

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

Aviation Emissions Trends



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

- “Are improvements in technology, operations and alternative fuels sufficient to compensate for the expected growth in global international aviation CO₂ emissions?”
- “Is it possible for the sector to achieve its near-term emissions objective without an MBM?”

Approach to Quantification through:

- Data Collection and Compilation (RTK¹, Fuels² 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 CO₂

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



- Each three-year work cycle, the Committee on Aviation Environmental Protection (CAEP) develops the present and future environmental trends for aviation
- Serve as the basis for decision-making by the Council and Assembly
- Facilitate the reporting of global CO₂ emissions from international aviation
 - Resolution A38-17, Appendix A, paragraph 3:
“Assembly ... requests the Council to assess regularly the present and future impact of aircraft noise and aircraft engine emissions ...”
 - Resolution A38-18, paragraph 29:
“Assembly ... requests the Council to regularly report CO₂ emissions from international aviation to the UNFCCC ...”

Advanced technologies are already being incorporated into aircraft designs in order to contribute to carbon neutral growth from 2020, e.g.:

- Aircraft fuel efficiency standards
- Purchase of new, more efficient aircraft
- Retrofitting and upgrade improvements on existing aircraft
- Optimizing improvements in aircraft produced in the near- to mid-term
- Aerodynamics improvements
- Avionics
- Adoption of revolutionary new designs in aircraft/engines
- E-Taxiing

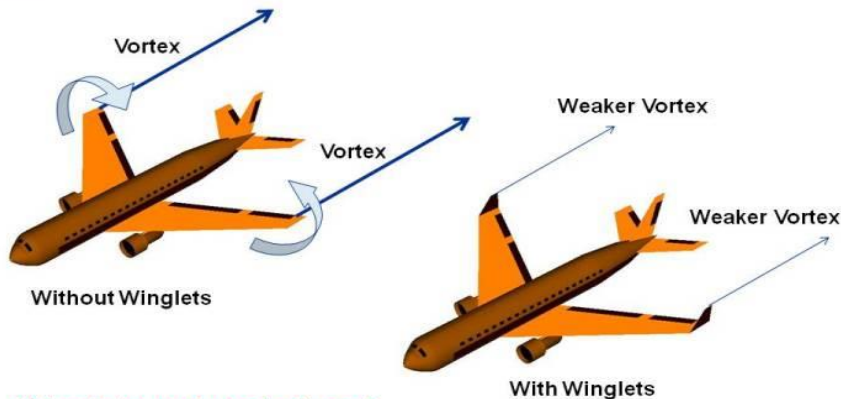


Example: Aerodynamics

- Drag reduction technologies
- Wingtip devices

National Aeronautics and Space Administration

Winglets



Winglets reduce induced drag component.

www.nasa.gov



www.airlinereporter.com/

Rules of Thumb (Doc 9888)

- Blended winglet/sharklets:
Fuel Savings = [3% to 6%] x Fuel Burn
- Raked wingtip:
Fuel Savings = [3% to 6%] x Fuel Burn
- ...



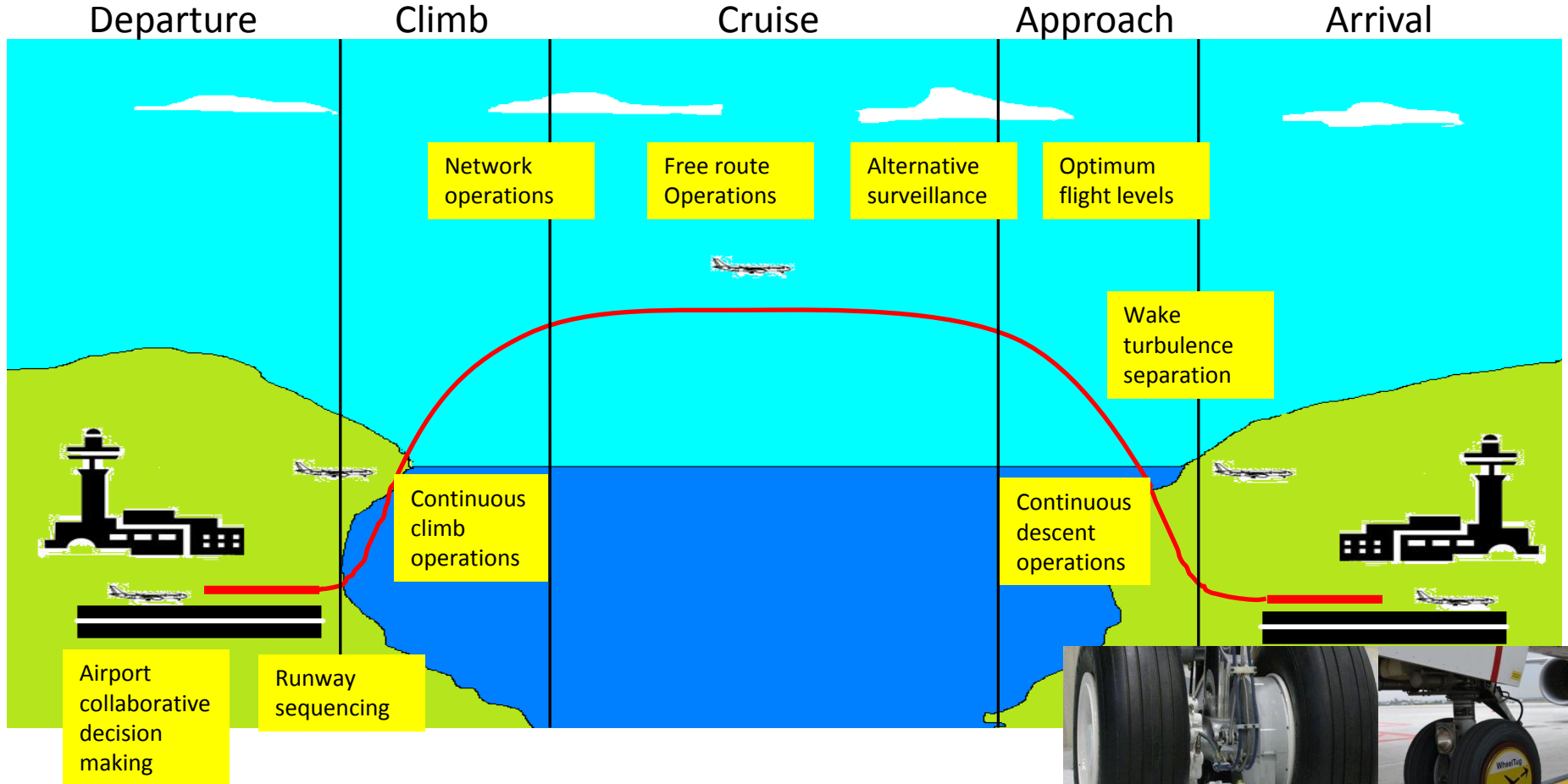
Aircraft Technology Improvements

- Benefits are delivered when a new/retrofitted aircraft is introduced into the fleet
- For the 2013 trends assessment, the total efficiency improvement derived from the introduction of new aircraft technology in the global fleet ranged from 0.57% to 1.5% per annum (from 13% to 31% between 2010 and 2035); this range reflects the pace of introduction of new technology in the fleet

Reference: Complete documentation of the trends is available in A38-WP/26

Example: Improved Air Traffic Management

www.bbc.co.uk/news/business-22992654
www.aviationpros.com/press_release/10705890/



Rules of Thumb (Doc 9888)

- E-Taxi (for B737 and A320):

$$\text{Fuel Savings} = 10.41 \text{ Kg of fuel/min} \times \text{time (min)}$$



Example: E-Taxiing



Operational Improvements

- Necessary to accommodate growth
 - With no improvements, global operational efficiency will decrease by 2% every decade (e.g. congestion, waiting time)
- Can deliver additional benefits
 - Improvement potential depends on the local situation
 - Potential for significant improvement in some countries (e.g. flexible military/civil use of airspace)
 - Scenarios considered ranged from 0% to -8% efficiency gain (gate-to-gate)

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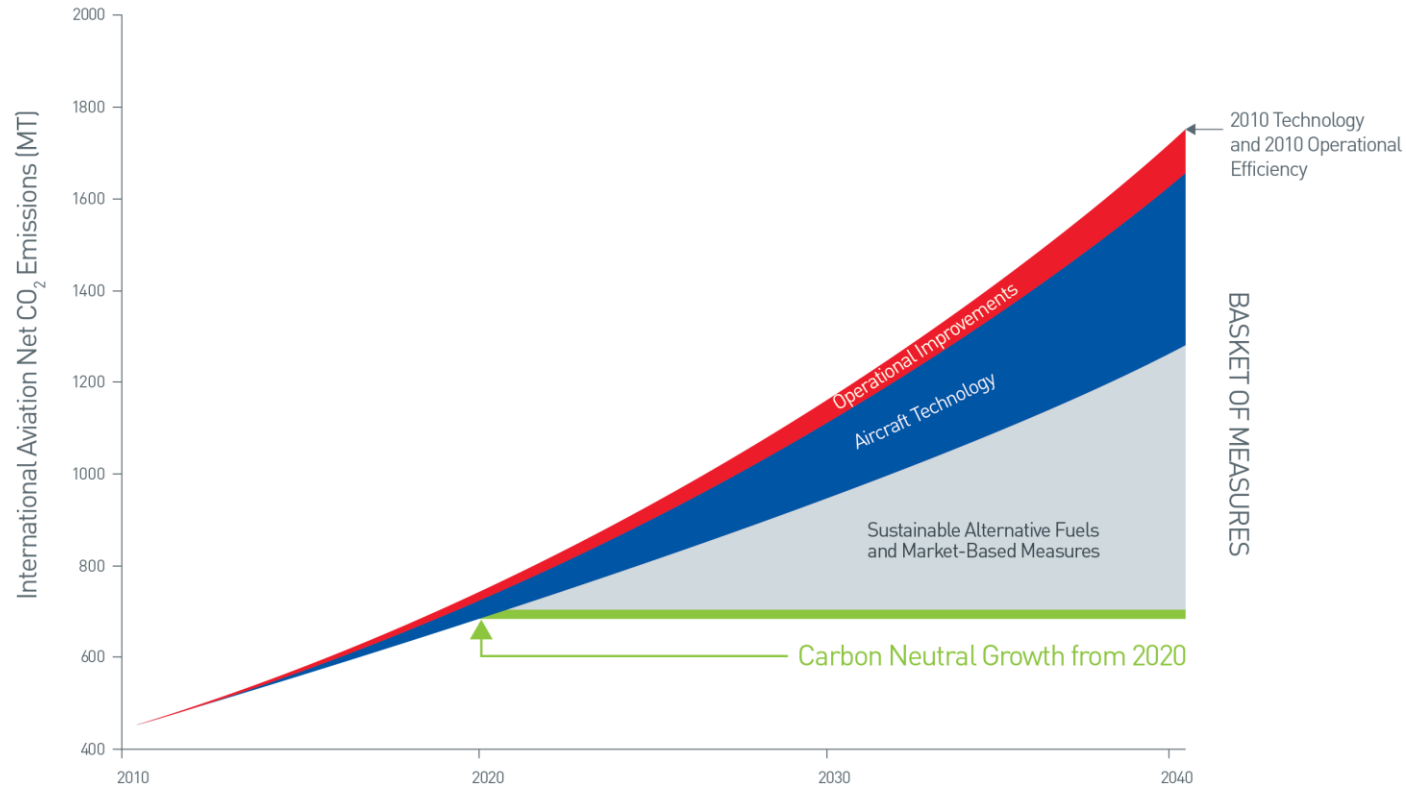
Sustainable Alternative Fuels

- In 2020, approximately 3% of total international aviation fuel supply is expected to be available
- High uncertainty for a longer term level of production
- CAEP Alternative Fuels Task Force (AFTF) is further assessing future production and life-cycle benefits

Reference: Complete documentation of the trends is available in A38-WP/26

International Aviation CO₂ Emissions Trends

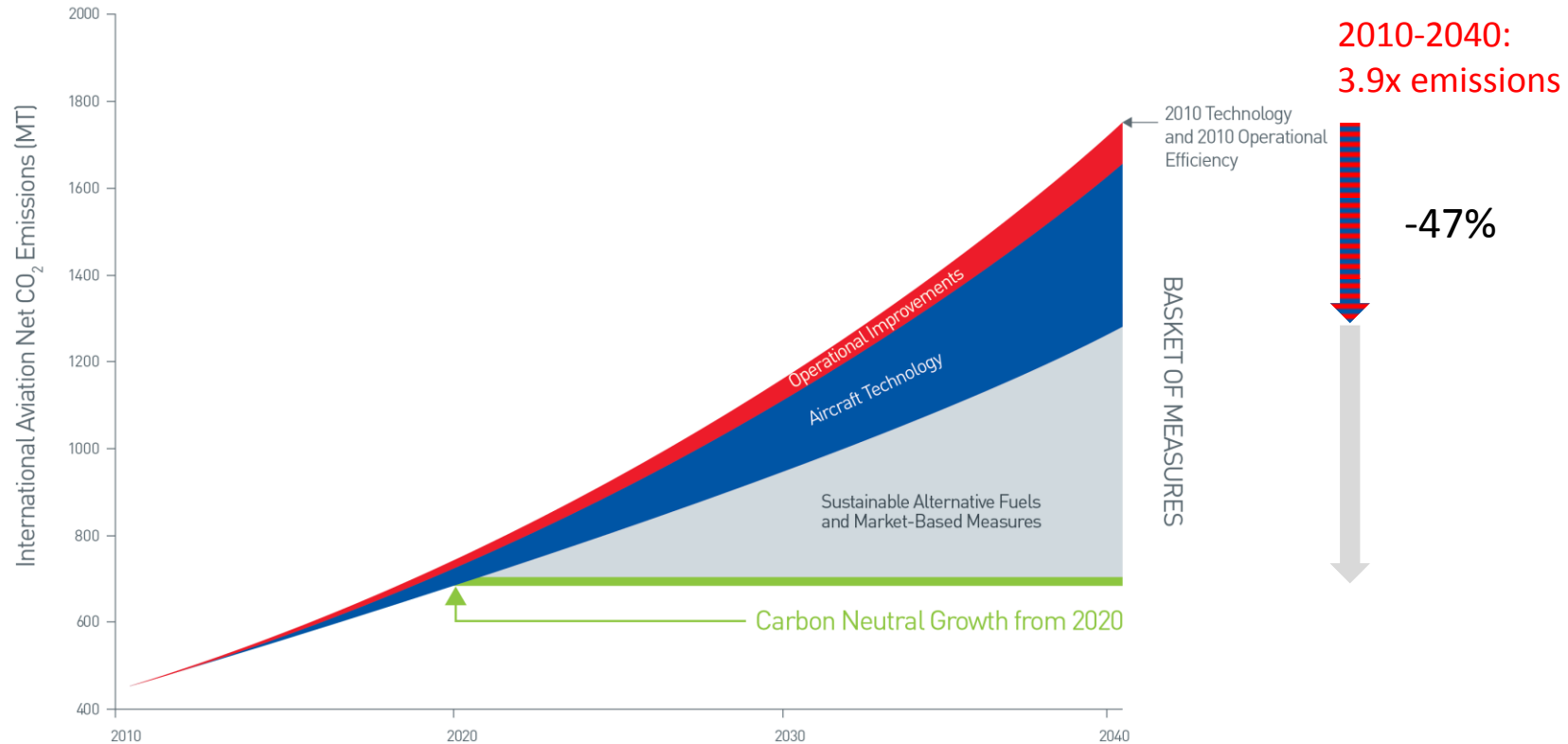
Contribution of Measures for Reducing
International Aviation Net CO₂ Emissions



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

International Aviation CO₂ Emissions Trends

Contribution of Measures for Reducing
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- Specific measures are underway to address the environmental impact of international aviation
- As a result, CO₂ emissions are expected to grow slower than the demand for international air traffic
- Additional measures are likely to be needed to achieve carbon neutral growth from 2020