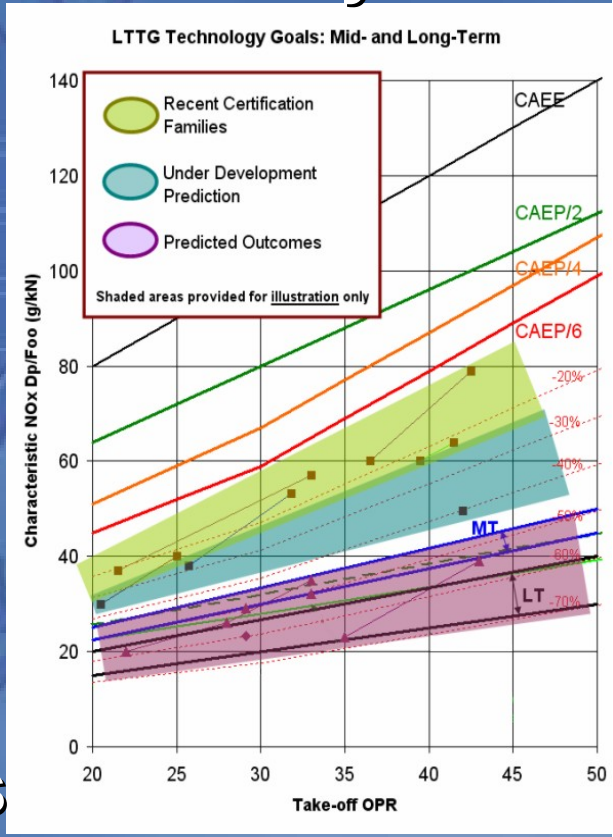



# NOx Standards

- $NO_x$ Standard was first adopted in 1981 then made more stringent in 1993, when ICAO reduced the permitted levels by 20% for newly certificated engines and again in 1998 by about 16%, on average for engines newly certificated from 31 December 2003
- The latest NOx Standards adopted in November 2005 and apply to engines manufactured after 31 December 2007

# Long-term Technology Goals for NOx

- **Long and medium term goals - 10 and 20 years**
  - **45% (2016) and 60% (2026) below CAEP/6**




- **Progress towards goals to be Monitored**

**Independent Experts NOx Review and the Establishment of Medium and Long Term Technology Goals for NOx (Doc 9887)**

# Other technology related ICAO publications

- Airport Air Quality Guidance Manual. Preliminary edition 2007 (Doc 9889)

- Guidelines on the use of Procedures in the Emissions Certification of Aircraft Engines
  - Future ETM part II

# Work in progress on technology and standards - 2010

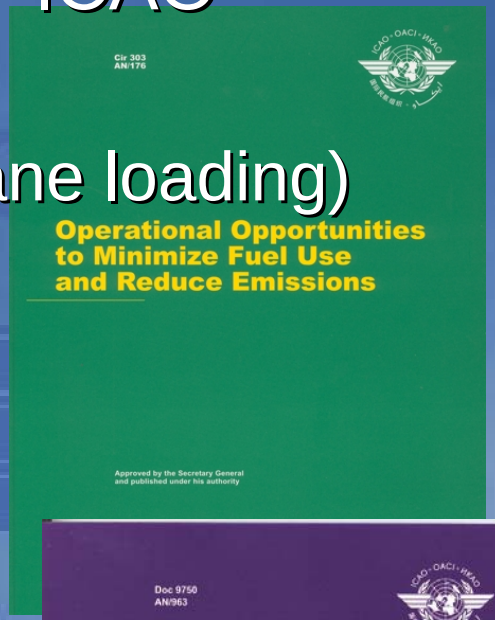
- $CO_2$ / fuel efficiency metrics and parameters
- Fuel burn Technology Goals
- Environmental impact of alternate fuels
- New NOx Stringency (to be included in Annex 16)
- Review of NOx Technology Goals
- New  Environmental Technical Manual for emissions

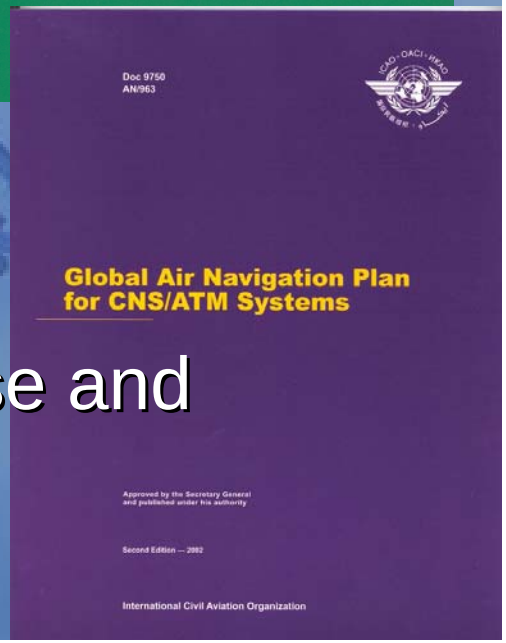
# Operational Measures

- Emissions savings can come from improvements in air traffic management (ATM) and other operational procedures
- Most important fuel saving opportunities come from the implementation of CNS/ATM systems - more direct routings and the use of more efficient conditions such as optimum altitude and speed
- $CO_2$ emissions are directly proportional to fuel burn
- Optimize fuel consumption = reduced emissions
- 1 tonne of fuel is equivalent to 3.16 tonnes of $CO_2$

# Operational Measures (Cont'd)

- Opportunities for fuel conservation – ICAO Circular 303
  - Reduce weight (fuel reserves; airplane loading)
  - Route selection
  - Altitude selection
  - Speed selection
  - Flap selection
- Voluntary agreements template
- Chapter 16 Global plan
- CAEP/7 - New ICAO Circular on noise and emission effects from NADPs



# Reduce Weight


Catering

# How Much is a 1% Reduction in Fuel Worth?

| Airplane Type | Fuel Savings (Gal/Year/Airplane) |
|---|---|
| 737 | 15 000 |
| 727 | 30 000 |
| 757 | 25 000 |
| 767 | 30 000 |
| 777 | 70 000 |
| 747 | 100 000 |

(* Assumes typical airplane utilization rates)

# Work in progress on operational measures

- Fuel burn operational goals
- New guidance on CDA – Continuous Descent Arrival
- Update global plan and support to regional/state implementation of the operational concept
- Guidance on computing, assessing, and reporting on aviation emissions
- Environmental indicators

# What Are Market-Based Measures?

- "*policy tools that are designed to achieve environmental goals at a lower cost and in a more flexible manner than traditional command and control regulatory measures.*"

# Types of Market Based Measures considered by ICAO

- Voluntary Measures
  - government and other entity agree to take specified actions or meet specified goals
- Emissions Charges
  - a charge on the amount of emissions
  - revenues used to mitigate the environmental impact of engine emissions
- Emissions Trading
  - the total amount of emissions would be capped
  - allowances in the form of permits could be bought and sold to meet emission reduction objectives
  - open trading allows trading across sectors

# Market-based measures (Cont'd)

- *Voluntary Measures:* ICAO/CAEP developed a template to facilitate voluntary agreements and collects information for the purpose of information sharing among stakeholders.
- ***New*** Local Air Quality Emission Charges Guidance
- Changes to the ICAO Policy on Charges for Airports and Air Navigation Services
- ***New*** report on Voluntary Emissions Trading for Aviations
- *Emissions Trading:* ***New*** (Draft) Guidance document (ICAO Doc 9885) identifies a range of emission trading issues involved in including aviation in an open trading scheme – to be updated in June 2008

# Guidance on emissions trading

- New area
  - Living document
- Focus on aviation-specific issues
  - Aircraft are mobile sources
- International civil aircraft operations only
  - Not State aircraft - no customs and police services
- Identifies options, pro's and con's and offers potential solutions where possible
- Doc 9885 - Draft edition – Sept 07
- Document to be updated and released June 08

# Work in progress on Market Based Measures

- Three Scoping Studies
  - 1. Issues related to linking GHG emissions trading schemes including aviation
  - 2. Potential for emissions offset measures to mitigate effects of aviation on climate change
  - 3. Potential for using emissions trading and offsets to address local air quality
- Updated Report
  - Report on Voluntary Emissions Trading

# On going work on Adaptation

- Climate Change will impact aviation operations as more intense and frequent weather events are expected, causing e.g. delays, re-routing, and possible airport infrastructure damage

- Work being carried out by WMO/ICAO/ICCAIA – early warning and monitoring – proposal initiated by WMO/ICAO in CAEP for the further installation of sensors at aircrafts

# Providing accurate information

- Events – CAEP prepares workshops and CAEP experts participate in main ICAO events (e.i. Colloquium on aviation emissions; Carbon markets workshop)
- IPCC reports - CAEP experts contributed to the Special Report and on the update of IPCC Guidelines
- ICAO Environmental Report – CAEP experts provided articles and helped review the report

# UPCOMING EVENTS 08

## ICAO PROCESS

**GIACC/2 – 14-16 Jul 08**

**CAEPSG/2 – Sept 08**

*ICAO Workshop*

*" Aviation and Carbon Markets"*

*18-19 June 2008 Montréal*

## UNFCCC/AWLCA PROCESS

**UNFCCC Subsidiary bodies – 2-13 Jun 08**

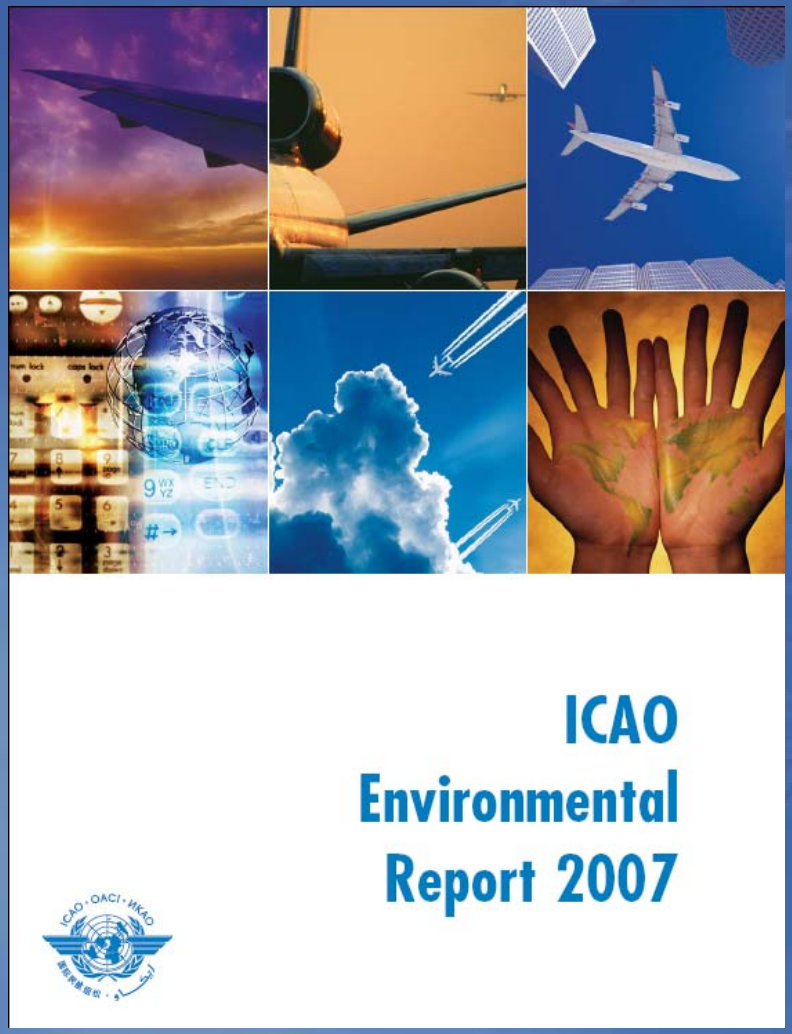
**AWGLCA/3 – Aug/Sept 08**

**COP/14 & SBs –1-12 Dec 08**


- The event will familiarize participants with key issues related to aviation emissions and carbon markets. A variety of approaches including emissions trading and carbon offset programmes will be reviewed
- The event will also provide information on possible ways of including international civil aviation in a global carbon market.
- The workshop will be conducted in English and will be free of charge. As the number of participants is limited, advance registration will be required

- http://www.icao.int/2008wacm/Registration.htm

# For more information




**ICAO ENV WEB PAGE**
*www.ICAO.int/env*

**ICAO work on emissions**
*http://www.icao.int/icao/en/env/aee.htm*

**Thank you**