

# Global Aviation Dialogues (GLADs) on Market-Based Measures to address Climate Change

## Overview of ICAO's Environment Work



Environment, Air Transport Bureau  
International Civil Aviation Organization (ICAO)



UN specialized agency

Established by the “Chicago Convention” in 1944

Forum for cooperation in all fields of civil aviation

191 Contracting States

Standards, policies & guidance for environmental protection since 1960’s

Focus on aircraft noise, local air quality and global climate

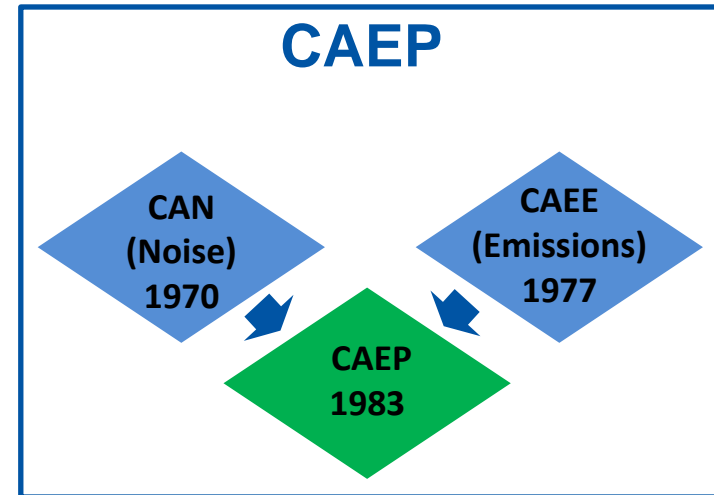
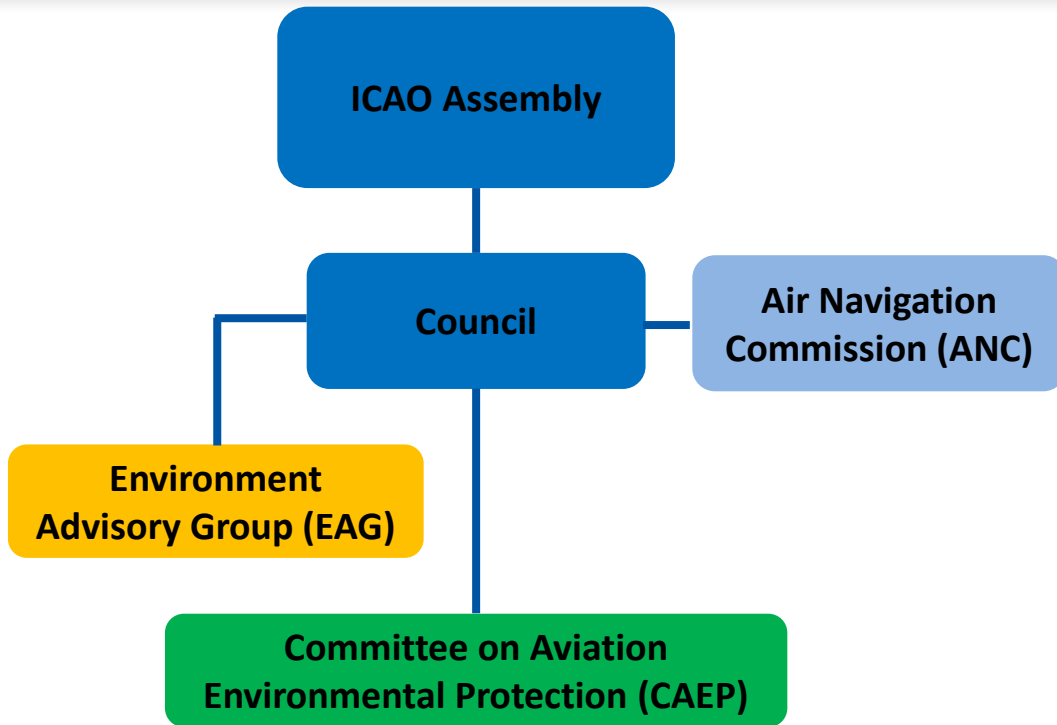


Limit or reduce the impact of aviation GHG emissions on **global climate**

Limit or reduce the number of people affected by significant aircraft **noise**

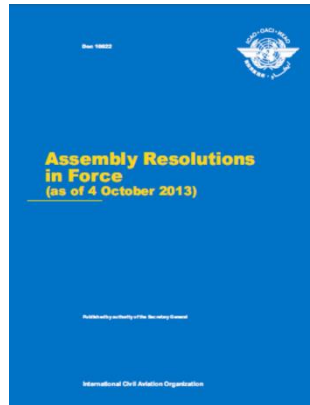
Limit or reduce the impact of aviation emissions on **local air quality**

**Minimize the adverse effect of global civil aviation on the environment**



- **CAEP was established by the ICAO Council in 1983**
- **Assists the ICAO Council** in formulating new policies and adopting new Standards and Recommended Practices (SARPs)
- **Technical committee reporting to the ICAO Council**

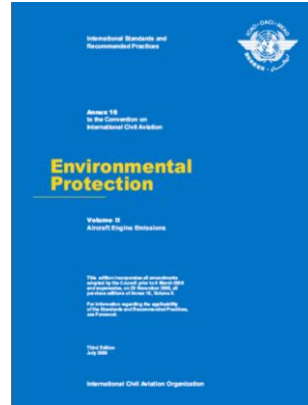
## ICAO Policy



### ICAO Assembly Resolution A38-18:

Consolidated statement of continuing ICAO policies and practices related to environmental protection - Climate change

## SARPs



### Annex 16 - Environmental Protection

**Volume I**, Aircraft Noise

**Volume II**, Aircraft Engine Emissions

**Volume III**, Aeroplane CO<sub>2</sub> Emissions (under development)

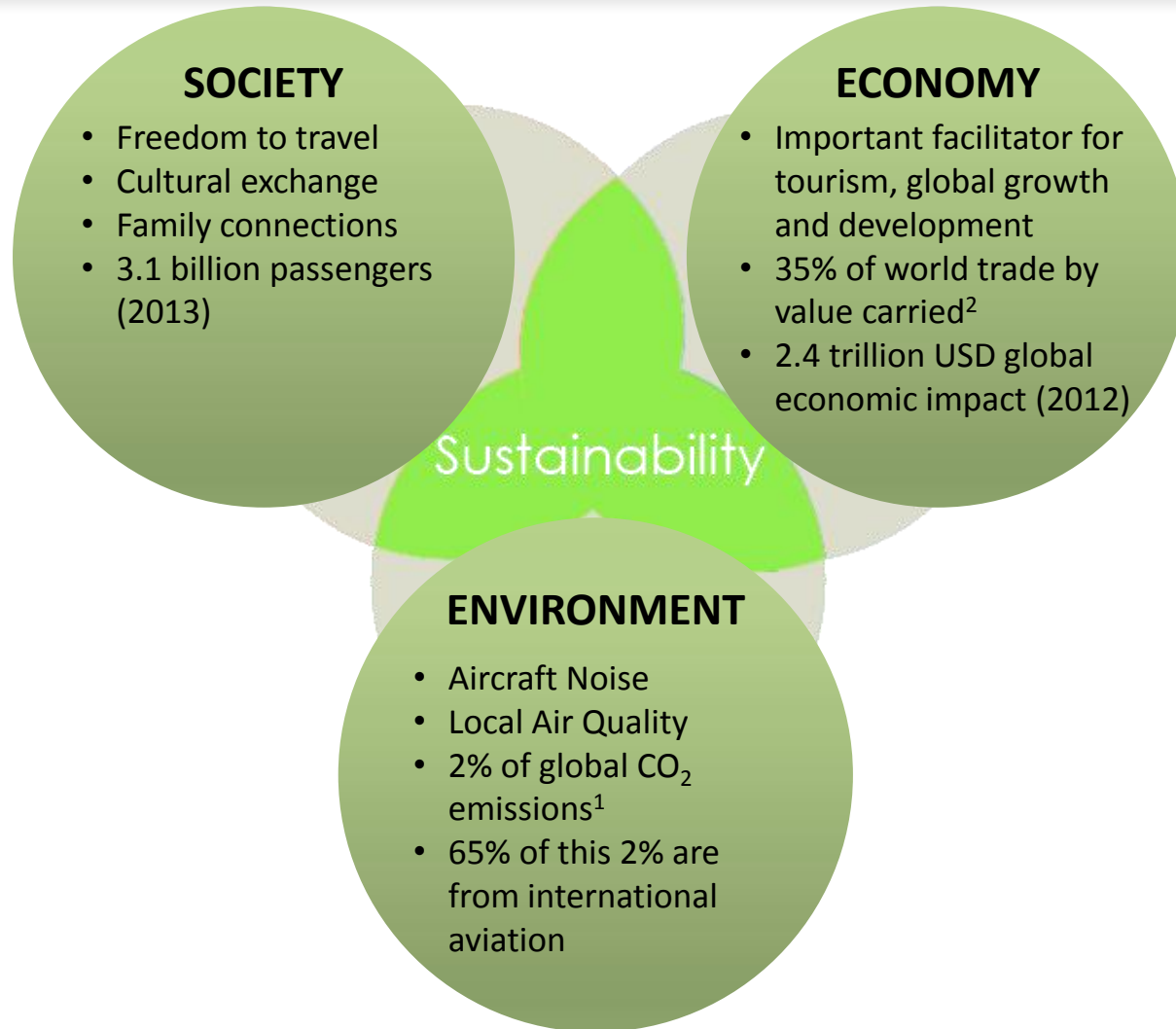
## Guidance



### Various guidance on noise, LAQ and climate change, e.g.

Airport Air Quality Manual (Doc 9889)

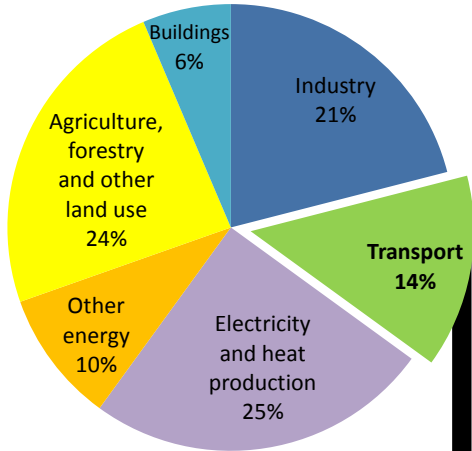
Environmental Assessment of Proposed ATM Operational Changes (Doc 10031)



1. Source: IPCC 4th Assessment Report, 2007

2. 0.5% of World International shipment volume is carried by aviation but accounts for nearly 35% of its value (US\$ 6.4 trillion)

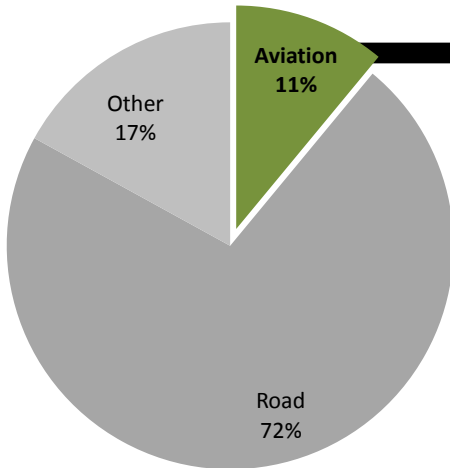
GHG emissions by sectors (2010)



## GHG emissions

Source: IPCC AR5

Transport GHG emissions (2010)



**1.5%**  
of global GHG emissions  
(2010)

## CO<sub>2</sub> emissions

Source: IPCC AR4

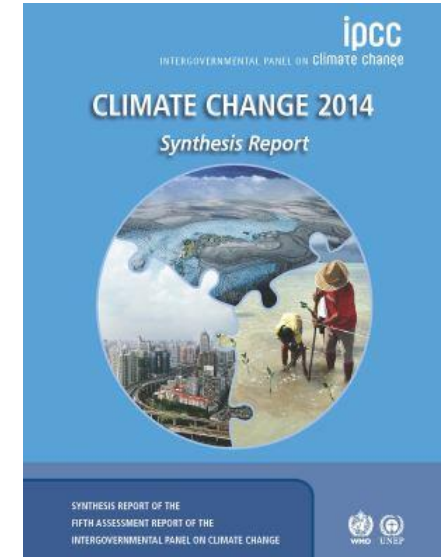
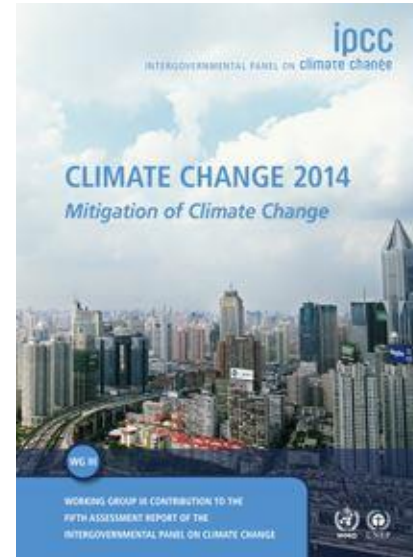
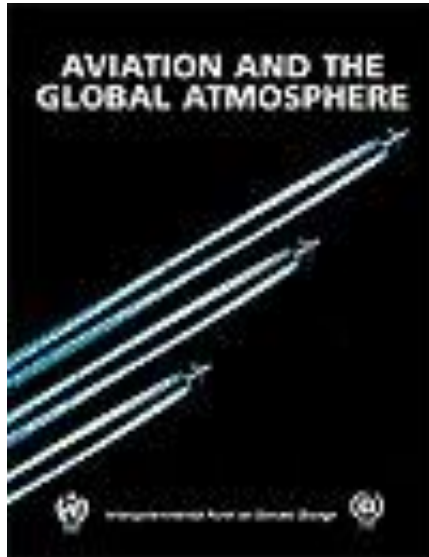
**2%**  
of global CO<sub>2</sub> emissions  
(2004)

**1.3%**  
International  
aviation

**0.7%**  
Domestic  
aviation

## Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5), 2013-2014

- “Warming of the climate system is unequivocal”
- “Human influence on the climate system is clear”
- “It is *extremely likely* that human influence has been the dominant cause of the observed warming since the mid-20th century”







"Aviation represents only 2% of global CO<sub>2</sub> emissions. In particular, international aviation is only 1.3%, why should we care?"



# The Road to a Sustainable Future for International Aviation

<https://www.youtube.com/watch?v=iAChyNGOwYk>

## Approach to Quantification through:

- Data Collection and Compilation (RTK<sup>1</sup>, Fuels<sup>2</sup> and Emissions Reduction)
- Forecasting
- Modelling

## Identification of Mitigation Measures through:

- Aircraft Technology
- Operational Improvements
- Sustainable Alternative Fuels
- Market-based Measures

### **BASKET OF MEASURES**

## Approach to Implementation through:

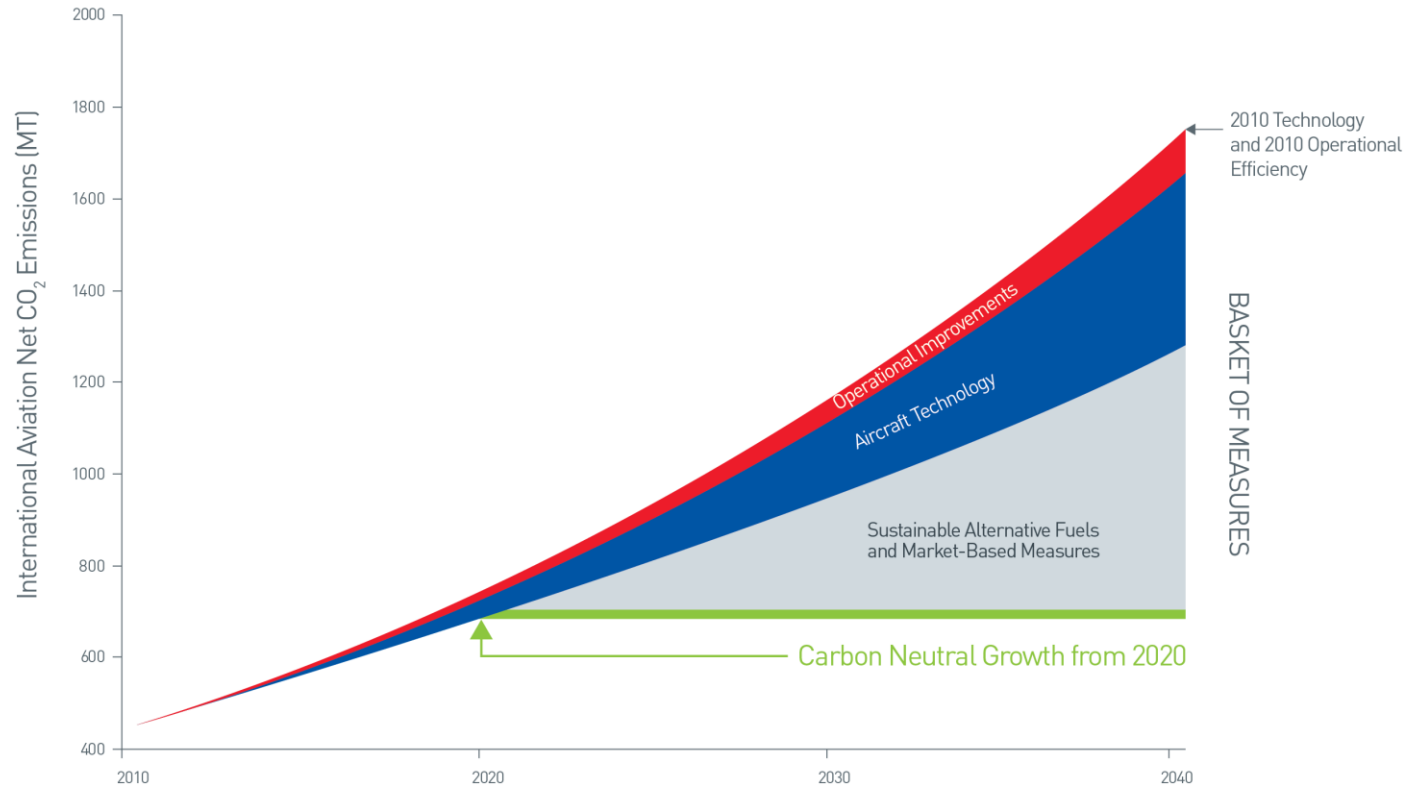
- States' action plans and Assistance to States
- Global action to implement measures to reduce CO<sub>2</sub>

1. ICAO Contracting States report traffic data through Form A

2. ICAO Fuel Consumption reporting Form M and modelled data is processed using ICORAS tool

# Quantification Global Aspirational Goals

Contribution of Measures for Reducing  
International Aviation Net CO<sub>2</sub> Emissions

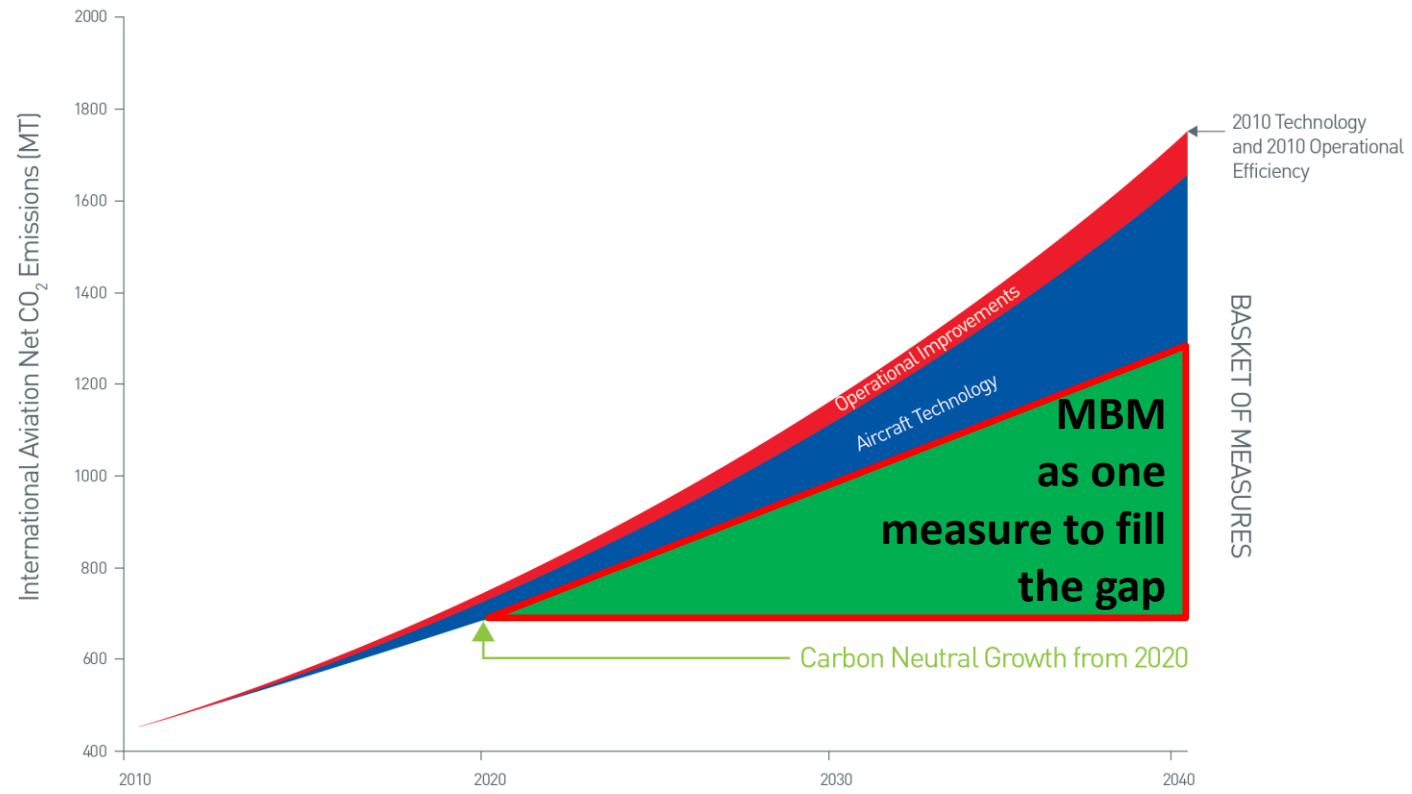


- Aspirational goal: carbon neutral growth from 2020
- To be achieved through various measures, including market-based measures



# Quantification Global Aspirational Goals

Contribution of Measures for Reducing International Aviation Net CO<sub>2</sub> Emissions



- Aspirational goal: carbon neutral growth from 2020
- To be achieved through various measures, including market-based measures



**ICAO Carbon Emissions Calculator**  
to calculate CO<sub>2</sub> emissions from air travel, as an internationally accepted tool and also used in support of Climate Neutral UN initiative.



Additionally available  
as Apple and  
Android applications



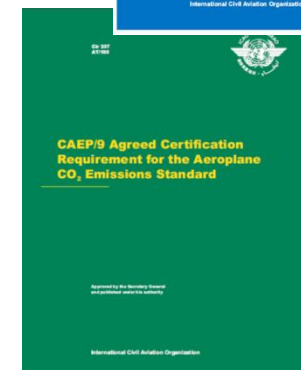
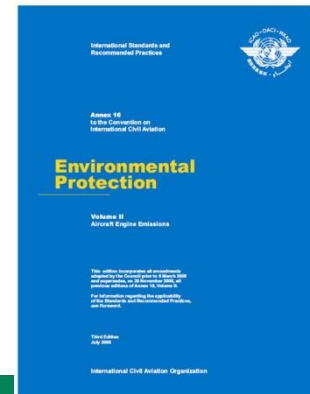
**ICAO Fuel Savings Estimation Tool (IFSET)**  
to assist States to estimate fuel savings and CO<sub>2</sub> emissions reduction from operational improvements. It is consistent with the models approved by CAEP and aligned with the Global Air Navigation Plan.



- Aircraft Technology
  - Improvements in aircraft technology to reduce fuel burn/CO<sub>2</sub>
  - Aeroplane CO<sub>2</sub> emissions standard - Annex 16 Vol. III
- Operational Improvements
  - More efficient ATM planning, ground operations, terminal operations (departure and arrivals), en-route operations, airspace design and usage to reduce fuel burn/CO<sub>2</sub>
  - Best practices in operations
- Sustainable Alternative Fuels
- Market-based Measures (MBMs)

# Mitigation Measures Aircraft Technology

- Improvements in aircraft technologies to reduce fuel burn/CO<sub>2</sub>
  - Weight reduction
  - Aerodynamics improvements
  - Engine combustion changes
  - Others ...
- The aeroplane CO<sub>2</sub> emissions Standard will result in a new Annex 16 Vol. III
  - Phase 1 (completed)
    - Development of CO<sub>2</sub> Certification Requirement, including a CO<sub>2</sub> metric system and procedures (published as Circular 337)
  - Phase 2 (ongoing)
    - CO<sub>2</sub> Standard setting process (stringency levels, technology responses, cost effectiveness assessments and interdependencies)





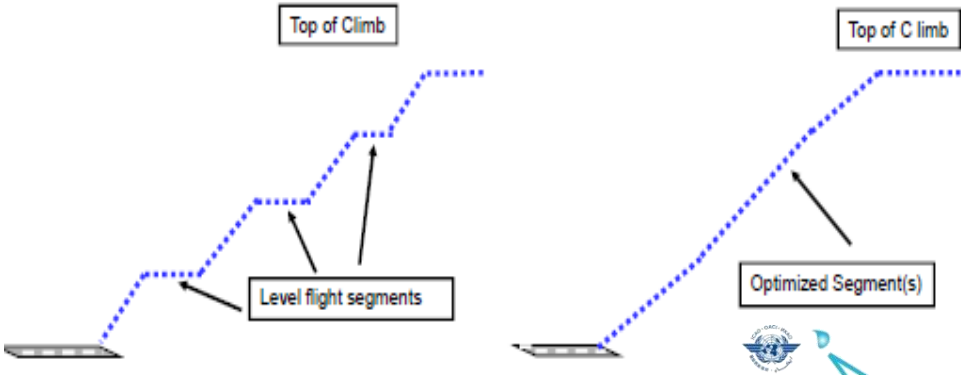
# Mitigation Measures Operational Improvements

- Improved air traffic management and infrastructure use

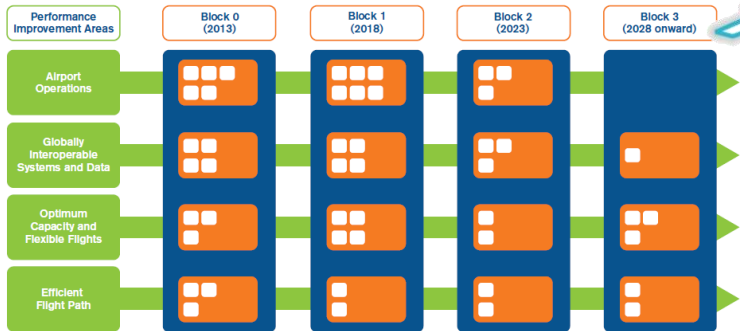
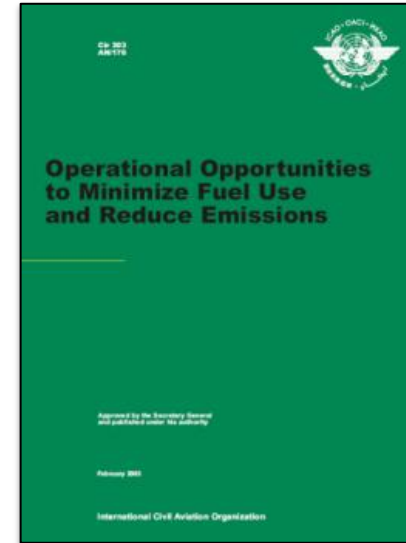
- More efficient operations

Conventional Departure

Continuous Climb Operations



Example: E-Taxiing



ASBU Aviation System Block Upgrades



Example: Engine washing

### Sustainable Alternative Fuels

- Technical aspects are proven to be viable
  - Drop-in fuels without need to change aircraft design or fuel infrastructure
  - Three pathways of production for such fuels have been approved
  - 15,000 commercial flights already undertaken
- Benefits will depend on:
  - the availability of such fuels and the time profile of their deployment
  - their actual lifecycle emissions reduction
- Challenges
  - Decreasing production cost
  - Investment in feedstock production and conversion facilities
  - Ensuring a sustainable deployment (e.g. land use changes)
- States' policy support is required

# Mitigation Measures

## Sustainable Alternative Fuels

- **Milestones:**
  - ICAO Conference (2009): Sustainable alternative fuels for aviation in the basket of measures
  - ICAO Global Framework on Aviation Alternative Fuels (GFAAF): a database on alternative fuels development and deployment  
<http://www.icao.int/environmental-protection/gfaaf/Pages/default.aspx>
  - Rio+20 (2012): a demo of commercial use feasibility
  - International consortia and initiatives
- **On-going: CAEP Alternative Fuels Task Force**
  - Assessment of potential emissions reductions from the use of alternative jet fuels to 2050
  - Methodology to define fuels emissions values for the inclusion of alternative jet fuels in the GMBM



FLIGHTPATH TO A  
SUSTAINABLE FUTURE  
ICAO's Rio+20 Global Initiative





Doc 10022



### Assembly Resolutions in Force (as of 4 October 2013)

Published by authority of the Secretary General

International Civil Aviation Organization

## The 38<sup>th</sup> Assembly 2013 “decided to develop a global MBM scheme for international aviation” (implementation from 2020 onwards)

- Requested the Council, with the support of Member States, to:
  - Finalize all preparatory work (technical, environmental and economic impacts, modalities of possible options)
  - Organize seminars and workshops
  - Identify major issues and problems, and make a recommendation for a global MBM that addresses them
  - Report the results of the above work for decision at A39 (2016)



1. Council established EAG - Environment Advisory Group
  - Composed of 17 Council representatives and IATA
  - To oversee the development of a global MBM
  - Technical support is provided by CAEP Global MBM Task Force (GMTF) and the Secretariat
  - GMTF is undertaking work on:
    - Emission unit eligibility
    - Monitoring, reporting and verification requirements
    - The assessment of MBM impacts
  
2. Global Aviation Dialogues (GLADs) on market-based measures to address climate change (five regions, April 2015)

# Implementation States' Action Plans

## States' Action Plans to reduce aviation CO<sub>2</sub> emissions

- Opportunity for States to identify measures to reduce emissions, and specific needs for assistance
- Allows future progress toward the global environmental goals to be assessed

[http://www.icao.int/environmental-protection/Pages/ClimateChange\\_ActionPlan.aspx](http://www.icao.int/environmental-protection/Pages/ClimateChange_ActionPlan.aspx)

## Current status of Action Plans submitted

- 76 States, representing around 82% international RTK, submitted action plans by end 2014
- Submission of new or updated plans expected by June 2015





## ICAO works closely with a significant number of organizations

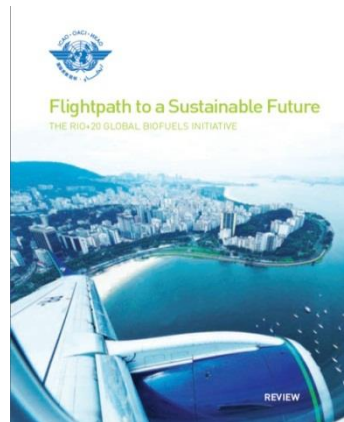
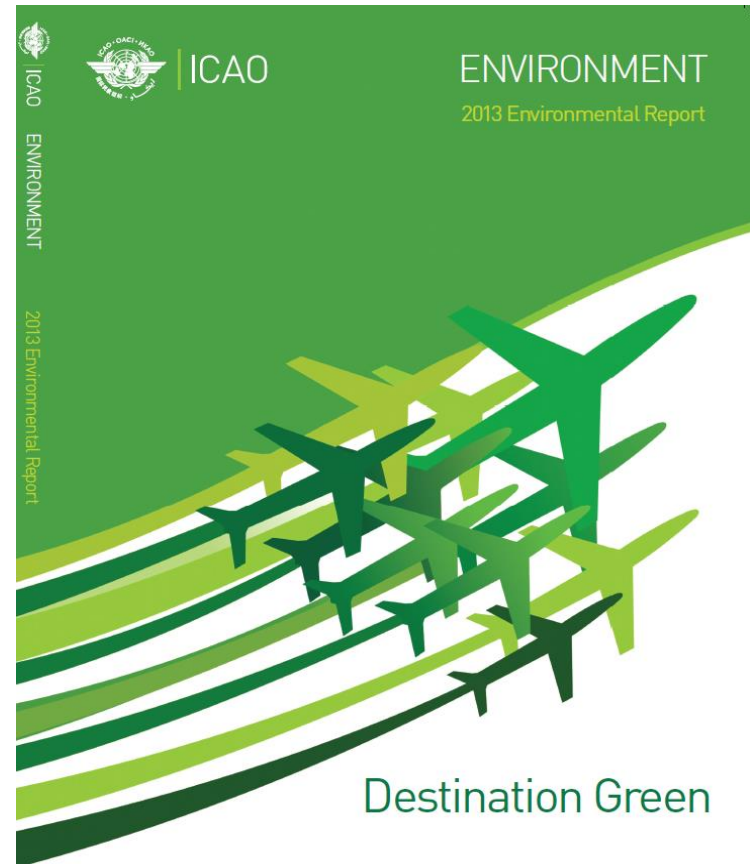
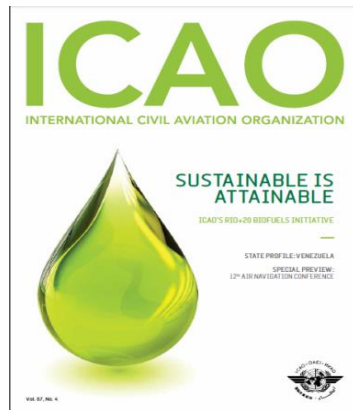
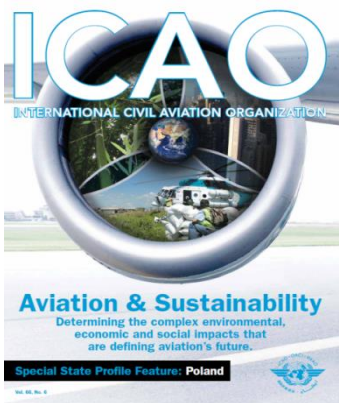
- UN Framework Convention on Climate Change (UNFCCC)
  - Reporting of ICAO developments
  - CDM methodologies for aviation related projects
  - New climate change agreement expected in December 2015
- Intergovernmental Panel on Climate Change (IPCC)
  - Special Report on Aviation and the Global Atmosphere (1999)
  - Development of emissions inventory guidelines
  - ICAO Input to Assessment Reports: AR4 in 2007 and AR5 in 2014
- UN Environment Programme (UNEP)
  - e.g. Carbon Neutral UN Initiative
- World Meteorological Organization (WMO)
  - e.g. Adaptation and Data Collection
- Others ...



- International Sector's CO<sub>2</sub> emissions are sizable and growing
- ICAO has progressed in addressing CO<sub>2</sub> emissions from international aviation under the 3 pillars' approach
  - Quantification
  - Mitigation: Basket of Measures
  - Implementation: State Action Plans and Assistance
- Cooperation and partnerships with other UN bodies and Organizations is paramount to success
- As requested by the 38<sup>th</sup> Assembly, the development of a global MBM scheme for international aviation is underway, for decision by the next Assembly



## Additional information



For more information on our activities, please visit: <http://www.icao.int/env>