ICAO actions and initiatives on climate change

Accra, Ghana

23 August 2008

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ICAO - International Civil Aviation Organization

Contents

- ICAO' s environmental activities
- Aviation data
- Scientific background
- Measures to address aviation GHG emissions
  - Technology
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- Group on International Aviation and Climate Change (GIACC)
- The way forward

Air transport key figures

- 2,2 billion passengers transported by air annually
- Total scheduled passenger traffic worldwide forecast to increase at an average annual rate of 4.6% (2005–2025)
- International traffic: 60% scheduled passenger traffic; 83% of freight air traffic

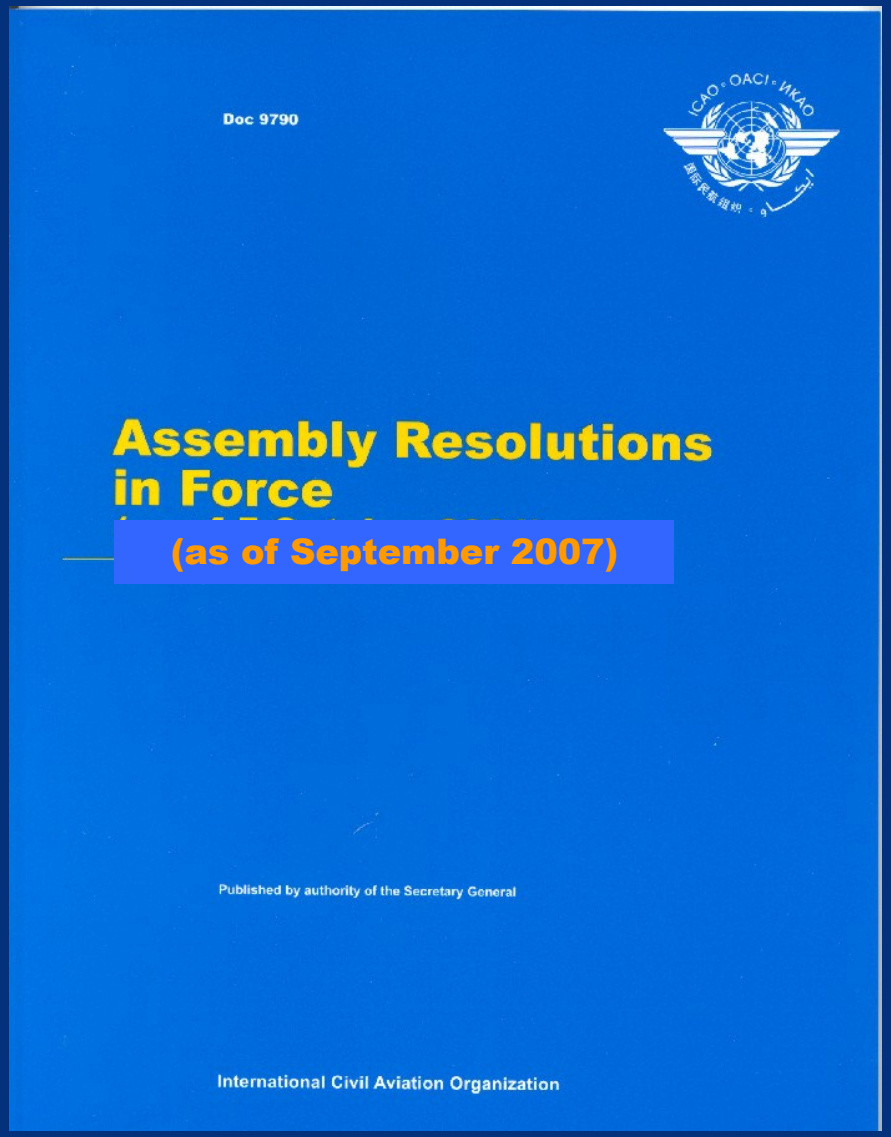
ICAO

- Established by the “Chicago Convention”
- UN specialized agency
- 190 Contracting States
- 86 International Organizations
- Safety is paramount
- Environmental Policies and Standards since early 70’s
- Special circumstances of developing Countries

Environmental Protection

- **Key Strategic Objective:** minimize the adverse effect of global civil aviation on the environment
- **ICAO GHG goal:** to limit or reduce the impact of aviation GHG emissions on global climate
- **Standards:** Annex 16 - *Environmental Protection, Volume II — Aircraft Engine Emissions*
- **ICAO Env. Policy:** **Assembly Res. A36-22 -** *Consolidated statement of continuing policies and practices related to environmental protection*

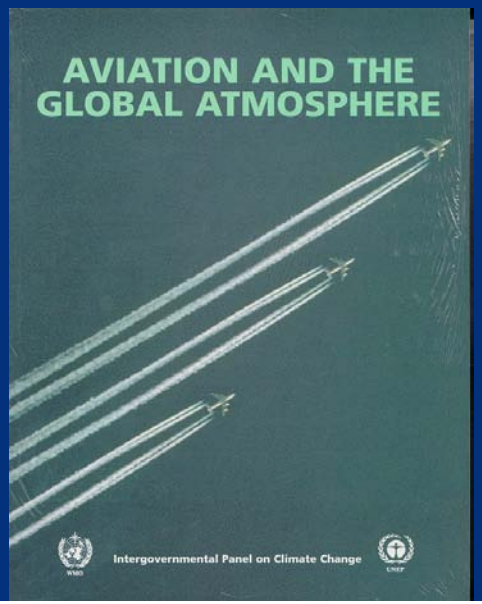
ICAO Policies and Standards

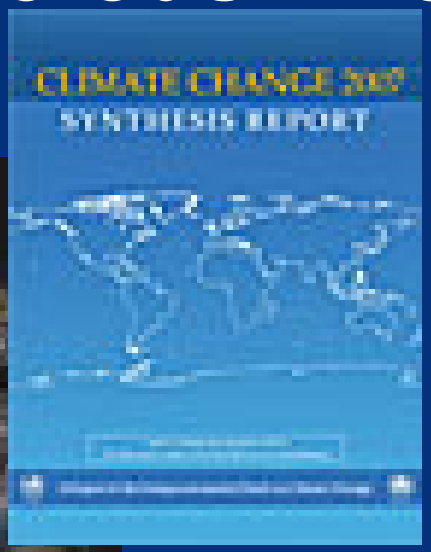


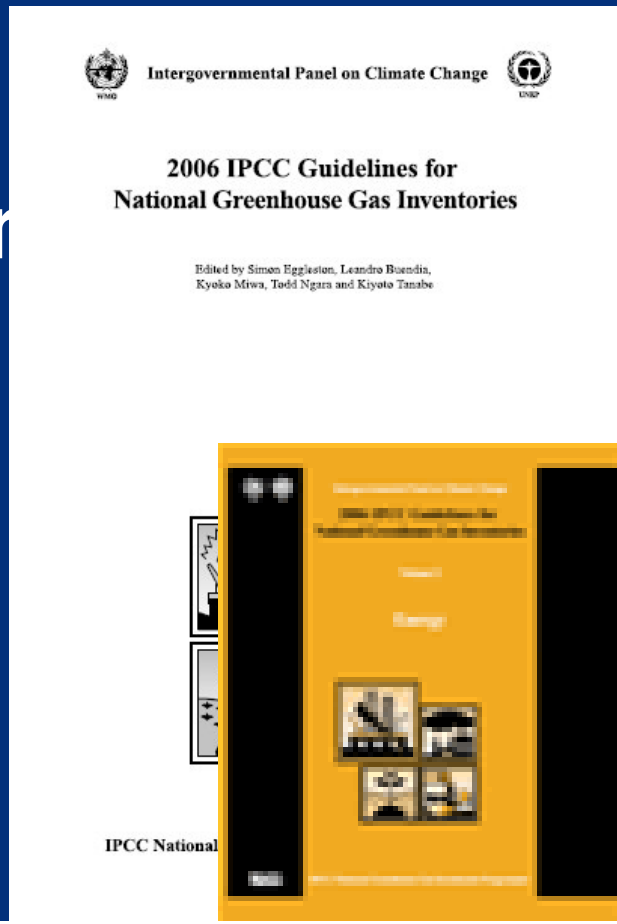
Doc 9902
A36-22: Consolidated statement of continuing ICAO policies and practices related to environmental protection

Main scientific reports

- 1999 IPCC Special Report on Aviation and the Global Atmosphere
- IPCC Fourth Assessment Report – Climate Change 2007
- IPCC 2006 Guidelines for National Greenhouse Gas Inver

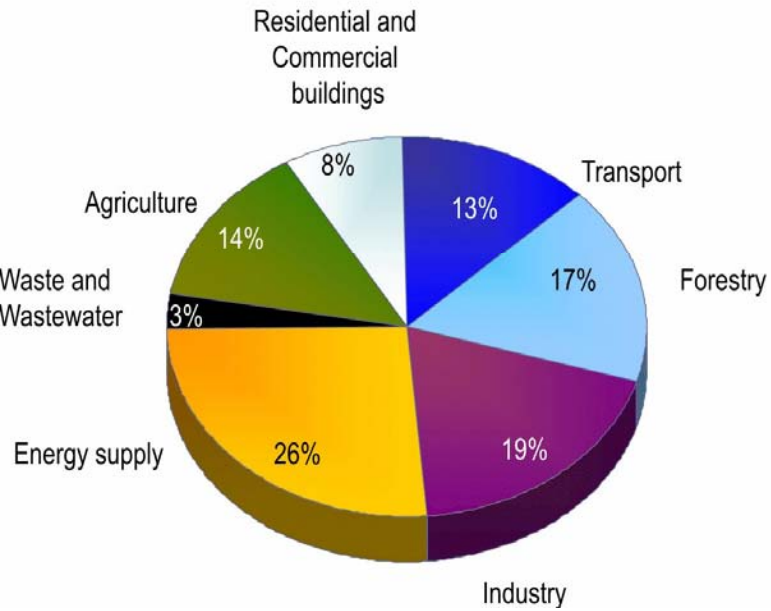




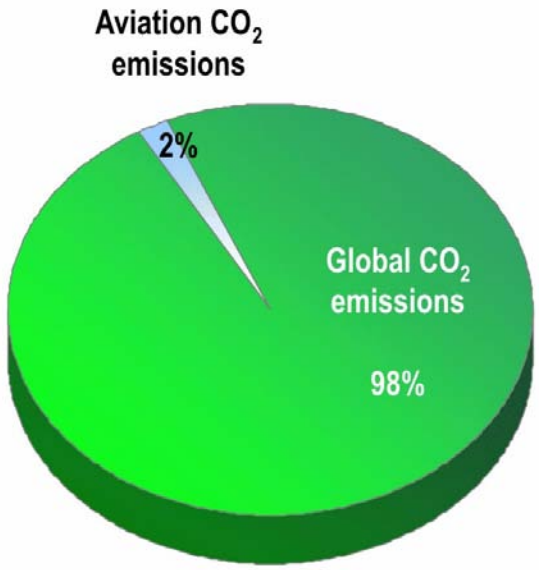


Key data – IPCC

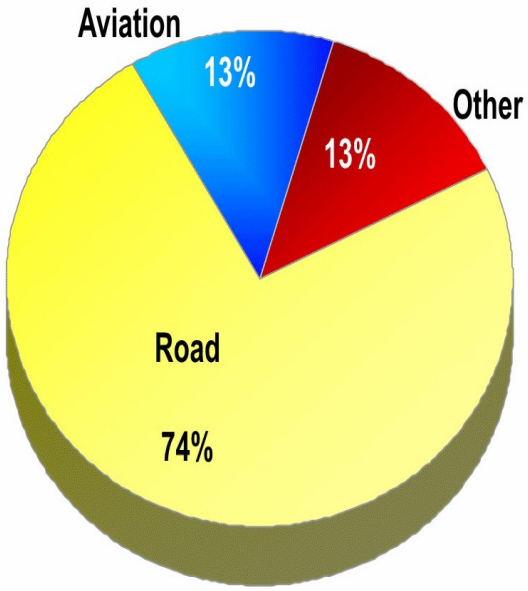
Global GHG by Section, 2004 (IPCC)



Part of Aviation Global CO_2 Emissions



Global CO_2 emissions per transport (%)



- Transport sector accounts for 23% of global GHG
- Aviation accounts for 2% of worldwide CO_2 emissions from fossil fuel use
- Could reach 3% by 2050
- International Aviation CO_2< 2%

Aviation emissions Kyoto Protocol

- Domestic aviation - within States territory - included as part of the national totals
- International aviation – beyond States boundaries – not included in national totals, just reported

International aviation emissions - Kyoto Protocol art 2.2

" Pursue limitation or reduction of emissions of greenhouse gases from aviation bunker fuels, *working through ICAO* "

COOPERATION WITH UNFCCC/IPCC

- Methodological issues
- Data Quality
- Split Domestic/international
- SBSTA – no progress since SBSTA22

ICAO fuel consumption estimates

- ICAO develops fuel consumption estimates by:
  - City-pair
  - Traffic flow
  - Country of departure, arrival
  - Country of airline registration
  - International / domestic
- Estimates based on airline schedules:
  - Non-scheduled (charter) flights are not accounted for
  - Flight cancellations are not accounted for
  - Flights additions are not accounted for

Fuel consumption - top 10 countries by category of service (by country of departure)

	Cargo Services	Fuel*
1.	United States	7 750
2.	China	2 956
3.	United Arab Emirates	1 611
4.	Korea	1 111
5.	Japan	994
6.	Germany	812
7.	Netherlands	725
8.	France	605
9.	India	481
10	Luxemburg	457

PASSENGER SERVICES

	International+	Fuel*
1.	United States	20 220
2.	United Kingdom	10 611
3.	China	8 346
4.	Germany	7 088
5.	Japan	6 774
6.	France	5 412
7.	Spain	3 693
8.	Singapore	3 531
9.	Thailand	3 255
10	Netherland	3 249

	Domestic	Fuel*
1.	United States	46 613
2.	China	6 979
3.	Japan	3 910
4.	Russia	3 006
5.	Australia	1 930
6.	Canada	1 918
7.	Brazil	1 672
8.	Indonesia	1 257
9.	Mexico	1 232
10	Spain	1 209

*Fuel consumption expressed in millions liters

Source: ICAO based on OAG timetable

+Including Domestic legs of International Services

Fuel consumption - top 20 countries of departure

	Country of departure	Fuel*
1.	United States	74 584
2.	China	18 282
3.	United Kingdom	11 804
4.	Japan	11 678
5.	Germany	8 611
6.	France	6 715
7.	Australia	5 354
8.	Canada	5 121
9.	Spain	4 953
10.	Russia	4 635

	Country of departure	Fuel*
11.	United Arab Emirates	4 038
12.	Korea	4 037
13.	Netherlands	3 983
14.	Italy	3 974
15.	Thailand	3 966
16.	Singapore	3 889
17.	Brazil	3 642
18.	India	3 556
19.	Mexico	3 054
20.	Malaysia	2 374

*Fuel consumption expressed in millions liters

Source: ICAO, based on OAG timetable

Fuel consumption by top 10 airlines

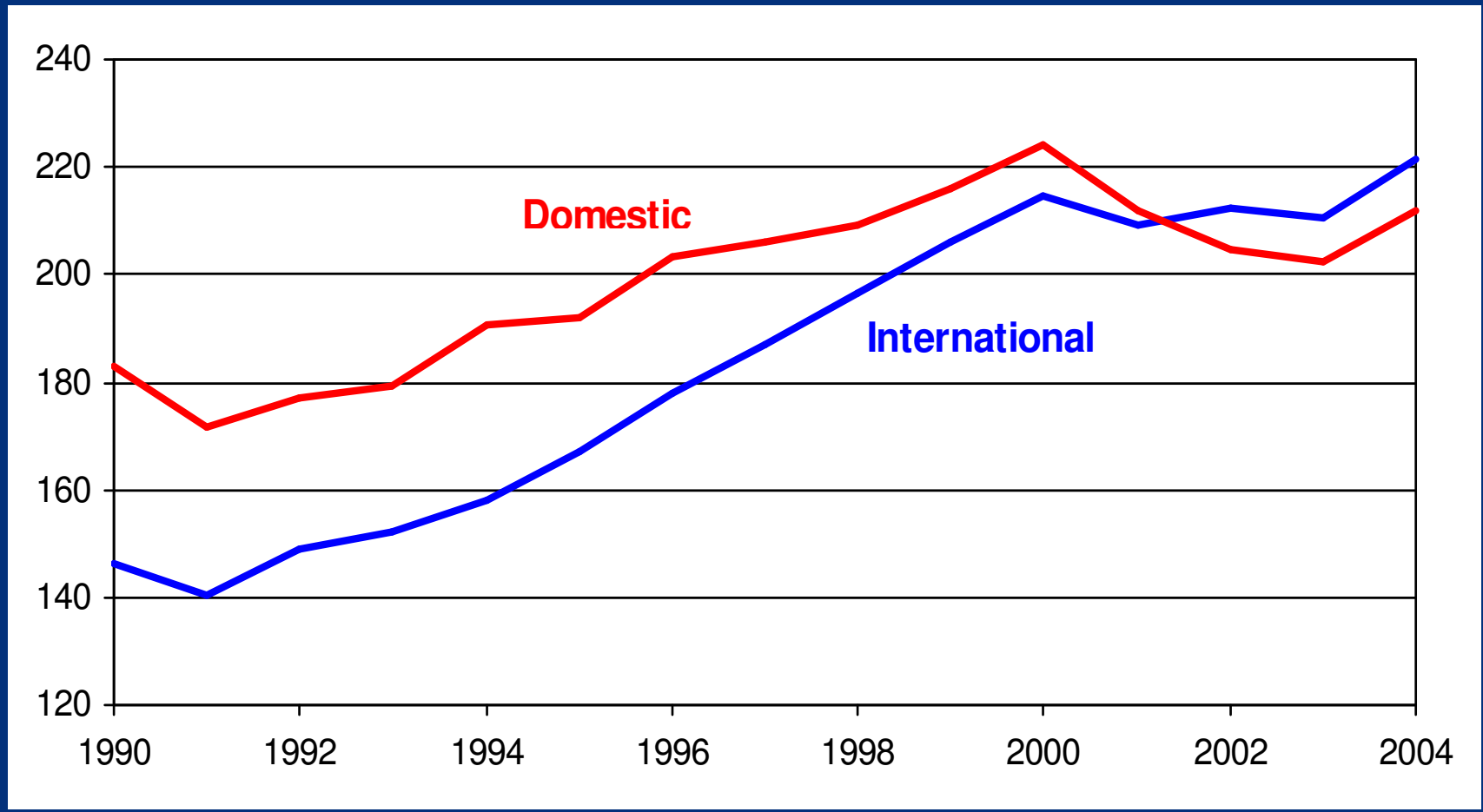
	AIRLINE	Fuel*
1.	American Airlines	11 490
2.	United Airlines	9 086
3.	Delta Airlines	8 465
4.	British Airways	7 172
5.	Northwest Airline	6 731
6.	Lufthansa	6 565
7.	Air France	6 167
8.	Southwest	5 412
9.	Singapore Airlines	5 386
10.	Continental	5 263

Source: ICAO based on OAG timetable

***Fuel consumption expressed in millions liters**

Annex 1 emissions

- Annex 1 International aviation emissions of CO2



Source: UNFCCC (data excludes the Russian Federation)

ICAO work on the environment

- CAEP – Committee on Aviation Environmental Protection
- Measures to address emissions
- GIACC

CAEP

1970
CAN
(Noise)

1977
CAEE
(Emissions)

1983
CAEP

- Technical feasibility
- Environmental effectiveness
- Economic reasonableness
- Interdependencies of measures

CAEP 22 *Members* and Observers

Argentina
Australia
Brazil
Canada
China
Egypt
France
Germany
India
Italy
Japan
Netherlands
Poland
Russian Fed.
Singapore
South Africa
Spain
Sweden
Switzerland
Tunisia
United Kingdom
United States

CAEP Members and 13 *Observers*

Greece

Norway

ACI

ACAC

CANSO

EC

ICSA

IATA

IBAC

ICCAIA

IFALPA

UNFCCC

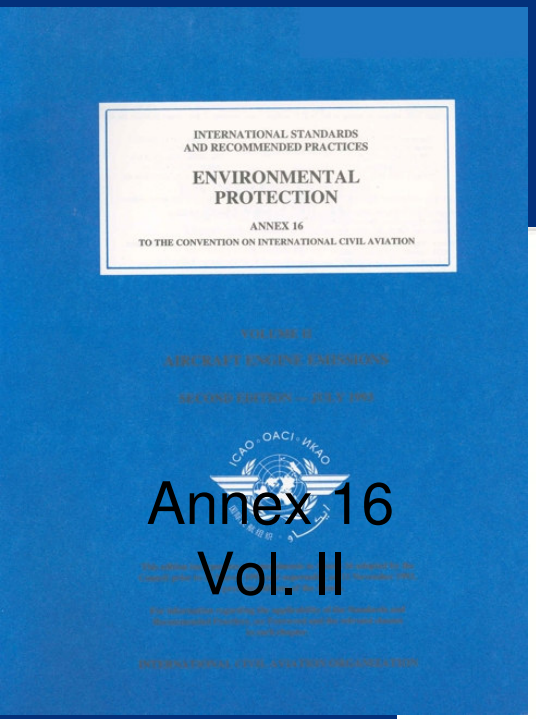
WMO

ICAO policy options to reduce emissions

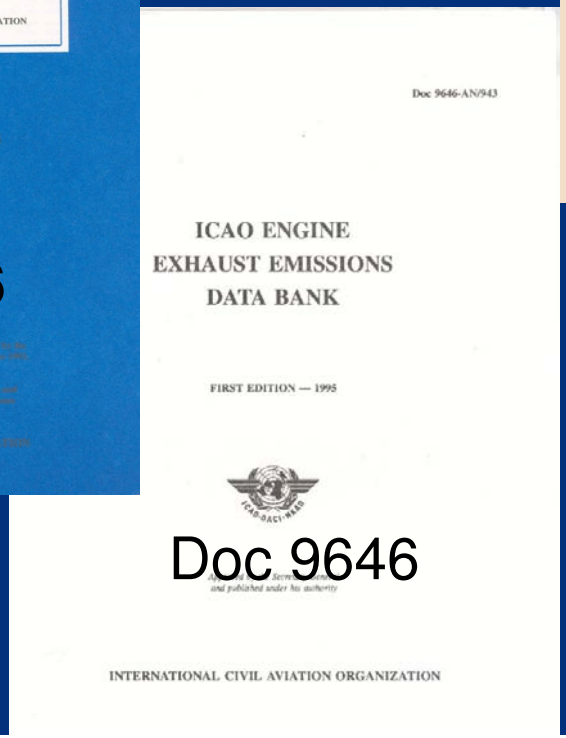
- Technology and Standards
- Operational Measures
- Market-based Measures:
  - Voluntary measures
  - Emissions charges
  - Emissions trading

Technology and Standards

- Emissions database available from ICAO website
- Emissions standards: NO_x, HC, CO and smoke
- Mid and long term goals (10 and 20 years)



Annex 16
Vol. II



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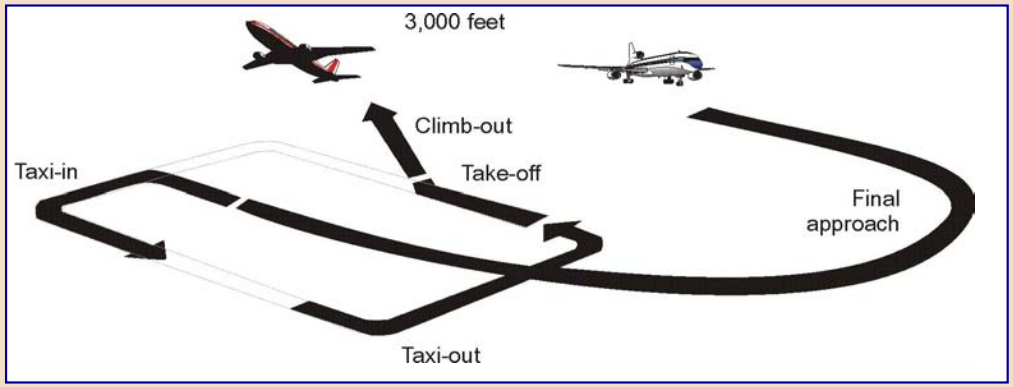
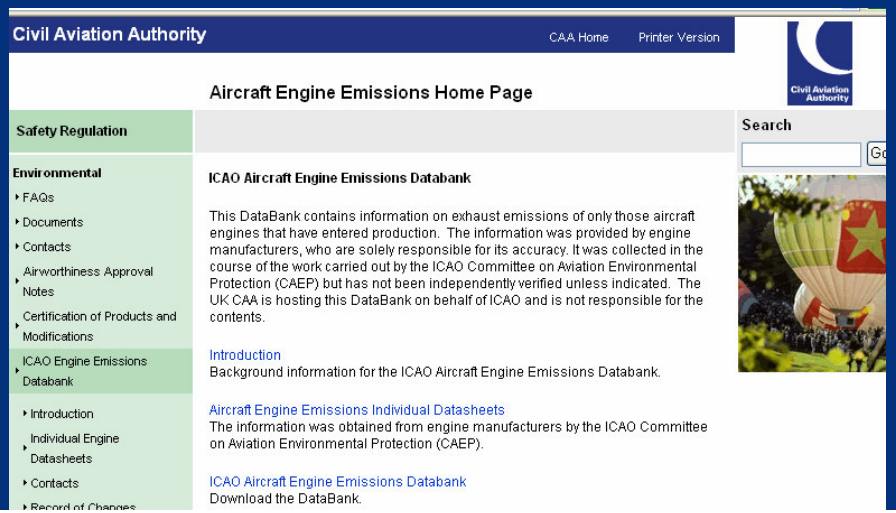




Work in progress on technology and standards - 2010

- 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

Summary of achievements on technology and Standards

- New aircraft obligatory certificated by ICAO Standards- resulting in more efficient, cleaner aircraft
- Passenger jet aircraft produced today are 70% more fuel efficient than those produced 40 years ago, and continued improvement is expected
- Increased stringency of NOx Standard by about 40%

Operational measures

- CO_2 emissions are directly proportional to fuel burn
  - 1 tonne of fuel is equivalent to 3.16 tonnes of CO_2
- Fuel saving opportunities come from improvements in air traffic management (ATM) e.g. more direct routings and the use of more efficient conditions such as optimum altitude and speed and other operational procedures
- Optimize fuel consumption = reduced emissions

Global ATM Operational Concept

- **Vision Statement**

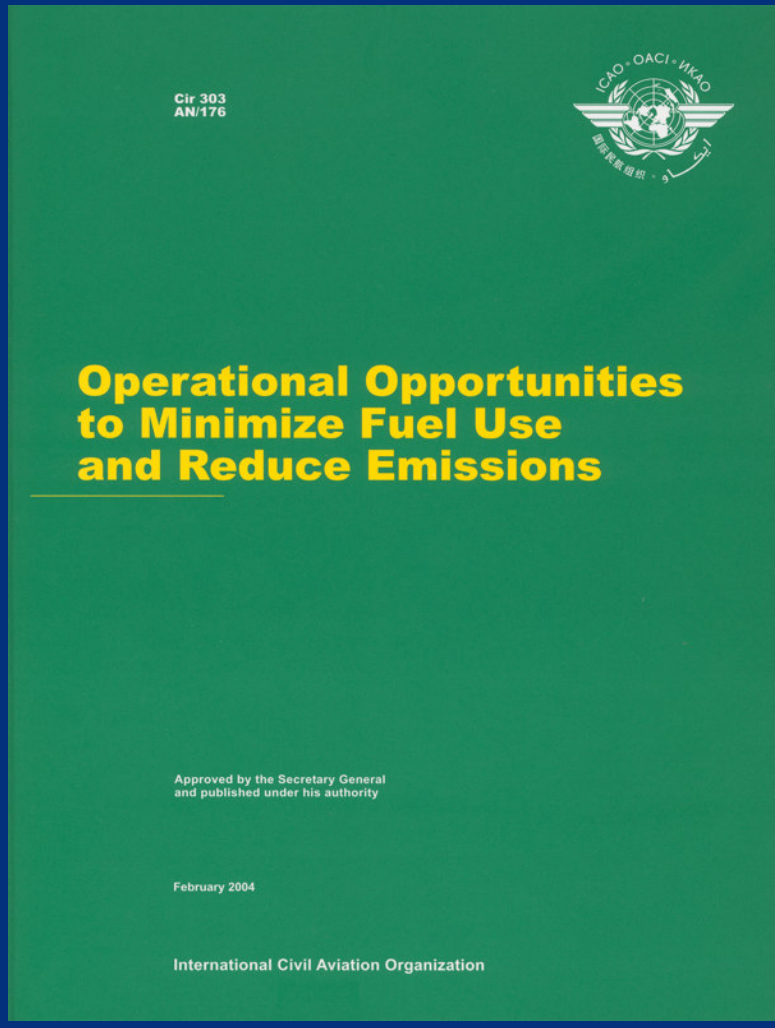
  - To achieve an interoperable global air traffic management system, for all users during all phases of flight, that meets agreed levels of safety, provides for optimum economic operations, is **environmentally sustainable** and meets national security requirements.

Next steps – ICAO role

- Support implementation of the ICAO Global Air Navigation Plan and its ATM global initiatives
- Facilitate the removal of **major impediments** to improving the global ATM system:
  - Encourage the organization and management of airspace based on **operational requirements** as opposed to **national and political boundaries**
  - Encourage **militaries to cooperate with civil authorities** so that airspace may be much more efficiently used
  - Encourage states to make funding available for **local ATM** improvements which should be based on clearly **established performance requirements**

Operational measures

- **Global Air Navigation Plan for CNS/ATM Systems** (Doc 9750)
- **Operational Opportunities to Minimize Fuel Use and Reduce Emissions** (ICAO Circular 303)
- **ICAO Circular on noise and emissions effects from NADPs**



Work in progress on operational measures - 2010

- Fuel burn operational goals
- New guidance on CDA – Continuous Descent Arrival
- Global plan and support to regional/state implementation of the operational concept
- Guidance on computing, assessing, and reporting on aviation emissions
- Environmental indicators
- Update of Circular 303

Market Based Measures (MBMs)

- Voluntary Measures – ICAO Template
  - 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

ICAO Documents on MBMs

- Report on Voluntary Emissions Trading for Aviations (ICAO website)
- Emissions Trading Guidance (Doc 9885)
- Local Air Quality Emission Charges Guidance (Doc 9884)
- ICAO Policy on Charges for Airports and Air Navigation Services (Doc 9082)

Work in progress on market based measures - 2010

- 3 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
  - 1. Report on Voluntary Emissions Trading

ICAO Carbon Calculator

ICAO Carbon Emissions Calculator

ICAO has developed a methodology to calculate the carbon dioxide emissions from air travel for use in offset programmes.

The ICAO Carbon Emissions Calculator allows passengers to estimate the 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.

For additional information, please see the accompanying methodology to the ICAO Carbon Emissions Calculator.

You can find your carbon footprint by entering your city of origin and destination

From: MONTREAL (YUL) To: TORONTO (YYZ)

From: TORONTO (YYZ) To: SAO PAULO (GRU)

My ticket is: Economy Class Premium Class (Economy Premium, Business, or First)

Number of passengers: 1

Restart Calculate Add a Flight

Click here to read the ICAO Methodology

Help us to improve the calculator

Methodology available

www.icao.int

Future developments

- Public consultation
- Periodic updates (6 months basis)
- Consult with the IPCC on the use of multipliers
- Explore the use of carbon offsets
- Consult with UNFCCC on the link to adaptation fund

- Mr. Yvo de Boer addressed the key issues related to aviation emissions and carbon markets
- A variety of approaches including emissions trading and carbon offset programmes were addressed, together with a broad discussion on other Kyoto flexible mechanisms and the opportunities for a global aviation carbon market
- Workshop also discussed the possible funding mechanisms for mitigation and adaptation.

GIACC - Group on action on International Aviation and Climate change - (Appendix K)

- New group established in 2007 to develop and recommend to ICAO an aggressive Programme of Action on International Aviation and Climate Change (GIACC)
- GIACC is composed of senior government officials representative of all ICAO regions, with the equitable participation of developing and developed States

1st GIACC meeting Feb. 2008

- GIACC/1 (Feb 08) reviewed aviation emissions-related activities within ICAO and internationally
  - GHG on going activities in CAEP
  - Cooperation with UN Bodies (UNFCCC/IPCC)
  - Information on National/regional activities
  - Information from Industry on possible actions to reduce aviation emissions (airlines; airports; air navigation services and business aviation);
  - Discussion on elements of a framework for action;
  - Aspirational goals

2nd GIACC meeting

- Held in July 2008
- UNFCCC participation
- Work progressed towards the establishment of aspirational goals
- 3 working groups were agreed upon:
  - Global aspirational goals
  - Measures to achieve reductions
  - Means to evaluate progress
- **Next meeting – February 2009**

PARALLEL PROCESS

ICAO/GIACC PROCESS

GIACC/1 – 25-27 Feb08
GIACC/2 – 14-16 Jul08

GIACC/3 – 16-18 Feb09
GIACC/4 – 1-3 Jun09
High Level Meeting in connection with COP/15 (date tbd)

CAEPSG/2-Sept08
CAEPSG/3-Jun09
CAEP/8-Feb10

UNFCCC PROCESS

AWG5KP/LCA/1 – 31Mar-4Apr08
AWKPG5/LCA/2 – 2-13 Jun08
AWGKP6/LCA/3 – 21-27 Aug08
AWGKP6/LCA/4 – 1-12 Dec08
AWGKP7/LCA/5 – Mar09
AWGKP7/LCA/6 – 1-12Jun09
AWGKP8/LCA/7– Aug/Sept09
AWGKP8/LCA/8– 30Nov/11Dec09
(COP/15)

WORKSHOPS / INFORMAL GROUPS

ICAO

- develops Standards, guidance and policies for use by States and the industry in addressing GHG emissions
- has the expertise, the fora and structure to address international aviation emissions
- is cooperating with the UNFCCC and developing an aggressive Programme of action on aviation and climate change to be considered in connection with COP/15 in 2009

www.icao.int/icao/env

ICAO Environmental Report 2007

ICAO

INTERNATIONAL CIVIL AVIATION ORGANIZATION

Aviation & the Environment

Though its CO_2 and NO_x impact is less than those of other industries and transport sectors, aviation continues to take bold steps toward aggressive targets as its global stakeholders confront the technological and leadership challenges of climate change.

In this issue:
ICAO's Environmental Leadership • EU and US Climate Change Strategies
What Science is Saying: Olivier Boucher • Boeing and Airbus Initiatives
Overview of Engine Advances and Planning • CANSO Perspective
Advances Through ICAO Implementation (TCB) • IFALPA UAV Feature
Message from UNFCCC Executive Secretary, Yvo de Boer

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THANK YOU