

AVIATION CO₂ REDUCTIONS



STOCKTAKING SEMINAR

TECHNOLOGY · OPERATIONS · SUSTAINABLE AVIATION FUELS



Setting the scene: challenges, trends and energy requirements for aviation

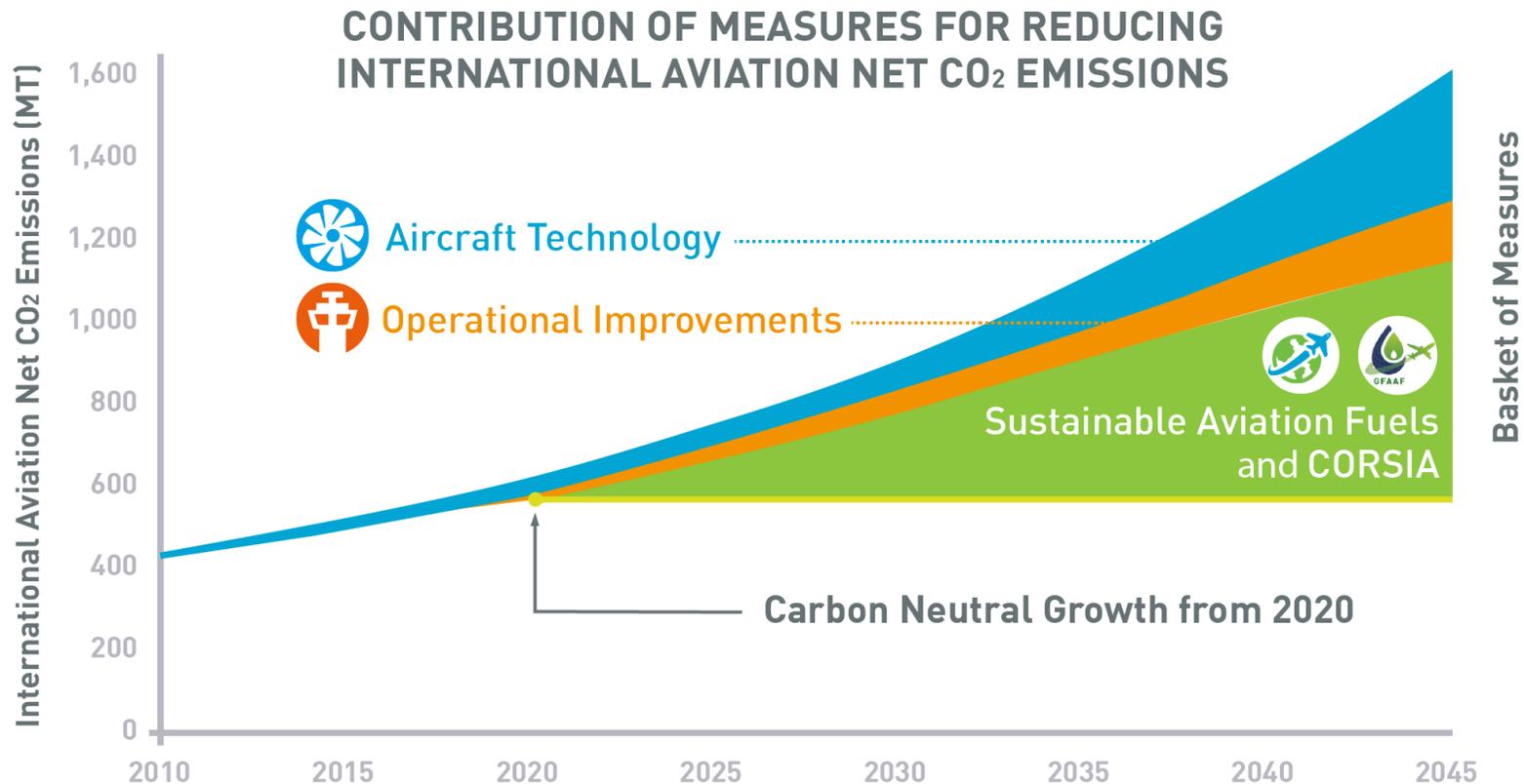
Neil Dickson

Chief, Environmental Standards,
ICAO



ICAO'S BASKET OF CO₂ MITIGATION MEASURES

- ICAO aspirational goal - Carbon neutral growth (CNG) from 2020 onwards.
- To be achieved with a “basket of measures” for CO₂ reduction



*Based on CAEP/11 Analysis

Advanced Aircraft Technology

Challenges & Opportunities

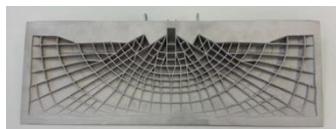


- Short term (2020-2035), reductions up to 25% or 30% - BUT harder each time!
- More feasible to implement than “Novel” concepts
- High applicability and compatibility



Examples:

- Propulsion: Higher by-pass ratio, GTF, higher turbine temperature
- Aerodynamics: Winglets, foldable wings
- Materials: Additive manufacturing, composites



Images courtesy of Boeing, Airbus

Novel Aircraft Technology

Challenges & Opportunities

Opportunities

- Reductions in emissions up to 100%
- Long term reductions
- Also benefits on local air quality

Challenges

- Often require extra infrastructure
- Dependent on life-cycle emissions
- Depend on long fleet roll-over times
- High development costs

Examples:

- Blended wing body
- Hydrogen propulsion
- Electric/ hybrid propulsion

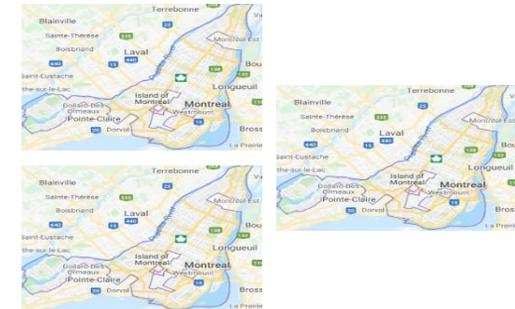
Images courtesies of: EnableH2, Pipistrel



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Key energy figure / Electric

- Per day, electrification of all flights from YUL would need ~3X the household energy usage of Montreal.



Key energy figures / Hydrogen

- Aviation 2019 fuel consumption: ~290 MT
- H2 production 2019: ~ 120 MT (<1% renewable)
- Hydrogen has 2.8 times more energy per unit mass than aviation fuel. By energy content, the world supply of Hydrogen needs to increase by 80%

ATM & Aircraft Operations

Challenges & Opportunities

Opportunities

- **Wide** applicability
- **Cost effective** to implement
- **Lower dependency** to fleet roll-over
- **Often Reduced** A/C maintenance cost
- **Route** efficiency

Challenges

- Safety
- Regulatory constraints
- Constant limitations (weather, equipment, facilities, military activity, traffic)
- Site-specific requirements
- Limited airport capacity -> Congestion and delays

Examples:

Continuous climb and descend

Harmonized airspace- Direct routing

Big data and AI to optimize operations



Sustainable Aviation Fuels

Challenges & Opportunities

Opportunities

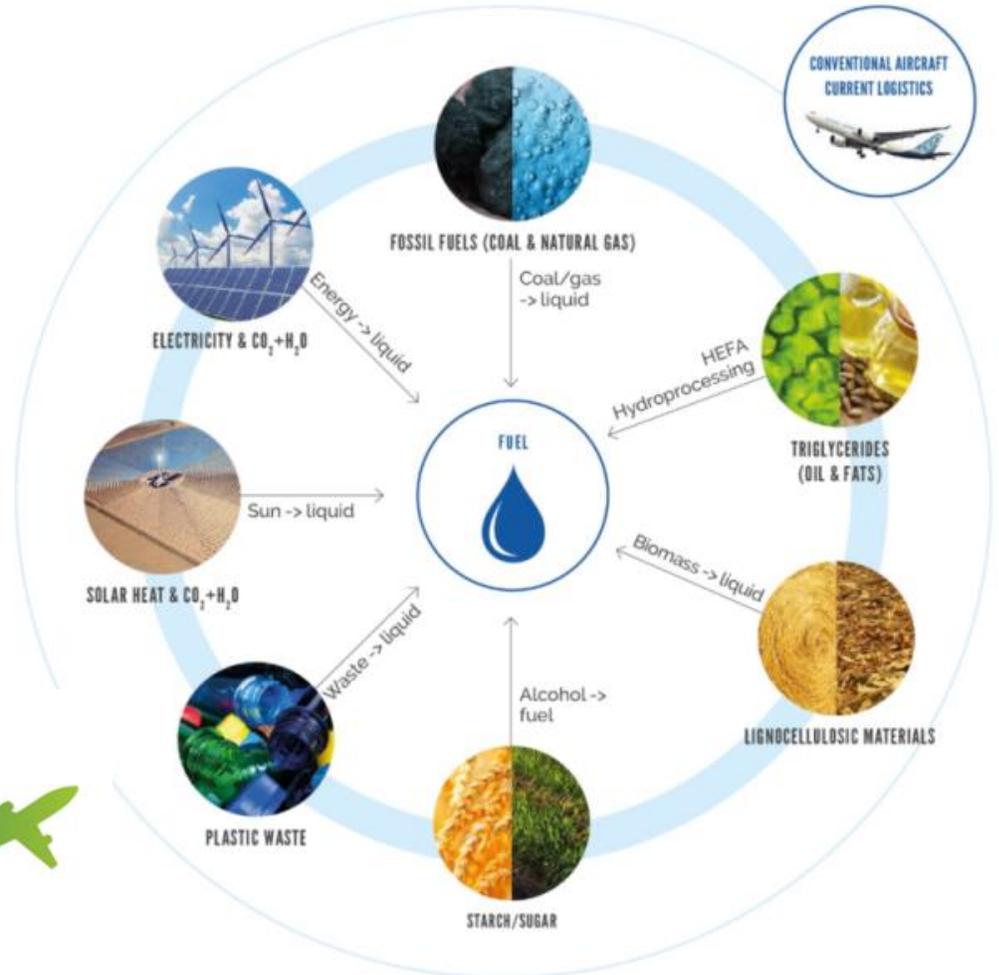
- **High** emissions reduction potential
- **“Drop-in”** fuels, same safety standards
- **Wide** applicability
- **No delay** due to of fleet roll-over
- **Around 250,000** flights already operated

Challenges

- **Availability** of feedstock
- **Environmental** sustainability
- **Cost** competitiveness



Global Framework for Aviation Alternative Fuels

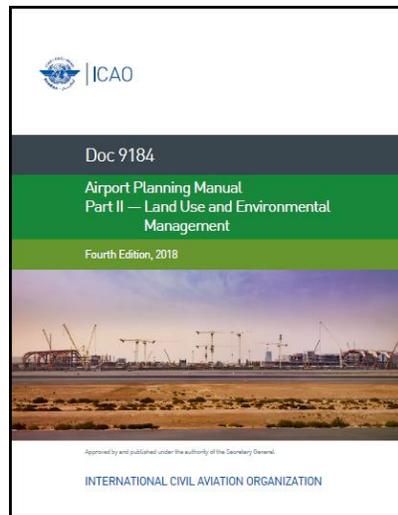
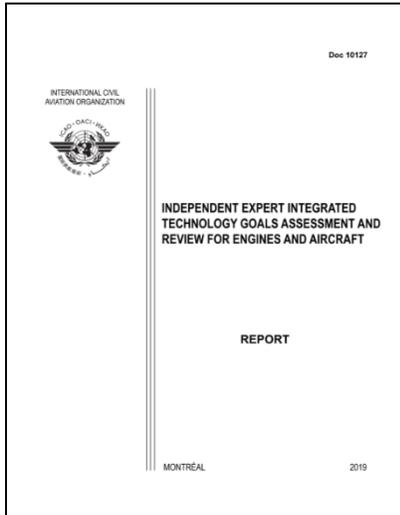
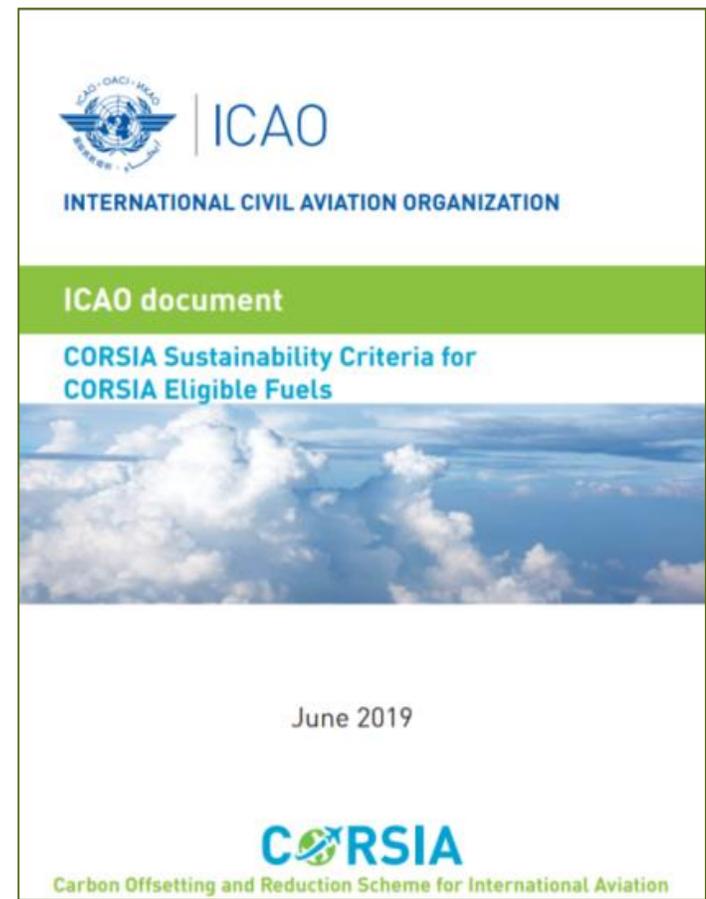


ICAO's work - some examples

ICAO Council adopts new CO2 emissions standard for aircraft



The 36-State ICAO Council convenes regularly at the Headquarters of the International Civil Aviation Organization in Montreal, Canada. Alongside the ICAO 39th Assembly's landmark agreement last October on the new Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), this latest CO2 standard for aircraft confirms the air transport sector's leadership and concrete actions toward ensuring a sustainable end environmentally responsible future for global civil aviation.



Thank You



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