Transport Canada Transports Canada

AVIATION OPERATIONAL MEASURES FOR FUEL AND EMISSIONS REDUCTION WORKSHOP

An Overview of ICAO's Work on Aviation Environmental Protection

Jane Hupe

ICAO

Introductory Panel
Ottawa, 5-6 November 2002

Canada

Transport Canada Transports Canada

PRESENTATION PLAN

- ICAO – International Civil Aviation Organization
- ICAO'S work on the environment
- Standards and Policies
- CAEP
- Current Status of ICAO'S Work on Aircraft Engine Emissions
- The ICAO Circular

Transport Canada Transports Canada

GENERAL INFORMATION

ICAO and CAEP

ICCAIA

IATA

Introductory Panel
Ottawa, 5-6 November 2002

Canada

Transport Canada Transports Canada

ICAO – International Civil Aviation Organization

- **Specialized Agency of the United Nations**
- **Created** in 1944 by the Convention on International Civil Aviation (Chicago Convention)
- **Membership:** 188 Contracting States
- **Mission:** to ensure the safe and orderly development of international civil aviation
- **Mandate:** to establish and update the Standards and Recommended Practices (SARPs) of the Annexes to the Convention)

Canada

Environmental Protection

- Continuing growth (doubling in 10 years)
- Increased public awareness
- New information emerging on problems to which civil aviation may be contributing

BACKGROUND

- ICAO has been working with environmental issues since 1960's
  - Aircraft noise
  - Aircraft engine emissions
  - Local problems at airports
- The Organization's current environmental activities are largely carried out through its **Committee on Aviation Environmental Protection (CAEP)**

BACKGROUND

- 1970 - **CAN** - Committee on Aircraft Noise
- 1971- First SARP for aircraft noise, designated as Annex 16 to the Convention on International Civil Aviation (Chicago, 1944)
- 1977 - **CAEE** - Committee on Aircraft Engine Emissions

BACKGROUND

- **1981** - Annex 16 was expanded to encompass SARPs dealing with the control of aircraft engine emissions.
  - **Annex 16:** Volume I, Aircraft Noise
    Volume II, Aircraft Engine Emissions
- **1983** - **CAEP** - Committee on Aviation Environmental Protection
  - to supersede CAN and CAEE

Transport Canada Transports Canada

ICAO Assembly

Council

Air Transport Committee

Air Navigation Commission

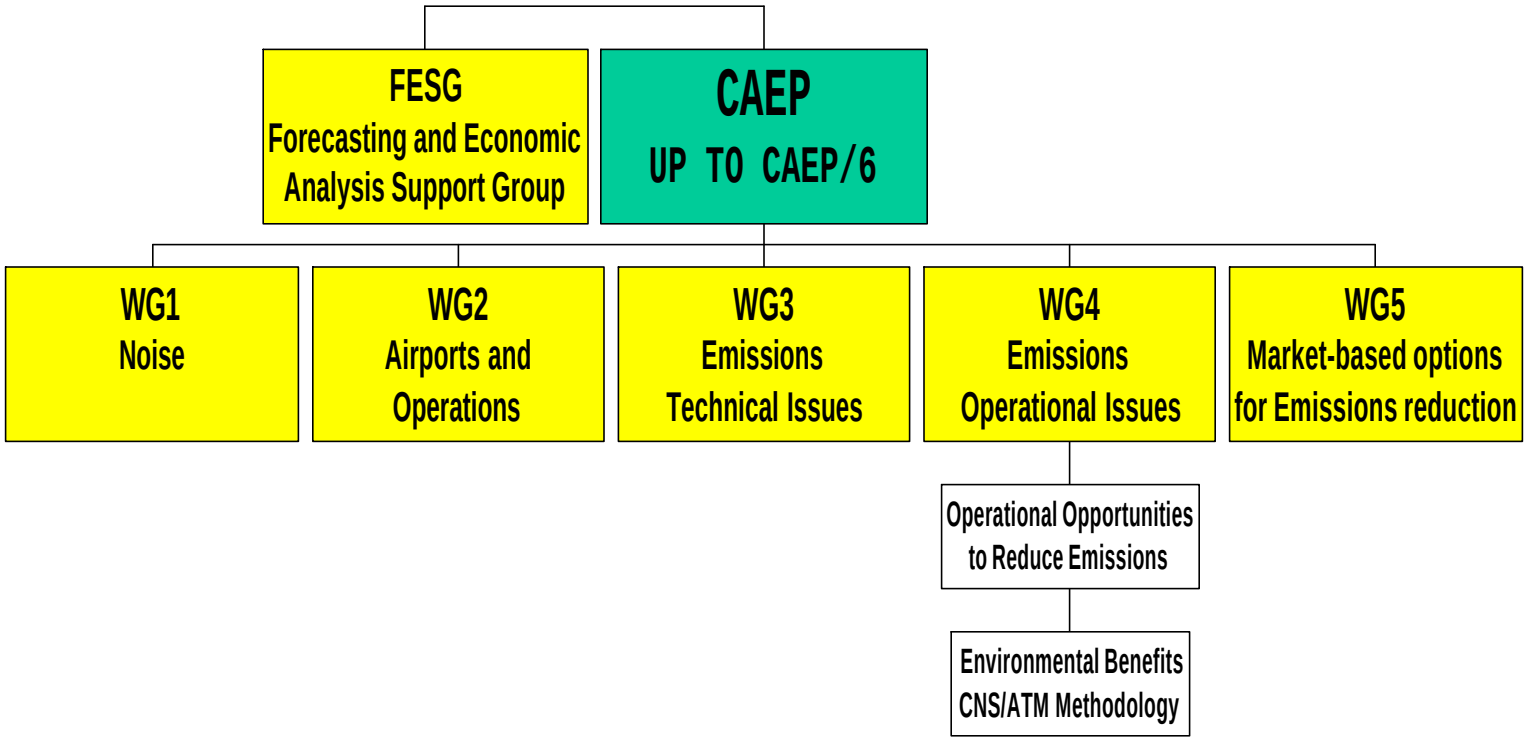
Committee on Aviation Environmental Protection

Introductory Panel
Ottawa, 5-6 November 2002

Canada

Transport Canada Transports Canada

CAEP Structure leading up to CAEP/6



Canada

CAEP Terms of Reference

To undertake specific studies, as approved by the Council, related to control of aircraft noise and gaseous emissions from aircraft engines

CAEP Terms of Reference

Effectiveness and reliability of certification schemes from viewpoint of

- **technical feasibility,**
- **economic reasonableness and**
- **environmental benefit**

to be achieved

CAEP Terms of Reference

- Developments in other associated fields, eg. Land-use planning, noise abatement operating procedures, emission control through operational practices, etc.

CAEP Terms of Reference

- International and national programmes of research into control of aircraft noise and control of gaseous emissions from aircraft engines; and

CAEP Terms of Reference

- The potential **interdependence of measures** taken to control noise and to control engine emissions

(TRADE-OFFS)

CAEP Members and Observers

Australia
Brazil
Canada
Egypt
France
Germany
Italy
Japan
Netherlands
Poland
Russian Federation
Singapore
South Africa
Spain
Sweden
Switzerland
Tunisia
United Kingdom
United States

CAEP Members and Observers

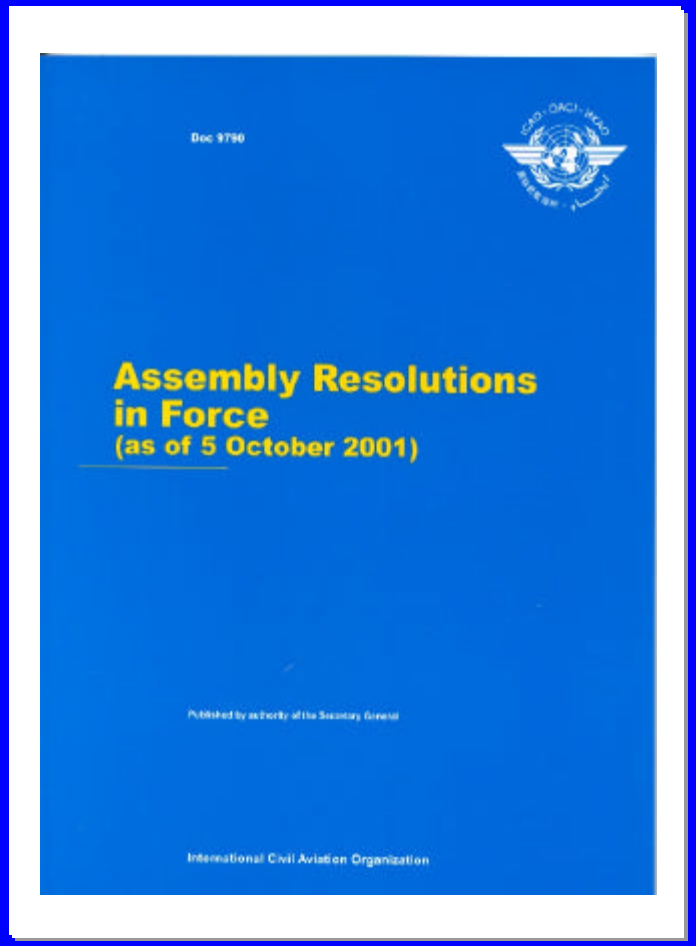
Greece	EC	IFALPA
Norway	IATA	T & E
ACAC	IBAC	UNFCCC
ACI	ICCAIA	WMO

Transport Canada Transports Canada

ICAO Policies & Standards

Introductory Panel
Ottawa, 5-6 November 2002

Canada



A33-7: Consolidated statement of continuing ICAO policies and practices related to environmental protection

Canada

A33-7

- Appendix A: General
- Appendix B: Development of Standards, Recommended Practices and Procedures and/or guidance material relating to the quality of the environment

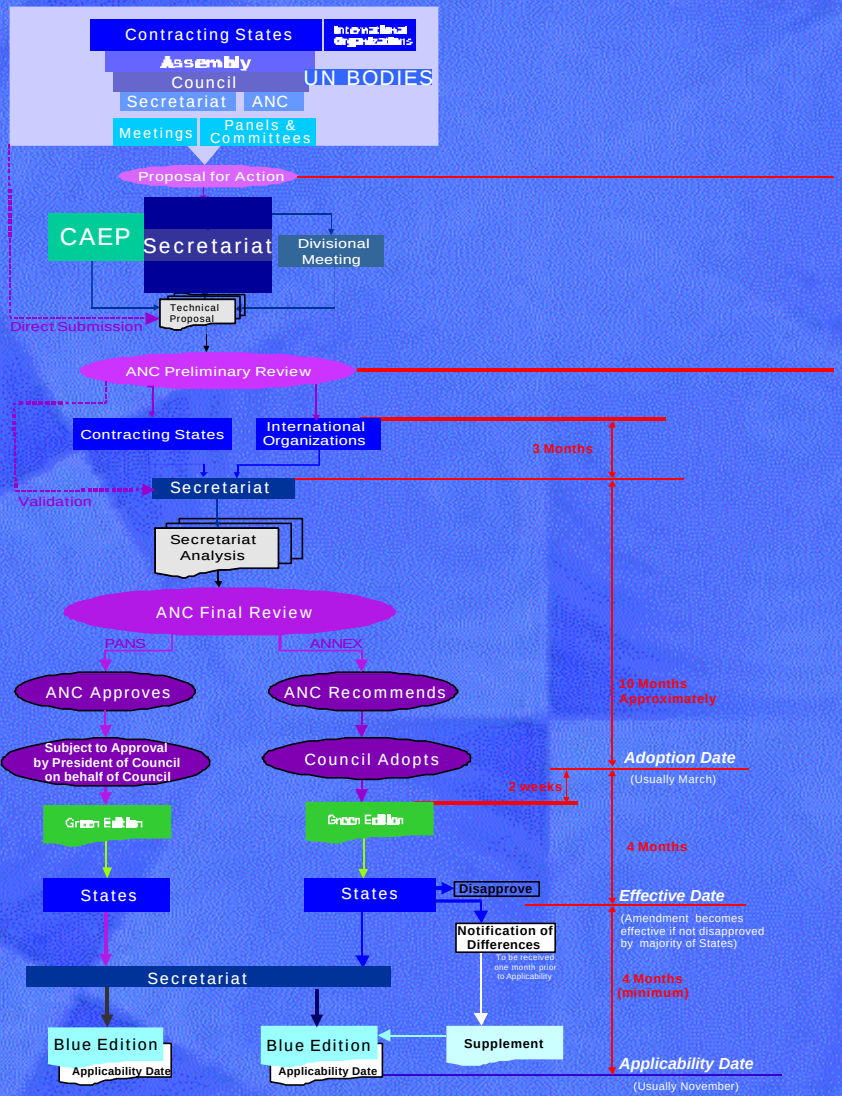
A33-7

- Appendix C: Policies and programmes based on a “balanced approach” to aircraft noise management
- Appendix D: Phase-out of subsonic jet aircraft which exceed noise levels in Volume I of Annex 16

A33-7

- Appendix E: Local noise-related operating restrictions at airports
- Appendix F: Land-use planning and management
- Appendix G: Supersonic aircraft – the problem of sonic boom

Making an ICAO Standard



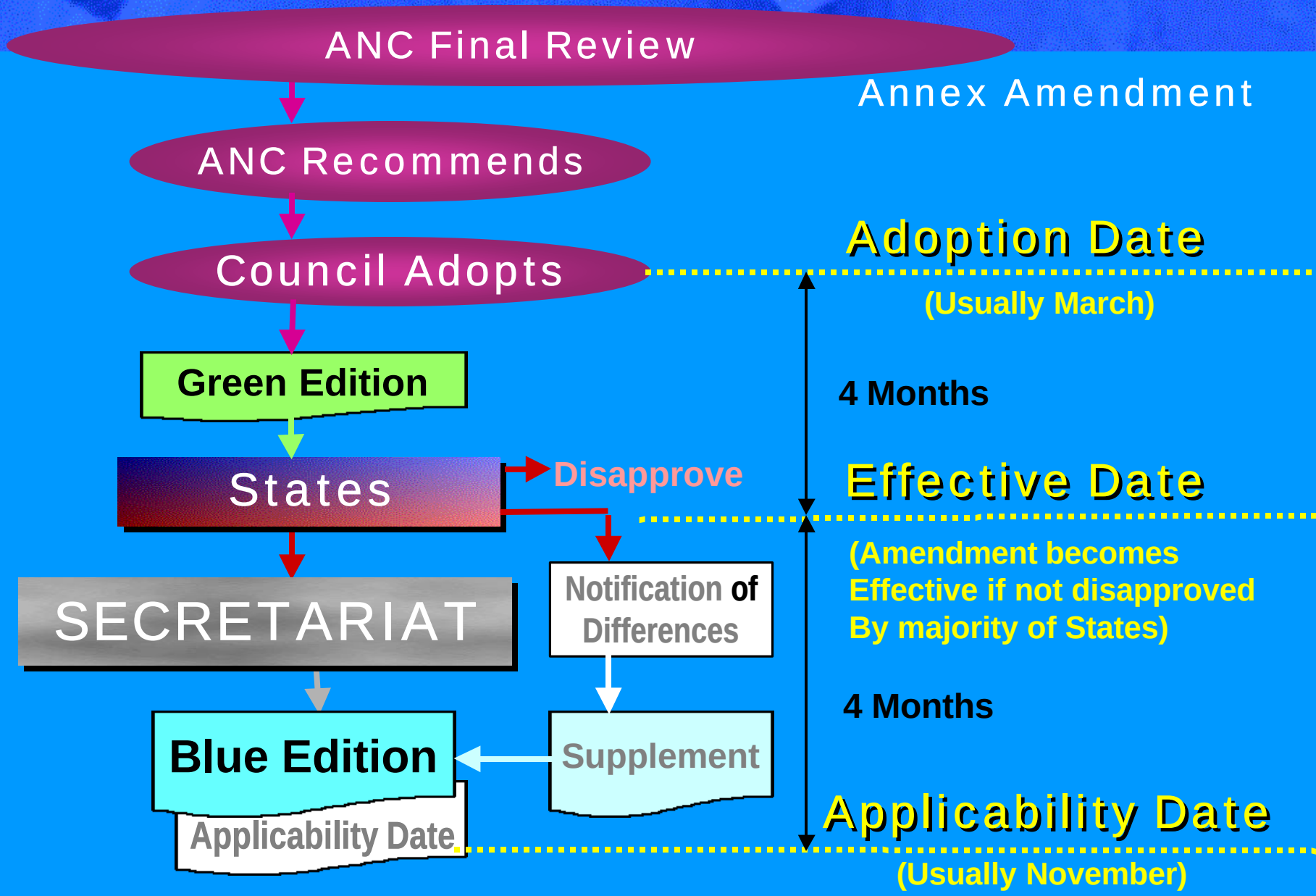
Origin of Proposal

Development Phase

Review Phase

Adoption/ Publication Phase

Adoption/Publication Phase



Aircraft Engine Emissions

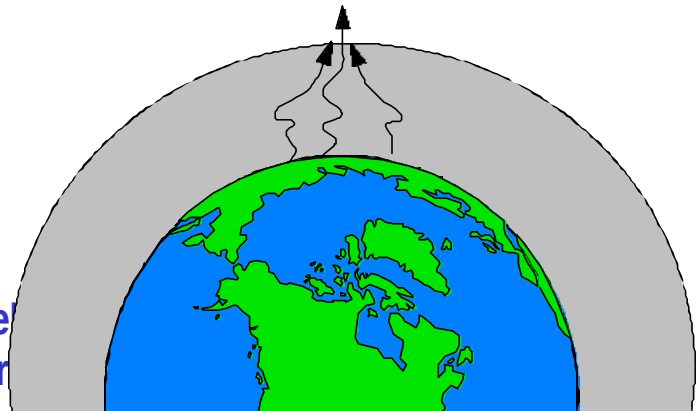
***Problems*:**

- Impact on air quality near airports
- Contributing to global atmospheric problems

Transport Canada Transports Canada

Global Atmospheric Problems

- Climate change (the "Greenhouse" effect)
- Depletion of ozone layer



Transport Canada Transports Canada

Intergovernmental Panel on Climate Change

Special Report on *Aviation and the Global Atmosphere*

- Prepared at ICAO's request
- Completed April 1999
- Covered both climate change and ozone depletion

ICCAIA IATA

Introductory Panel
Ottawa, 5-6 November 2002

Canada

IPCC Report

Contributions to climate change from:

- Carbon dioxide (CO_2)
- Oxides of nitrogen (NO_x), producing ozone
- Water vapour
- Contrails and cirrus clouds
- Sulphate and soot aerosols

IPCC Report

Regarding climate change :

- Current impact of aviation is about 3.5% of the total radiative forcing by all human activities
- Proportion expected to increase

IPCC Report

Regarding ozone depletion :

- A substantial fleet of supersonic aircraft could be a problem
- Present subsonic fleet is probably not

Transport Canada Transports Canada

Liaison with other UN Policy-making Bodies - UNFCCC

- All States must develop national inventories of emissions
- Developed countries aimed to stabilize greenhouse gas emissions at 1990 levels by year 2000
- Additional commitments by developed countries (Kyoto, Dec 1997)

UN FCCC

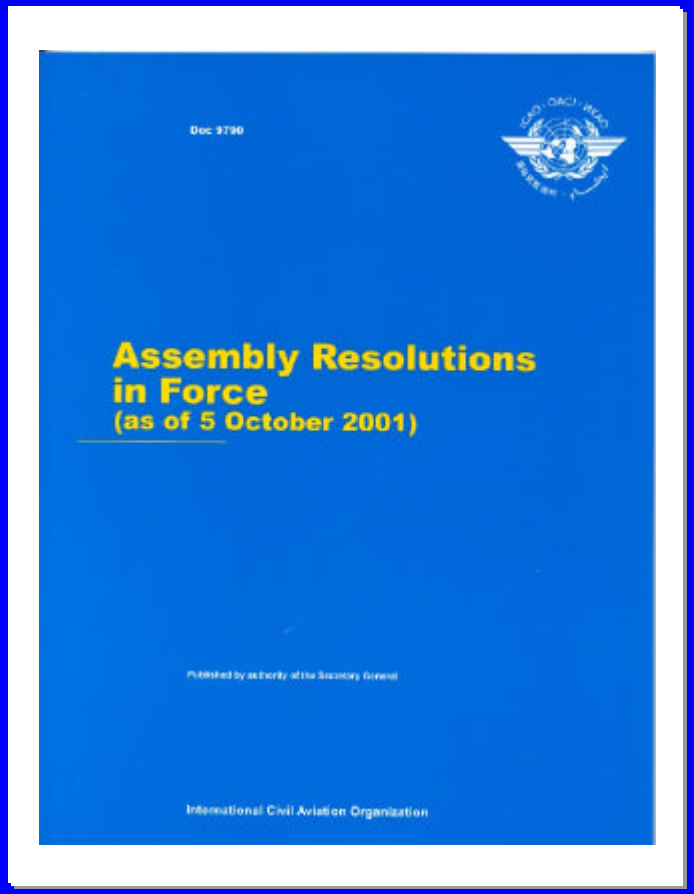
- Domestic aviation emissions are included in Parties' inventories
- International aviation emissions (bunker fuels) are reported by country where fuel is loaded, but omitted from national totals

Kyoto Protocol

- Developed countries are required to reduce greenhouse gas emissions by an average of 5% (compared with 1990) by 2008 - 2012

AND to

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



A33-7: Consolidated statement of continuing ICAO policies and practices related to environmental protection

Canada

Assembly Resolution A 33-7

- Appendix H: Environmental impact of civil aviation on the atmosphere
- Appendix I: Market-based measures regarding aircraft engine emissions

Assembly Resolution A33-7, Appendix H

- Requests the Council to continue to study policy options to limit or reduce the environmental impact of aircraft engine emissions
- To develop concrete proposals and provide advice to UN FCCC as soon as possible

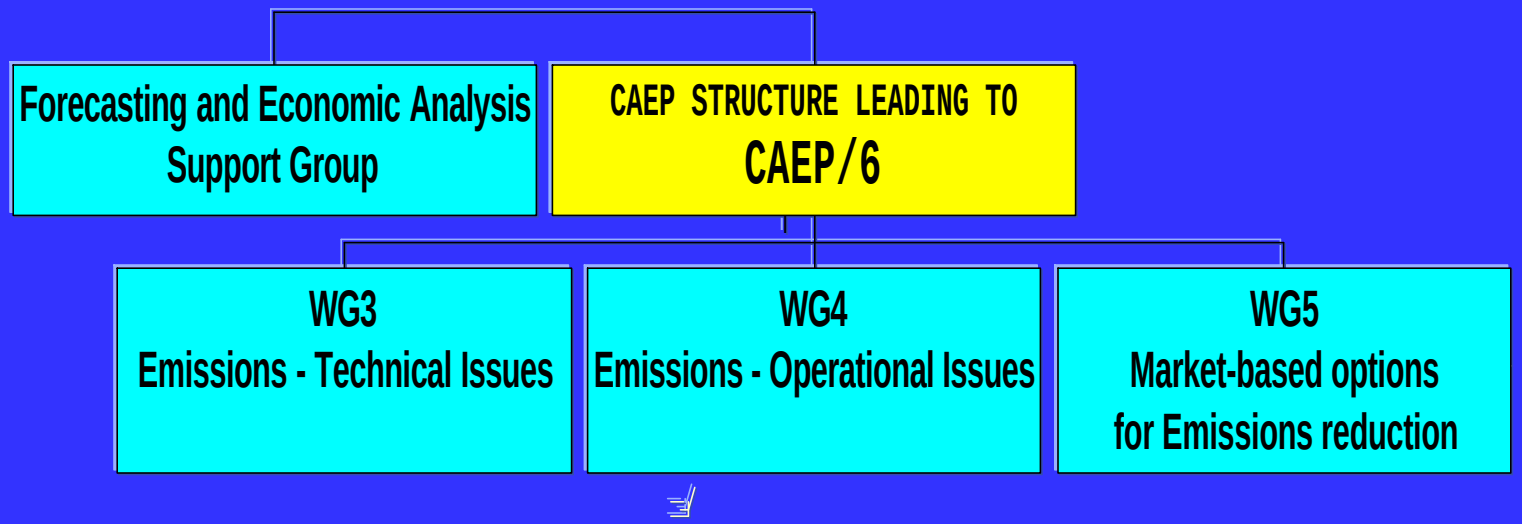
Assembly Resolution A33-7, Appendix H (cont.)

- To place special emphasis on the use of technical solutions while continuing its consideration of market-based measures
- To take into account the potential implications for developing as well as developed countries

CAEP is considering …

- Technology and standards
- Operational measures
- Market-based measures

CAEP Structure – Emissions



Transport Canada Transports Canada

Technology & Standards

ICCAIA IATA

Introductory Panel
Ottawa, 5-6 November 2002

Canada

ICAO Standards for Emissions Certification of Aircraft Engines

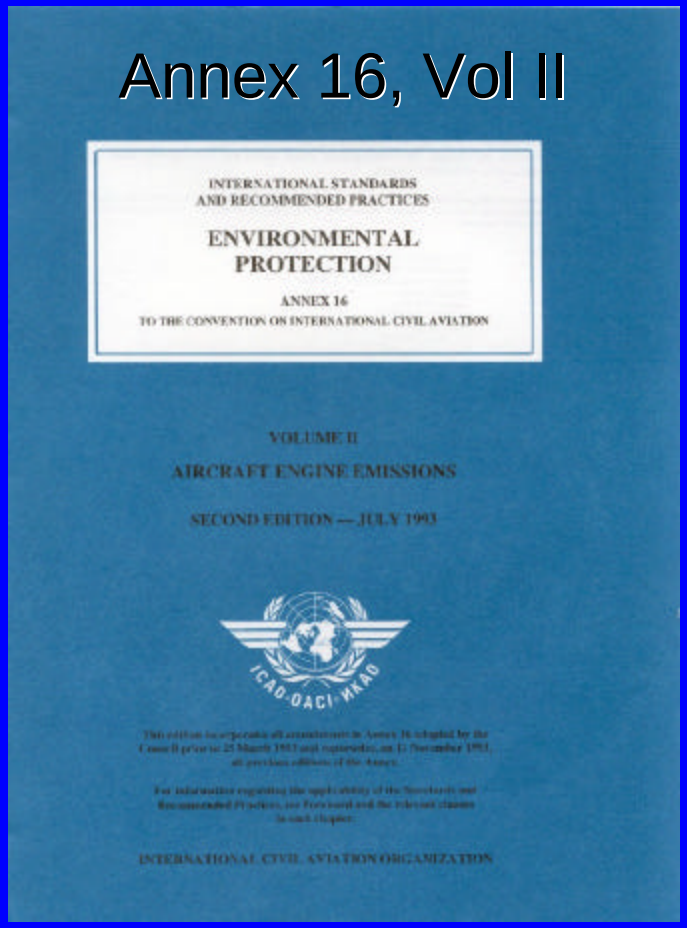
- Were originally designed to respond to concerns regarding air quality in the vicinity of airports
- Establish limits for emissions of oxides of nitrogen (NO_x), carbon monoxide (CO), unburned hydrocarbons (HC) and smoke, for a reference LTO cycle below 915 m altitude (3 000 ft)

Technical Issues

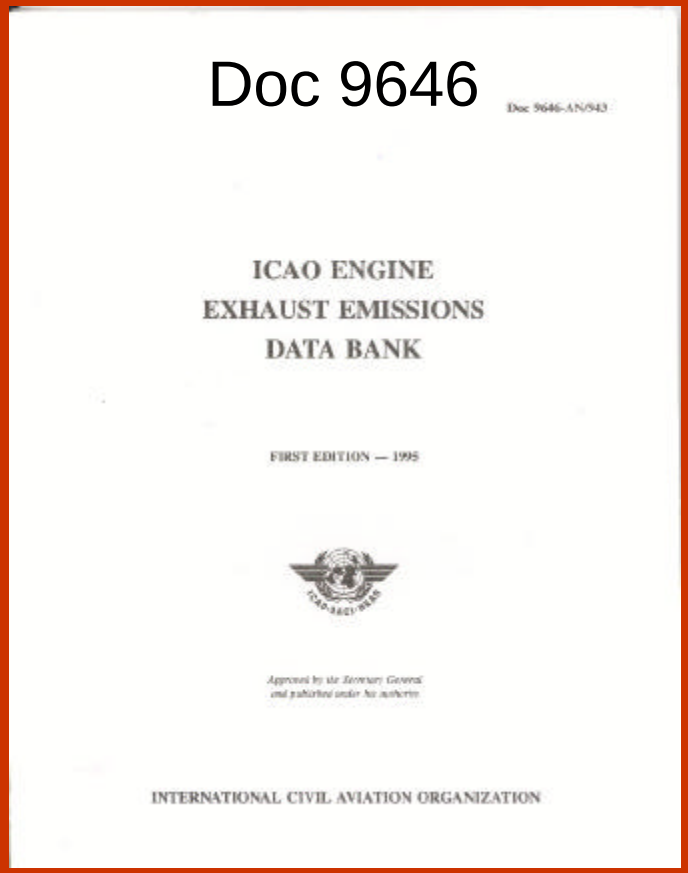
- NO_x Standard was first adopted in 1981 then made more stringent in 1993, when ICAO reduced the permitted levels by 20% for newly certificated engines and again in 1998 by about 16%, on average for engines newly certificated from 31/12/2003

Transport Canada Transports Canada

Annex 16, Vol II



Doc 9646



ICCAIA

IATA

Canada

Technical Issues - *Currently*

- Studying alternative emissions methodologies that will encompass all phases of flight (climb and cruise and LTO cycle)
- The new methodologies will also take into account fuel efficiency and productivity of the whole aircraft, which would have a direct bearing on CO_2 emissions
- Also exploring further stringency for the NO_x limits and a cut-off date for the production of aircraft complying with previous limits

Transport Canada Transports Canada

Market-based Measures

Introductory Panel
Ottawa, 5-6 November 2002

ICCAIA IATA

Canada

Transport Canada Transports Canada

Assembly Resolution A33-7, Appendix I

- Requests Council to develop guidance for States on the application of market-based measures
- Encourages States and Council to evaluate the cost and benefits of the various measures

Canada

Market-based Measures

- Emissions trading
- Voluntary measures
- Emission-related levies (charges or taxes)

Emissions Trading (ET)

- Results so far: an ET system is a cost-effective measure to limit or reduce aviation CO_2 in the long term

- A33 requested Council to develop an ET system for international aviation as a matter of priority

Emission-related levies (charges or taxes)

- Council Resolution of 9 December 1996
  - Strongly recommends charges, not taxes
  - Funds collected should be applied to mitigating impact of emissions

Emission-related levies (charges or taxes)

- Differing views amongst States
- A33 requested Council to carry out further studies and develop further guidance

Voluntary Measures

- Seen as a possible short-term measure
- A33 urged Council to facilitate actions by developing guidelines

  (for example, a template agreement; reporting procedures; and guidelines – The Circular would serve as reference for the guidance on available measures to be used as a basis for Voluntary Agreements)

Transport Canada Transports Canada

Operational Measures

Introductory Panel
Ottawa, 5-6 November 2002

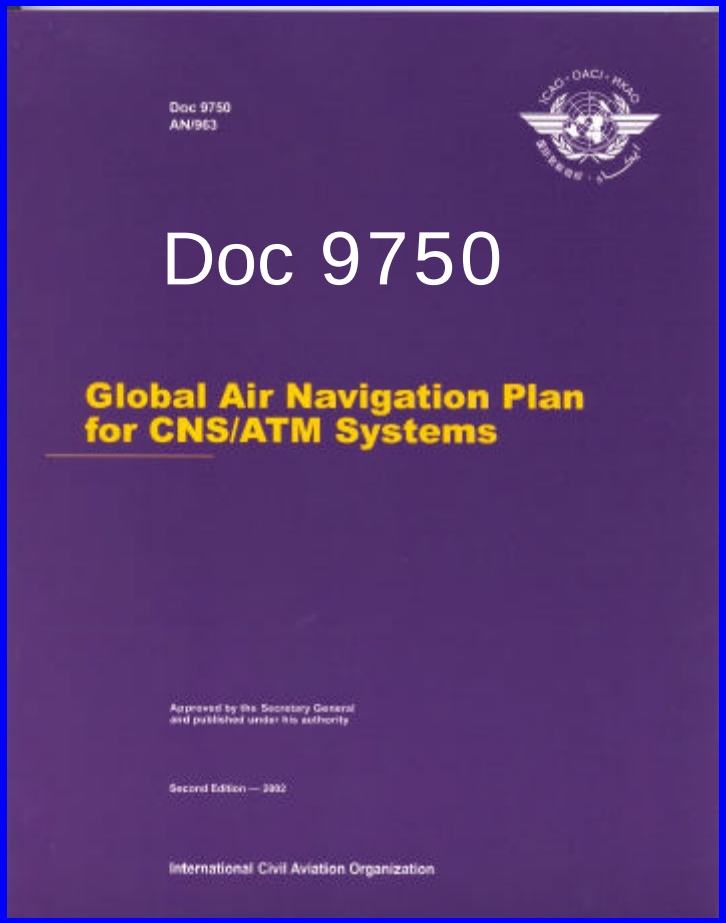
Canada

Operational Issues

- ALLPIRG 4 – Methodology to estimate the environmental benefits of the implementation of CNS/ATM Systems
- CAEP 4 – Parametric Model – Global Plan for CNS/ATM
- Currently expanding the Parametric Model to other regions and collecting common data for the development of more sophisticated programmes – SAGE and EURO2K

Transport Canada Transports Canada

Global Plan



Canada

Operational Issues

- ICAO Circular – Operational Opportunities to minimize fuel use and reduce emissions
- Workshops – Madrid, May 2002; Ottawa, 5 to 6 November 2002

ICAO CIRCULAR

CAEP/4 (Montreal, 6 to 8 April 1998) - new task

"ensure the development, dissemination and, to the maximum practical extent, use of the best operating practices to achieve near term reductions in aircraft emissions, including aircraft ground-level and in-flight operations, ground service equipment (GSE) and APUs with potential actions to facilitate their broader adoption."

Transport Canada Transports Canada

ICAO CIRCULAR

- Information provided by regulatory authorities, air traffic management (ATM) providers, airline associations, airport operators, manufacturers, specific airlines and ICAO Secretariat.

- CAEP/5 (Montreal, 8 to 7 January 2001) - ICAO to publish as a circular;

- A33-7 - to promote the circular

Transport Canada Transports Canada

ICAO CIRCULAR

OBJECTIVES

- document industry experience and the environmental benefits resulting from optimizing the use of current aircraft and infrastructure, and the related benefits of infrastructure improvements; and
- demonstrate that the more efficient use of infrastructure is an effective means of reducing aviation emissions.

Transport Canada Transports Canada

ICAO CIRCULAR

- This circular is based on the understanding that the most effective way to minimize aircraft emissions is to minimize the amount of fuel used in operating each flight. It reflects operational opportunities and identifies areas where improvements are important;
- It is aimed at airlines, airports, ATM/air traffic control (ATC) service providers, airworthiness authorities, environmental and other government bodies;

ICAO CIRCULAR

- The content is not of a regulatory nature and the choice of many of the operational procedures presented depends upon many factors other than environmental benefits;
- Safety must always be the over-riding consideration in all civil aviation operations.

Transport Canada Transports Canada

ICAO CIRCULAR

TABLE OF CONTENTS

ICCAIA IATA

Introductory Panel
Ottawa, 5-6 November 2002

Canada

Transport Canada Transports Canada

ICAO CIRCULAR

Comments concerning this document should be addressed to:

The Secretary General
International Civil Aviation Organization
999 University Street
Montreal, Quebec
CANADA - H3C 5H7

Transport Canada Transports Canada

Keeping track of ICAO's environmental activities

www.icao.int

ICCAIA IATA

Introductory Panel
Ottawa, 5-6 November 2002

Canada

Transport Canada Transports Canada

AVIATION OPERATIONAL MEASURES FOR FUEL AND EMISSIONS REDUCTION WORKSHOP

Thank you !

Introductory Panel
Ottawa, 5-6 November 2002

Canada