
GIACC/3

WP/5: Recent Developments in Other UN Bodies

WP/6: Update on CAEP Environmental Work

IP/1: Parallels between Noise and CO2 Environmental Goals

Workshop on Aviation and Alternative Fuels

Environmental Unit

Air Transport Bureau

International Civil Aviation Organization



Overview

- Activities within the UN
 - Key climate change milestones

- ICAO CAEP activities
 - Technology and operational goals through Independent Expert process
 - Assessments

- Parallel Noise X Emissions - Framework considerations

- Alternative Fuels

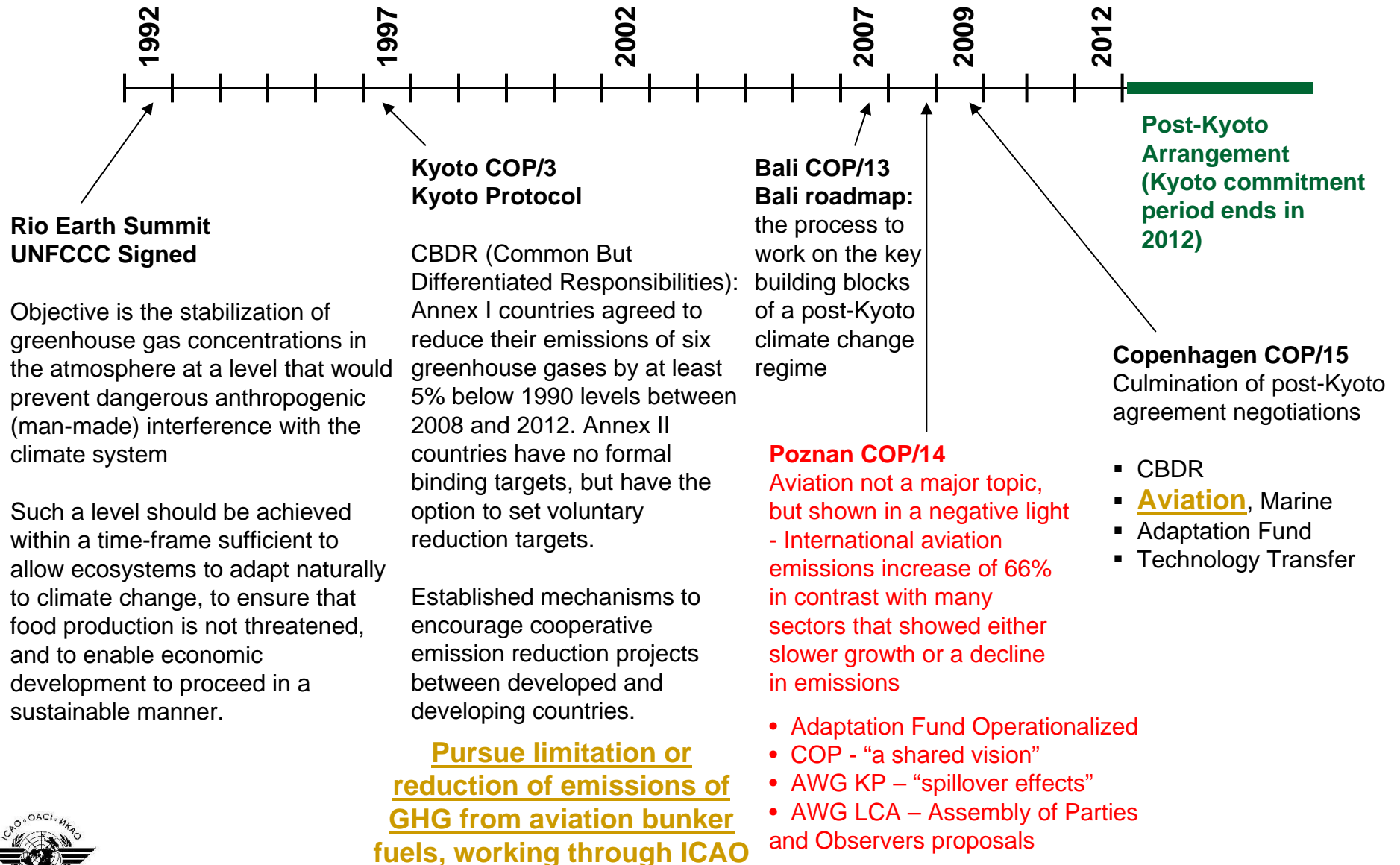
- Next steps



WP/5: Recent Developments in Other UN Bodies



Key Climate Change Milestones



Parallel Approach at IMO

- IMO approaching the reduction of global greenhouse gas emissions in a similar manner
- Common ground
 - Technology standards
 - Operational measures
 - Market based measures
 - Programme of action
 - Bodies
 - CAEP ≈ GHG WGs
 - GIACC ≈ MEPC
- Potential to harmonize approach and strengthen ICAO's position



2009 – A Critical Year for ICAO

2009	UNFCCC	ICAO	IMO
Jan			
Feb		GIACC/3	
Mar	AWG-LCA5, AWG-KP7		GHG-WG2, Sub-Ctee (BL&G)
Apr			
May			
Jun	SB30, AWG-KP8, AWG-LCA6	GIACC/4, CAEP SG	
Jul			Mkt Bsd Inst Workshop, MEPC 59
Aug			
Sep		High Level	
Oct	AWG-KP9, AWG-LCA7	Meeting (TBD)	
Nov			IMO26 Special Assembly
Dec	COP/15		

Post-Kyoto Agreement



The Road to the HLM and COP/15

- No major developments for aviation in the UNFCCC process in 2008 - High expectations for GIACC's results

Agreement on aspirational goals, global framework, means to measure progress

- Concrete proposals must be presented to COP/15 – Initial negotiating text to be provided by 24 April
- National coordination continues to be paramount
- States' positions on aviation to be provided to the UNFCCC process
- ICAO, IMO and UNFCCC Secretariats cooperation and ICAO access to the UNFCCC process to be enhanced
- Possible common strategy with IMO leading to COP/15

WP/6: Update on CAEP Environmental Work

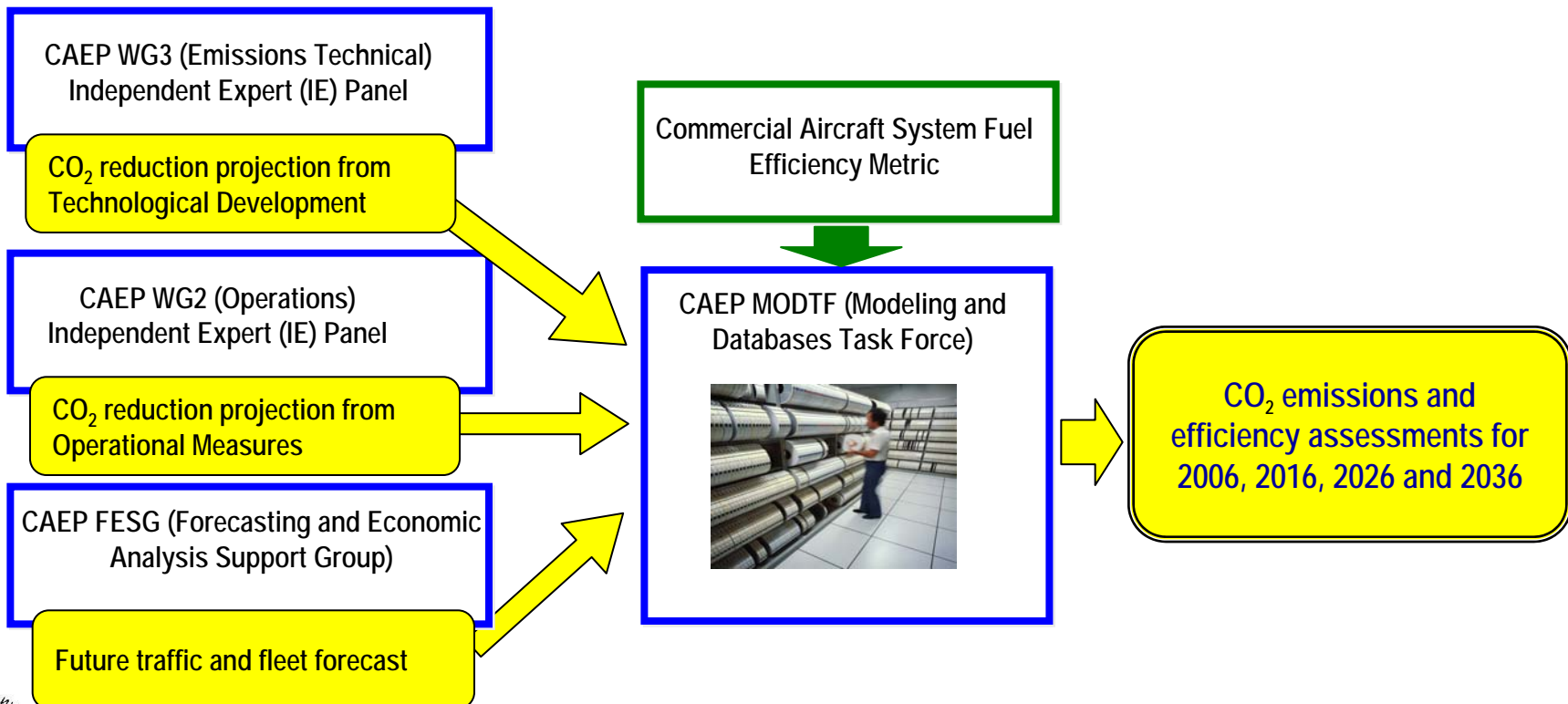


CAEP's Activities Relevant to GIACC

- “Global aspirational goals”
 - Technological development goals projection
 - Operational goals projection
 - Fuel efficiency metric
 - Environmental goals assessment
- “List of measures to reduce emissions”
 - Update of ICAO Circular 303
 - Studies on market-based measures
- Data

Overview of CAEP Work Process

- ICAO Environmental Goals (A36-22 Appendix A)
 - Limit or reduce the number of people affected by significant aircraft noise;
 - 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.**



Technological Development Goals

CAEP WG3 Independent Expert (IE) Process

- ICCAIA's preliminary view presented to CAEP WG3 in November 2008:

Fuel-burn reduction for average in-production aircraft

- Low: .95% per year to 2015, and .57% per year 2015+
 - Moderate: .96% per year from 2006+
 - Advanced: 1.16% per year from 2006+
-
- Technology IEs will consider
 - Weight reduction using advanced materials, structural layout and manufacturing methods
 - Aerodynamic improvements
 - Propulsion system and power generation developments
 - Aircraft configuration optimizations and systems developments, etc.
 - Technology IE Schedule
 - Workshop in March 09
 - Presentation of initial findings to CAEP Steering Group June 09
 - Formal review to follow



Operational Goals

CAEP WG2 Independent Expert (IE) Process

- Operational Review in January 2009 recommended

Global aspirational goal for operational efficiency of 95% for 2026 (ranged values of 92-94% for 2006, 92-95% for 2016, and 93-95% for 2026)

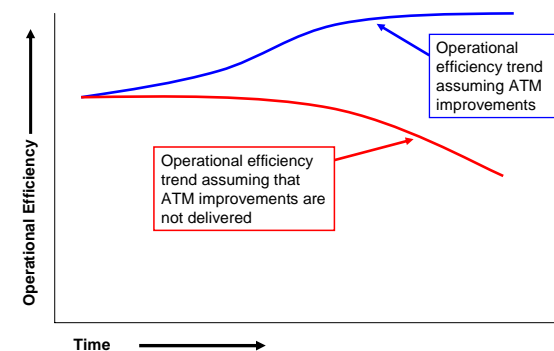
- Can be translated to changes in per-flight fuel consumption:

Year	Frozen technology	Moderate Operational Improvement	Advanced Operational Improvement
2006		Baseline	
2016	+3% to +6%	-0.5%	-1.0%
2026	+5% to +8%	-1.4%	-1.6%
2036	+15% to +20%	-2.3%	-3.0%

- Operational IE Panel noted that operational efficiency is expected to decrease with the growth of traffic unless system improvements are made
- Operational improvements considered:
 - Flexible use of airspace
 - Reduced vertical separation minimum
 - RNAV and RNP (performance-based navigation)
 - Air traffic flow management
 - Terminal area design & management, etc.

Report to CAEP Steering Group in June 09

Conceptual Diagram of Operational Efficiency

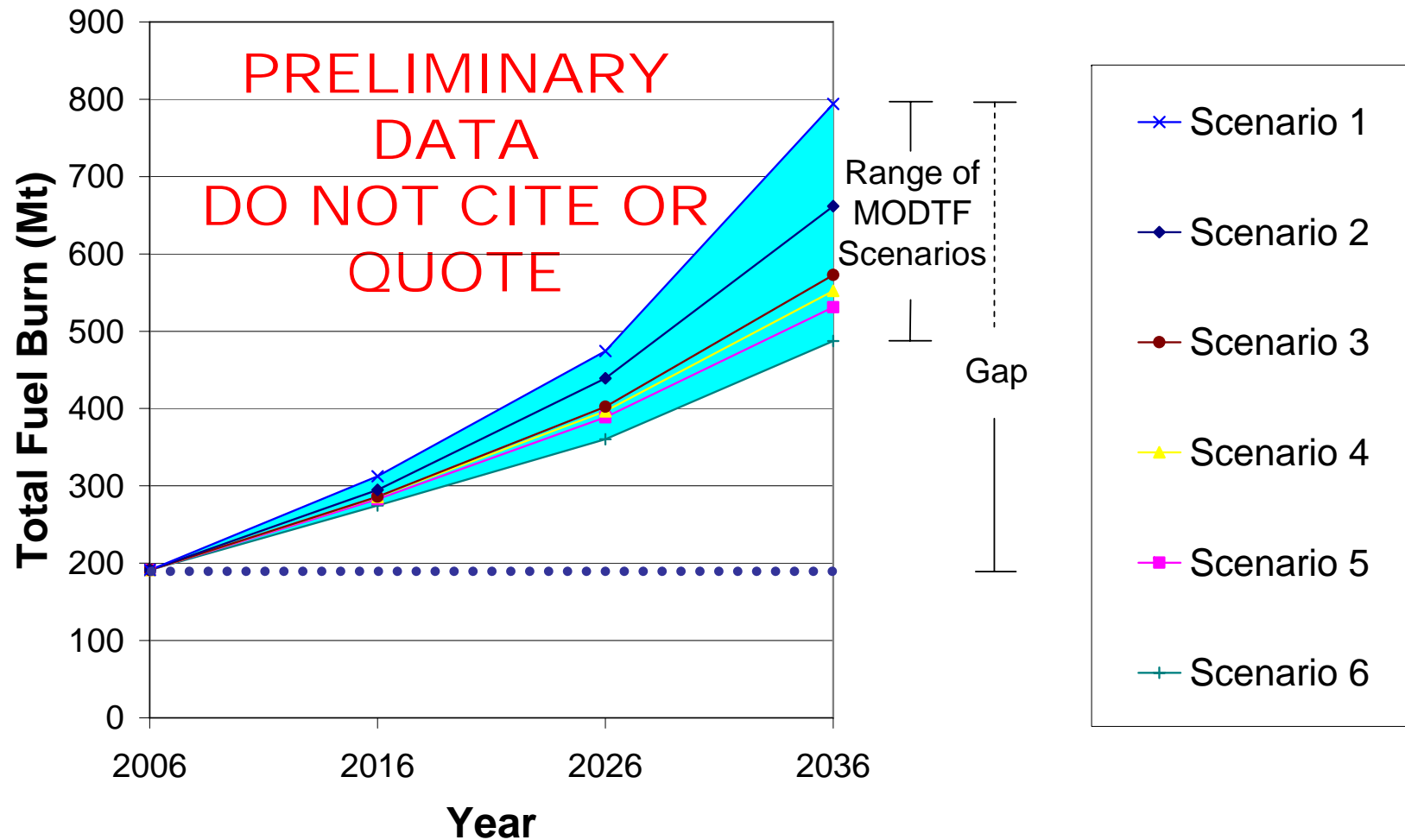


MODTF Scenarios

- **Scenario 1 (Do Nothing)**: No improvements in aircraft technology beyond those available today and no improvements from CNS/ATM investment or from planned initiatives
- **Scenario 2 (CAEP7 Baseline)**: This scenario includes the CNS/ATM improvements necessary to maintain current ATM efficiency levels, but does not include any technology improvements beyond those available today.
- **Scenario 3 (Low Aircraft Technology and Moderate Operational Improvement)**: In addition to including the improvements associated with the migration to the latest CNS/ATM initiatives, e.g., those planned in NextGen and SESAR (Scenario 2), this scenario includes fuel burn improvements of 0.95 percent per annum for all aircraft entering the fleet after 2006 and prior to 2015, and 0.57 percent per annum for all aircraft entering the fleet beginning in 2015 out to 2036. It also includes additional fleet-wide moderate operational improvements of 0.5, 1.4 and 2.3 percent in 2016, 2026 and 2036, respectively.
- **Scenario 4 (Moderate Aircraft Technology and Operational Improvement)**: In addition to including the improvements associated with the migration to the latest CNS/ATM initiatives, e.g., those planned in NextGen and SESAR (Scenario 2), this scenario includes fuel burn improvements of 0.96 percent per annum for all aircraft entering the fleet after 2006 out to 2036, and additional fleet-wide moderate operational improvements of 0.5, 1.4 and 2.3 percent by 2016, 2026 and 2036, respectively.
- **Scenario 5 (Advanced Technology and Operational Improvement)**: In addition to including the improvements associated with the migration to the latest CNS/ATM initiatives, e.g., those planned in NextGen and SESAR (Scenario 2), this scenario includes fuel burn improvements of 1.16 percent per annum for all aircraft entering the fleet after 2006 out to 2036, and additional fleet-wide advanced operational improvements of 1.0, 1.6 and 3.0 percent by 2016, 2026 and 2036, respectively.
- **Scenario 6 (Optimistic Technology and Operational Improvement)**: In addition to including the improvements associated with the migration to the latest CNS/ATM initiatives, e.g., those planned in NextGen and SESAR (Scenario 2), this sensitivity study includes an optimistic fuel burn improvement of 1.5 percent per annum for all aircraft entering the fleet after 2006 out to 2036, and additional fleet-wide optimistic operational improvements of 3.0, 6.0 and 6.0 percent by 2016, 2026 and 2036, respectively. This sensitivity study goes beyond the improvements based on industry-based recommendations.



Total Domestic + International Aviation Fuel Burn 2006 - 2036



- Domestic and International aviation are combined. Based on the UNFCCC inventories of Annex I States, International Aviation accounts for ~60% of global aviation fuel consumption
- Scenario 1 is *Do Nothing* while Scenario 6 is *Optimistic Technology and Operational Improvement*

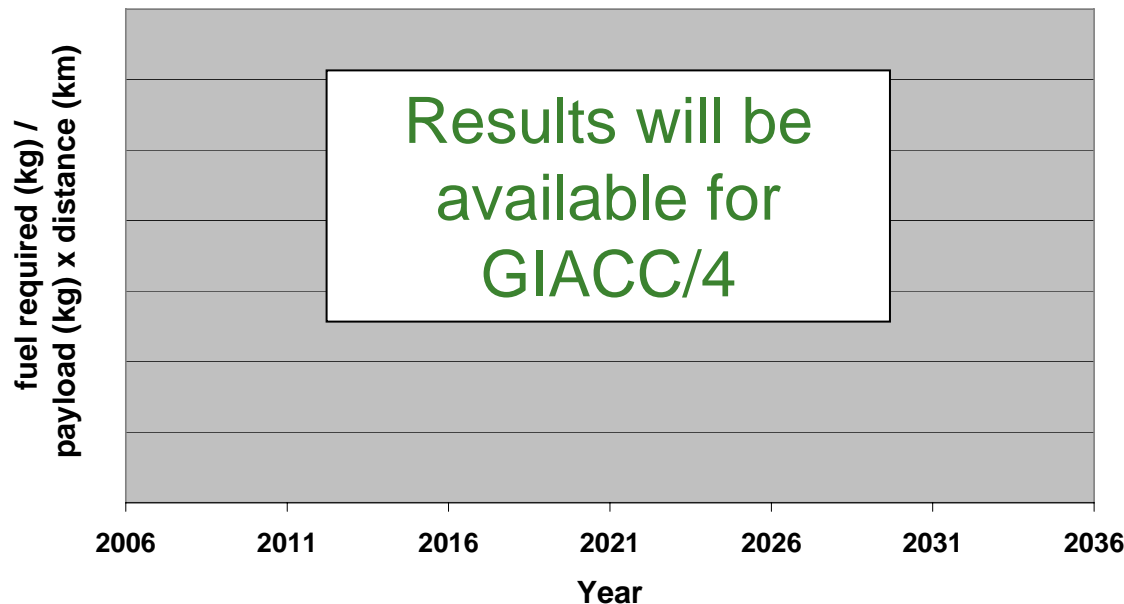


CAEP Fuel Efficiency Metric

$$\text{Commercial Aircraft System Fuel Efficiency} = \frac{\text{fuel mass used}}{\text{payload} \times \text{distance}}$$

- This can be thought of as the *fuel required* to transport 1 kg for 1 km
- *Intended for fleet-wide analysis, not for specific aircraft types*

Commerical Aviation System Fuel Efficiency
(Fuel Required)

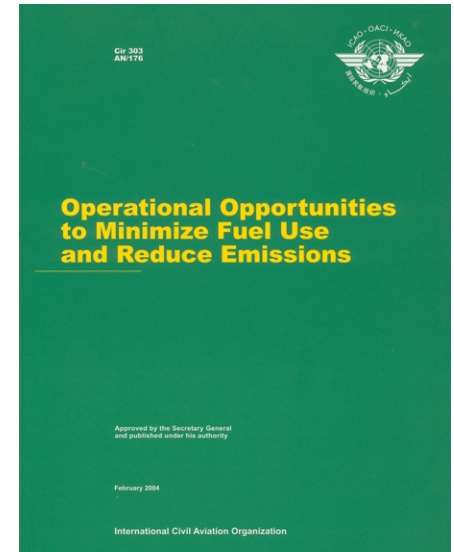


MODTF Next Steps

- Round 2 modelling results will provide
 - Indication of uncertainty
 - Interpolated values for 2012, 2020, and 2025
 - Commercial Aircraft System Fuel Efficiency values in addition to total fuel burn
- Due to the lack of forecast data, results for 2050 are not expected
- **FESG is meeting this week and could consider developing a forecast for 2050 if requested by GIACC. This request would need to be made by 18 February to ensure that the FESG considers it in time for results to be available for GIACC/4.**

New Guidance Replacing ICAO Circular 303

- ICAO published Operational Opportunities to Minimize Fuel Use and Reduce Emissions (Circular 303) in 2004
- Work in progress in CAEP WG2 to develop a new guidance replacing Circular 303 by;
 - providing an update on current ATM and other operational initiatives
 - (extended provision) on environmental impact assessment methodology applied to CNS/ATM
 - (extended provision) guidance on computing, assessing and reporting on aviation emissions
 - (extended provision) environmental indicators
- Draft guidance is expected to in time for CAEP SG in Jun 09



Studies on Market-Based Measures (MBM)

- Work in progress in CAEP MBM Task Force on
 - Update of information on voluntary agreed measures
 - Update of Report on voluntary ETS for aviation
 - Scoping study on issues related to linking open ETS including aviation
 - Scoping study on potential for Carbon Offset to mitigate effects of aviation on climate change
- Carbon offset has a big potential as long as there are nations and emission-sources not covered by a regulated system and achieving reductions from these sources cost less than reducing emissions from aviation itself.
- ICAO has the potential to play an important role in increasing offset demands, improving the transparency and ensuring the offset results by
 - developing a global carbon offsetting strategy for aviation
 - (e.g. implementation guidelines, emission measurements, credit tracking system, emission reduction target by offsetting)



DATA

- Following SL/44 ICAO has now collected initial information on fuel and CO₂
- The role of ICAO and the extent of its responsibilities regarding the collection, reporting and verification of aviation GHGs in the future needs to be clarified
- Also, depending for what purpose the data is collected, the request for information may vary (total, by aircraft, by route, by State of registry, by State of departure)
- Secretariat is now evaluating the results of the first set of information collected and will start discussions on the future data format to be used at the upcoming Statistics Panel (23 to 27 March)
- Secretariat is also working with CAEP on the guidance on collecting, reporting and verification of GHG data
- Subject to resources, Secretariat can provide support to States in this area



IP/1: Parallels between Noise and CO2 Environmental Goals



Noise and Emissions Goals

NOISE		GHG EMISSIONS	
Limit or reduce		Limit or reduce	
The number of people	DNL Noise contours converted into population	The impact on the global climate	Science working to convert mass/efficiency into impact
Affected by		of	
Significant aircraft noise	Metric agreed to be DNL (contours)	Aviation GHG emissions	Metric seems to be efficiency

Developed and Developing States' Needs in Phase-outs

- ICAO established a global framework for the phase-out of Chapter 2 aircraft in 1990
- States with serious airport noise problems were allowed to impose restrictions on the operation of aircraft that did not comply with Chapter 3 requirements
 - Only for aircraft over 25 years old and in a progressive manner over a seven year period beginning on 1 April 1995 and ending on 1 April 2002
 - Taking into account the special circumstances of developing nations' airlines through limited economic hardship exemptions, up to 2005
 - Urged not to impose any operating restrictions on Chapter 3 compliant aircraft

The Assembly

- “urged States to assist aircraft operators in their efforts to accelerate fleet modernization and thereby prevent obstacles and permit all States to have access to lease or purchase of aircraft compliant with Chapter 3, **including the provision of multilateral technical assistance** where appropriate”.
- “urged the ICAO Council to promote and States to develop an **integrated approach to the problem of aircraft noise , including land-use planning procedures around international airports**, so as to minimize the adverse effect of aircraft noise on any residential, industrial or other land-use”.

Led to ICAO Balanced Approach for Noise



Mechanisms to Improve Fleet Performance for Noise and CO₂

	Used for Noise	Potential for CO ₂
<u>“Global” Regulatory Schemes</u>		
Stringency Standards	X	Yes
Phase-outs	X	No?
Production Cut-offs		Yes?
<u>“Local” Mitigation Rules</u>		
Operating Restrictions	X	Yes?
Operational Procedures	X	Yes
Land Use Planning and Management	X	No
<u>Market Based Measures</u>		
Cap and Trade Systems		Yes
Off-set Schemes		Yes
Airport Charges	X	Yes?



Towards a Balanced Approach

- ICAO Balanced Approach consists of identifying the ^{GHG}Emissions problem at an airport and then analyzing the various measures available to reduce ^{GHG}Emissions with the aim of addressing the ^{GHG}Emissions problem in the most cost effective manner by exploration of four principal elements

Noise	GHG Emissions	
Reduction at source	Reduction at source	design Standard at global level
Land-use planning/management	Operational improvements	} nationally or regionally but globally harmonized
Noise abatement operations procedures	Aircraft operating restrictions	
Operating restrictions	Market-based measures	

Workshop on Aviation and Alternative Fuels



Alternative Fuels

- ICAO hosted a Workshop on Aviation and Alternative Fuels from 10 to 12 February 2009
- **Key outcome: options exist to narrow the “CO₂ emissions gap” that cannot be mitigated with operational and engine technological improvements alone**
 - Over the last 2 years, a number of successful in-flight demonstrations of BioJet fuel have been conducted
 - ASTM (international) certification for blends of BioJet fuels underway
 - Sasol has proven that alternative fuels can be certified
 - Given sufficient demand or incentive, significant supplies of Jet fuel that offer a 50% or more reduction in lifecycle CO₂ emissions could be available in 15 years
- Challenges were acknowledged, but none of the participants felt they were insurmountable

Conclusions and Next Steps



Conclusions and Next Steps

- Aviation has a strong track record of improving efficiency
- The current perception of aviation action (and of ICAO action) to address CO₂ is not very positive
- Interaction with the UNFCCC process is paramount (outreach; negotiating text etc.)
- ICAO Secretariat and CAEP will continue to provide data to support GIACC so that ICAO is well positioned for COP/15
 - Results show that operational initiatives and technology will make a significant difference, but a gap will exist due to continued growth
 - Gap can be narrowed by also considering alternative fuels, carbon offsetting, and other market-based measures
- **Clarification on the role of ICAO in collecting, verifying and monitoring data is necessary**
- **GIACC requests for further information/deliverables from Secretariat and CAEP need to be clearly defined**
- **GIACC consensus on an aspirational goal (including carbon neutral growth by 20__?) would enable further assessments**

