



ICAO

UNITING AVIATION

E-GAP



ICAO Global Aviation Partnerships on Emissions Reductions (E-GAP)

Multiplying Environmental Action

**A Scoping Study on the Possible Effects of Climate
Change on Air Navigation Services over the North
Atlantic**

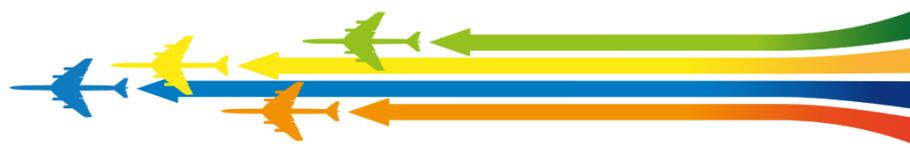
Neil Dickson,

Environment Officer, Environment, ICAO



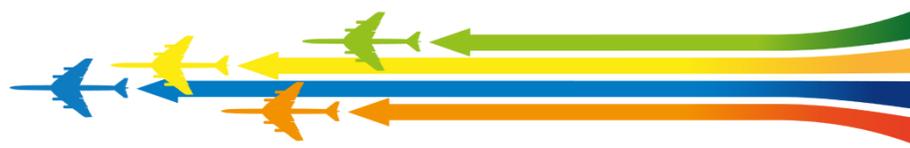
- It is only recently that atmospheric scientists have begun to study the possible impacts of climate change on aviation.
- The main atmospheric variables that affect aircraft are expected to be modified to varying degrees as the climate changes.

The potential consequences of these modifications for aviation are poorly understood.

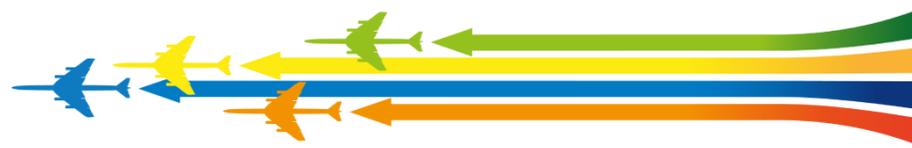


- ICAO is conducting a scoping study of the possible effects of climate change on air navigation services over the North Atlantic.
- Governments of Denmark and Iceland, and the ICAO Secretariat, are coordinating the study.
- Dr. Paul Williams, University of Reading, United Kingdom has carried out the research.

The aim is to survey the current scientific knowledge on the long-term trends in aviation meteorology driven by climate change.

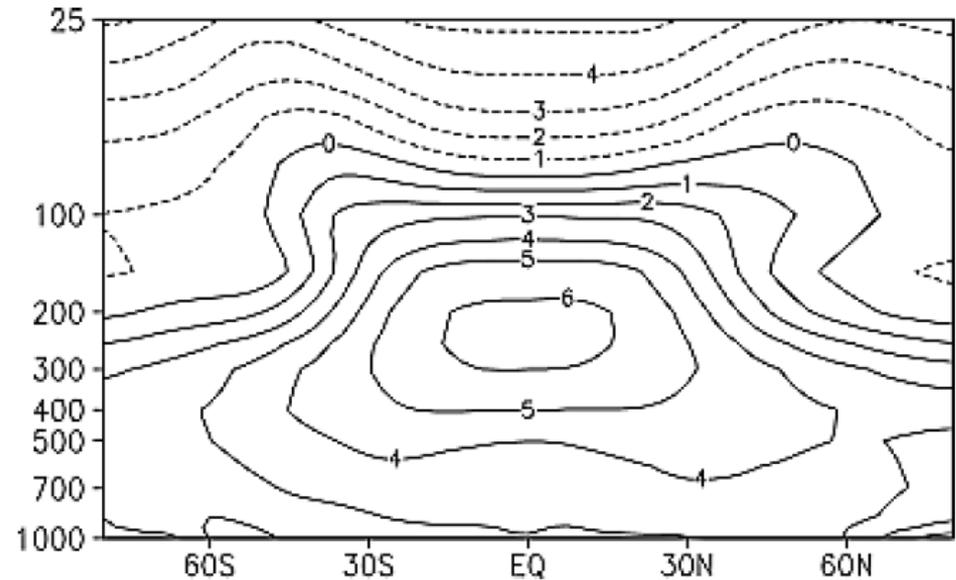


- The following seven possible impacts of climate change on aviation were reviewed:
 - take-off weight restrictions;
 - Icing;
 - clear-air turbulence;
 - Convective turbulence;
 - Extreme weather;
 - Navigation infrastructures; and
 - flight times and fuel burn.



Icing

- Possibility of an increased risk of icing at typical cruising altitudes on the northernmost transatlantic flight tracks by the end of the century is plausible.



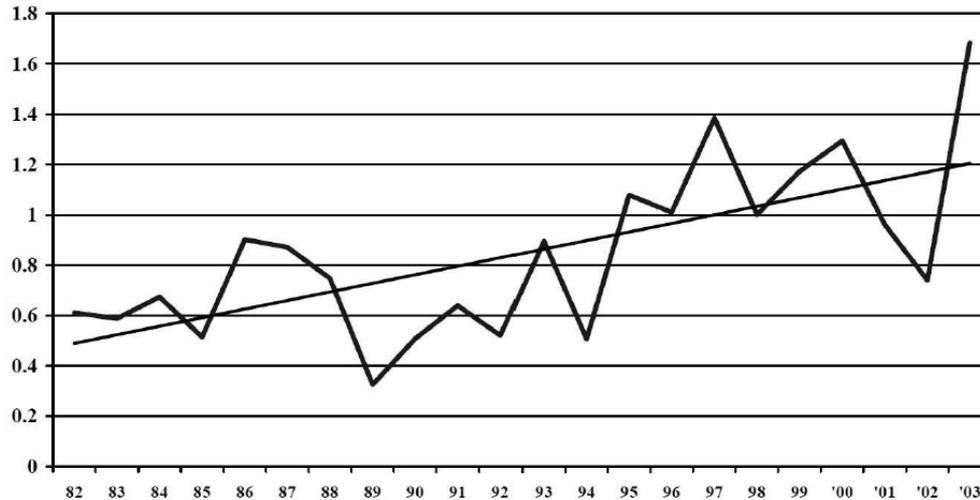
Annual-mean zonal-mean temperature change (°C) from 1980-1999 to 2080-2099 averaged over an ensemble of IPCC climate models. The horizontal axis is latitude and the vertical axis is pressure in hPa. Solid contours indicate warming and dashed contours indicate cooling. From Lorenz and DeWeaver (2007).

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- There are few published scientific studies on the Possibility of increased icing.

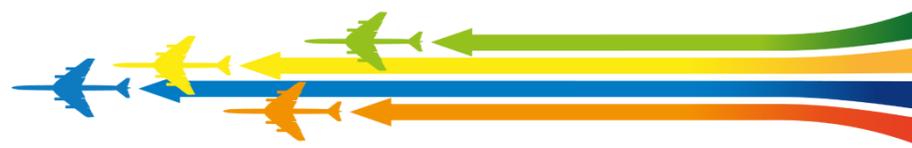


Clear Air Turbulence



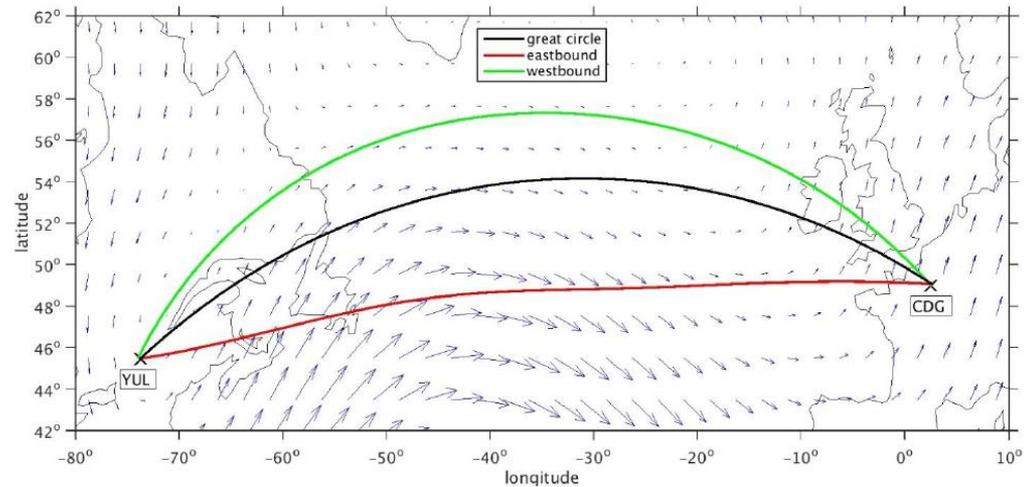
From Ballough (2007). Copyright © U.S. Federal Aviation Administration.

- Several studies have shown evidence of the growing impact of turbulence events.
- There is evidence for an increased risk of clear-air turbulence at typical cruising altitudes in the North Atlantic.



Fuel Burn and Flight times

- Studies have investigated flight times using 20 years of pre-industrial winds and 20 years of doubled-CO₂ winds.
- For YUL to CDG, when CO₂ is doubled the mean roundtrip journey time could increase.
- Other studies have found similar results.



Optimal eastbound and westbound flight tracks between YUL and CDG, as calculated for a given atmospheric wind field from an IPCC climate model (blue vectors).



In summary...

- The study has just been completed.
- The study has surveyed the current scientific knowledge on the long-term trends in aviation meteorology driven by climate change.
- It will be thoroughly reviewed over the coming weeks.



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ICAO Partnerships to advance the Scientific Understanding of Aviation and Climate Change



Transport
Canada



Dmi
Vejr, klima og hav



Luftfartstilsynet
CIVIL AVIATION AUTHORITY - NORWAY

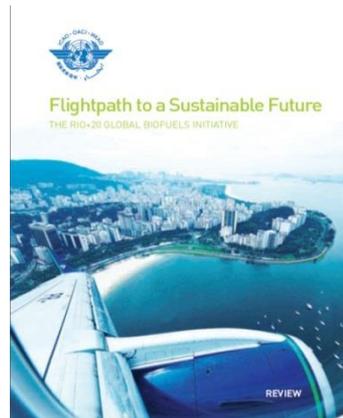
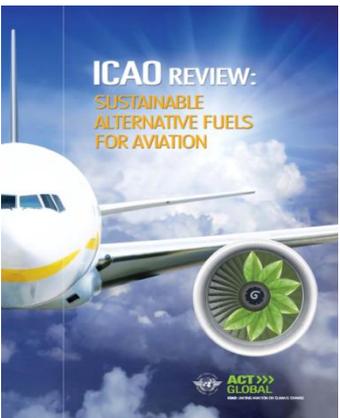
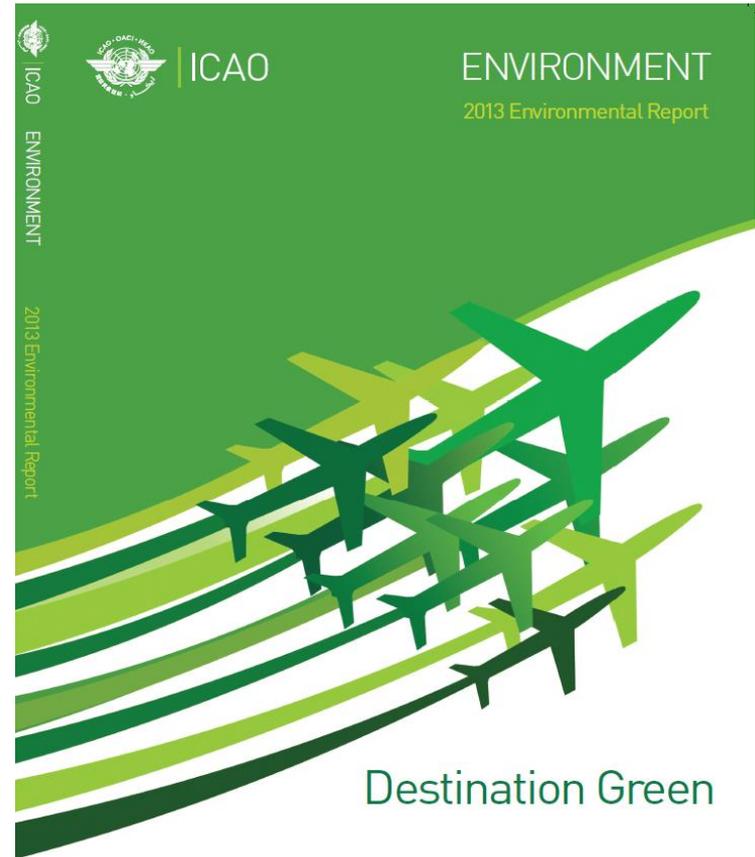
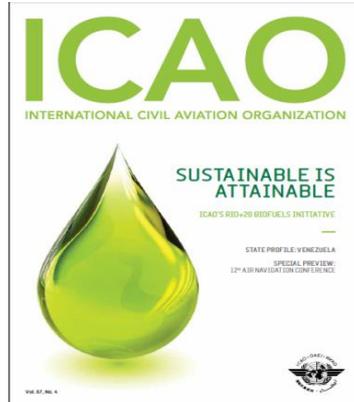
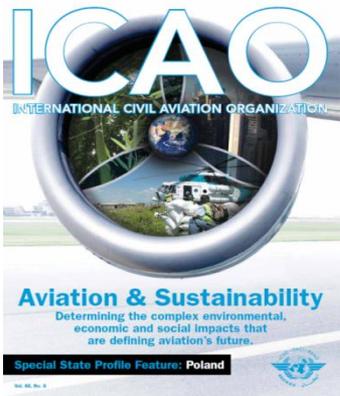


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Additional information



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

ICAO Global Aviation Partnerships on Emissions Reductions (E-GAP) Seminar
ICAO Headquarters, Montréal, 16 to 17 September 2015

ENV2015