

# Aviation and the Environment

## Research on Climate Change Impacts

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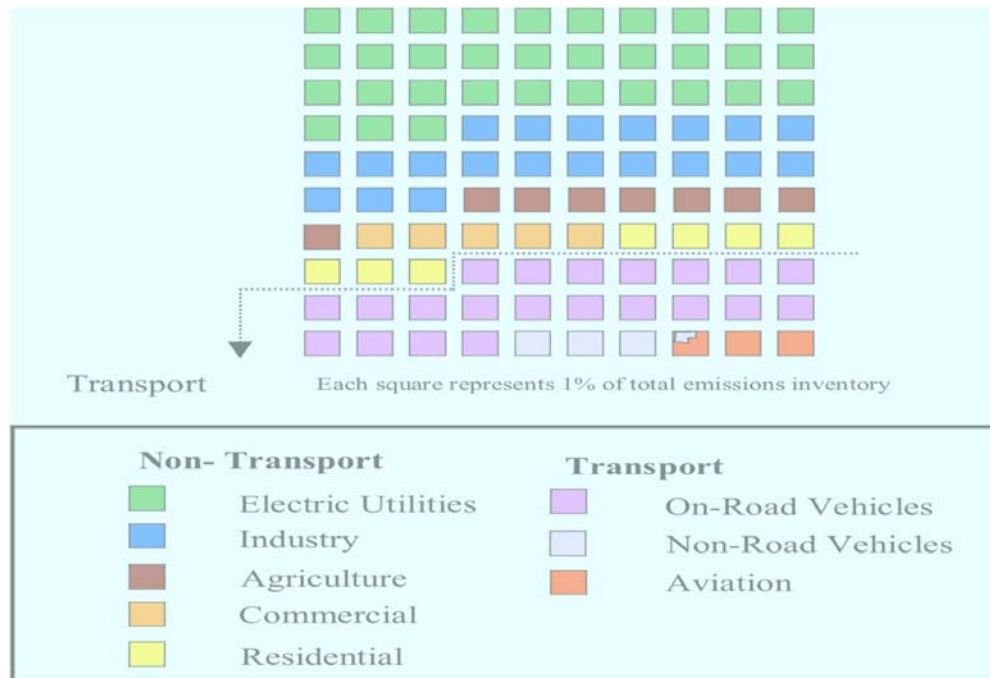
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Federal Aviation  
Administration



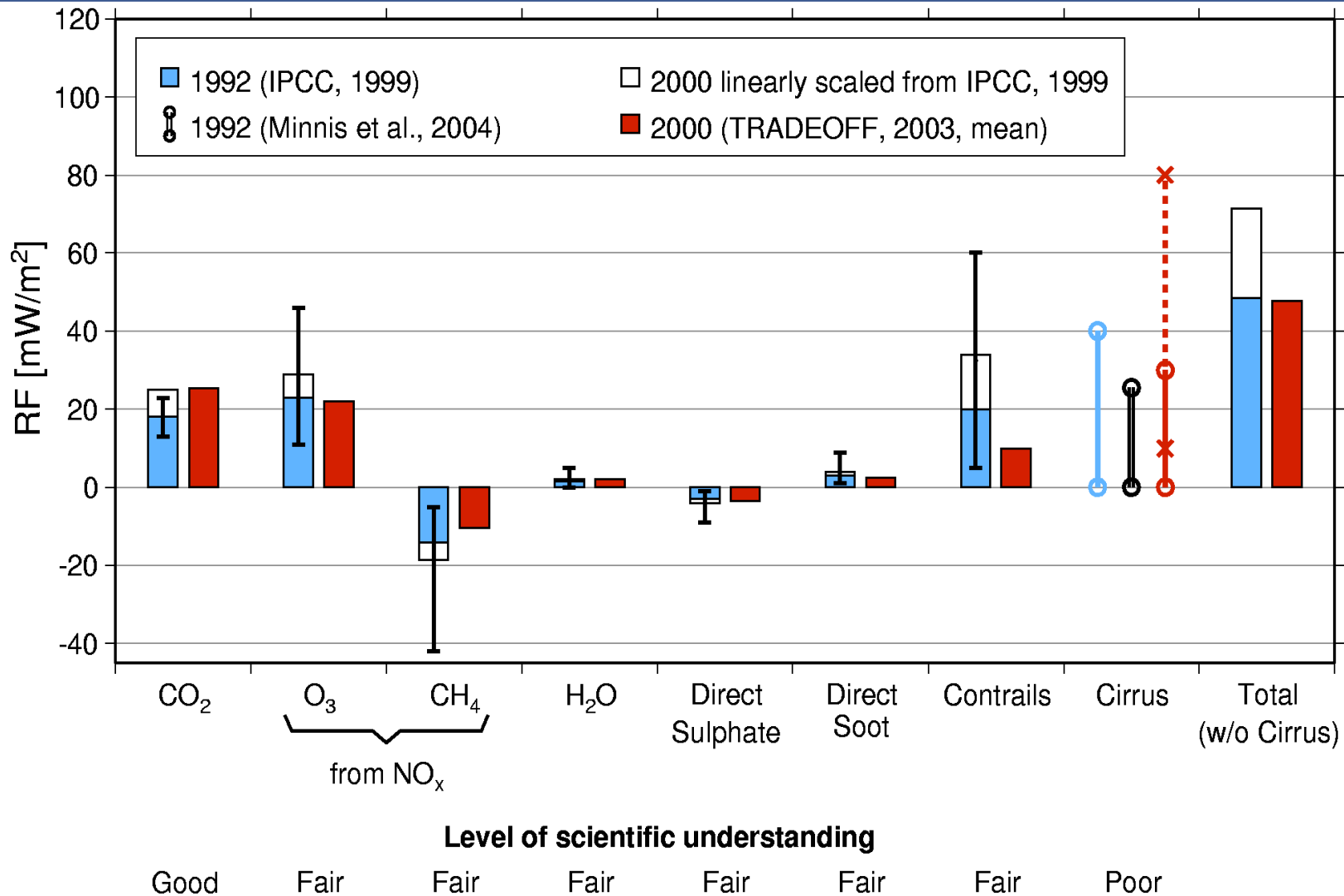
# Present Aviation Greenhouse Gas Emissions



**With projected increase in aviation demand, aviation emissions are expected to increase both absolutely and relative to other sources**

- Aviation 2-3% of global GHG emissions
- Aviation is a key category for UNFCCC
- Aviation is the fifth largest contributor to GHG in EPA inventories (2006, EPA 430-R-06-002)
- Given alternative fuel technology diffusion - aviation may grow as a contributor in context with other sources

# Level of Understanding and Uncertainties of Aviation's Climate Impact



# Aviation and the Climate Change



**“The (environmental) topic of greatest uncertainty and contention is the climate impact of aviation.”**

**“... uncertainties regarding both the contribution of aviation to climate change will be reduced to levels that enable appropriate action.”**

*Aviation and the Environment:  
A report to the US Congress (2004)*

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# What Do We Need Going Forward?



- Better science-based understanding of the impacts of aviation emissions on climate change
- Improved metrics, measurement techniques, and modeling capability to quantify and predict impacts and to understand inter-relationships of aviation environmental factors

# State of Aviation-Climate Change Research

**The US had a substantial aviation-related atmospheric and climate change research until the late 90's through NASA's. However, there has been a lapse in research (funding support and accompanying community interest).**

**Presently, PARTNER is funding some research on contrail formation and its early stage evolution.**

**By contrast, there are several active aviation-focused climate research programs in the Europe (e.g. CORSAIRE and its various subprograms).**



# First Step - Workshop on Aviation and Climate Change



- June 7-9, 2006
- Sponsors: PARTNER Center of Excellence, JPDO, FAA and NASA
- Workshop chaired by Prof. Donald Wuebbles (UIUC)
- About **35 international science experts** from the US, Europe (UK, Norway and Germany) and Canada
- Federal research, university and industry representation

This report can be downloaded at:

- <http://web.mit.edu/aeroastro/www/partner/reports/index.html>
- <http://climate.volpe.dot.gov/papers.html>

# Workshop Focus

- **Emissions in the UT/LS (cruise altitude) region and resulting chemistry effects**
- **Contrails and induced cirrus clouds**
- **Climate impacts and climate metrics**
- **Climate impact tradeoffs**



# Workshop Objectives

- **To assess and document**
  - The current state of knowledge
  - Uncertainties and gaps
- **To identify**
  - Ongoing research to constrain the uncertainties and fill the gaps
- **To recommend**
  - Prioritized short- and long-term future research needs
- **To help focus the scientific community on aviation-climate change research needs**

*This workshop is the first such US (and even international) effort since the IPCC 1999 report on Aviation and the Global Atmosphere*



## Key Findings: Selected High Priority Research Needs

- **Identify, develop and evaluate metrics for climate impact assessments and examine their scientific basis;**
- **Quantify the uncertainties in proposed metrics;**
- **Radiative effects on climate from contrails and cirrus;**
- **Systematic model intercomparison of efficacy studies**
- **Update the magnitudes of climate impacts and underlying uncertainties using the latest state of the science models**



## Recommendations

**“... the need for focused research efforts in the US specifically to address the uncertainties and gaps in our understanding of current and projected impacts of aviation on climate and to develop metrics to characterize these impacts.”**

**“... coordination and expansion of existing and planned atmospheric and climate research programs or development and implementation of new aviation focused research activities.”**

**“... a strong interaction between science and aviation communities while undertaking such initiatives.”**



## Key Next Steps

***Communicating with CCSP and its research participating federal agencies to leverage their resources to address aviation-climate change research needs.***

- **Identify high priority research needs that can be addressed in short time period (3-5 years timeframe)**
- **Work with CCSP participating federal agencies to identify how they can help address this needs**
- **Coordinate PARTNER and CCSP research activities**
- **Develop roadmap for aviation-related climate change research**

