Overview of Canada’s Action Plan on Aviation Emissions and Alternative Fuels

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Purpose

• Outline Canada’s roles, responsibilities and activities related to aviation emissions and alternative fuels.
Canadian and US Federal Organizations
Transport Canada’s Responsibilities

• Ensures a safe, secure, efficient and environmentally responsible Canadian transportation system
  – Assess safety, security and economic implications in proposed environmental measures

• Regulates all emissions from the aviation, marine and rail sectors – leads Canadian participation and involvement at the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO)

• Removes barriers to enable take-up of clean technologies – e.g., modernized and harmonized codes, standards, test protocols, targeted incentives, research
The Current Approach

The Government of Canada promotes clean transportation by:

1. **Creating and implementing regulatory regimes:**
   - In consultation with our partners, such as the International Maritime Organization (IMO) and the International Civil Aviation Organization (ICAO), and aligned with the U.S., where appropriate;
   - Sector-by-sector approach.

2. **Implementing complementary measures to support the uptake of clean transportation technologies and innovative practices:**
   - Voluntary agreements with industry;
   - Programs that provide economic incentives to support deployment;
   - Research and information on new technologies.
Common Objectives

• Environmental goals include reducing or minimizing:
  – aircraft noise
  – impacts on air quality
  – impacts on the global climate

• R&D is a key component
  – Improved measurement / understanding
  – Clean technology
  – Efficient operations
Aviation Environmental Impacts

Noise Impacts

Air Quality Impacts

Climate Impacts

Other Impacts
What’s Missing?

Natural Greenhouse Effect

- More heat escapes into space
- Solar Radiation
- Greenhouse Gases (CO₂, CH₄, N₂O)
- Atmosphere

Human Enhanced Greenhouse Effect

- Less heat escapes into space
- Solar Radiation
- More re-emitted heat
- Re-radiated Heat
- CO₂
- CH₄, N₂O
- More Greenhouse Gases
Aviation Environmental Impacts

- CO, HC, NO, SO, Primary PM<sub>2.5</sub>: < 1%
- CO<sub>2</sub>: 71%
- Water: 28%

Combustion Emissions

Atmospheric Chemistry and Physics

- Soot
- SO<sub>x</sub>
- NO<sub>x</sub>
- O<sub>3</sub>
- CH<sub>4</sub>
- H<sub>2</sub>O
- CO
- CH<sub>4</sub>, N<sub>2</sub>O, CO<sub>2</sub>

Global Climate Change

- Cooling Effects
- Warming Effects

Aircraft Noise

Population Exposure and Health Impacts

Land and Water Usage

Emissions from Fuel Production
Aircraft Condensation Trails
“Contrails”
Why Study Aircraft Engine Emissions and Contrails?

- Public concern
- Emissions deposited at cruise altitudes
- Climate impacts
  - Significance of H₂O
  - Role of particulate matter (including Black Carbon)
  - Impacts from alternative fuels
Canada’s Airspace

- World’s second-largest ANSP (by traffic volume)
- 12 million aircraft movements a year
- 18 million square kilometres (domestic airspace and out to centre of the North Atlantic… > 1,200 flights/day)
- Areas of significant importance for contrails
Canada’s Action Plan to Reduce GHG Emissions from Aviation

Goals:
- 2% fuel efficiency/year from 2005 to 2020
- Carbon neutral growth from 2020
- Absolute 50% GHG reductions by 2050

Measures:
- Fleet renewal
- Improved ATM
- Alternative aviation fuels
Canadian Aviation Environmental Research Priority Areas and Efforts

1. Aviation Impacts on the Global Climate
   - Aviation Emissions Impacts in the Arctic (York U/EC/FAA)
   - New ICAO aircraft CO2 standard (ASCENT)

2. Aviation Impacts on Air Quality
   - Cdn measurement technology (LII 300) and real-time calibration technology for new ICAO nvPM standard and methodology (NRC/GARDN/ASCENT)
   *also important for climate impacts

3. Aviation Alternative Fuels
   - ICAO Alternative Fuels Task Force
   - Fuel, engine and flight testing (GARDN/NRC/EC)
   - NASA ACCESS II (NRC/NASA/FAA)
   - Cdn biojet value chain assessment (BFN/ASCENT)
Canadian Research – Measurement & Testing
Canadian Research – Modelling
Canadian Research – Alternative Fuels

BioFuelNet Canada

Public-Private Network
• brings together the Cdn biofuels research community to address key challenges

Task Force 6: Aviation (*new)
• involve researchers in feedstock, conversion, engine operations, policy, LCA, economics and supply chain.

Need estimated at 200 - 250 million litres by 2020
Next Steps – Continued Collaborations with Key Partners