

## Research Agenda for Reducing the Climate Impact of Aviation-Induced Cloudiness and Persistent Contrails from Commercial Aviation, Meeting #2

September 12, 2024

Virtual Meeting

Online via Zoom and Livestream

THURSDAY, SEPTEMBER 12, 2024

### OPEN SESSION

Zoom Remote Access

Meeting

Phone:

[CLICK HERE TO JOIN](#)

2:30 PM	Welcome	Tim Lieuwen, Chair
2:35 PM	<b>Observing Contrails</b> (3 20-minute presentations & 30-minute discussion)	<b>Carmen Emmel, German Weather Service</b> <b>Bill Smith, NASA</b> <b>Curtis Marshall, NOAA</b>
3:35 PM	Discussion	
4:05 PM	Break (Committee will go into closed session after the break)	
5:30 PM	Meeting Adjourns	

### EXECUTIVE SESSION

#### IMPORTANT NOTES

#### Presenters:

- Please do not include unpublished data, ITAR-controlled or sensitive information in your presentation.
- A National Academies Board staff member will ask you to sign a form before the meeting allowing us permission to use your likeness and presentation for our livestream video, which will be posted on our Board website after the meeting. Please get in touch with us before the meeting if you have any concerns about this usage.

#### Board Members and Presenters:

- Remote access will be provided through Zoom. This will allow you to participate in the meeting even if you can't be physically present.
- Please note that Zoom allows audio and any materials exchanged or viewed during the session to be recorded and shared.
- By participating in this activity, you agree to let your voice, likeness, and any materials you provide be recorded for use and dissemination. This includes any language, format, or media now known or later devised.

## **Contrails Research Agenda**

- You release the National Academies of Sciences, Engineering, and Medicine from any and all claims, liability, or damages arising from any such use. If you disagree, please do not join the session.

### **Members of the General Public:**

- Remote access will be provided through a live stream on Vimeo. This will also be publicly available and posted on the Board website. You do not need to register.

**Thank you all for your cooperation, and we look forward to a successful meeting.**

### Statement of Task

The National Academy of Sciences, Engineering, and Medicine will convene an ad-hoc committee to develop a national research agenda to understand better, quantify, and support the development of technical and operational solutions to significantly reduce the global climate impact of aviation-induced cloudiness (AIC) and persistent contrails (PC) from commercial aviation. The research agenda will comprise a prioritized set of scientific recommendations and research projects critical to the national and international commercial aviation and scientific research communities. It will include a review of advances in measurements, modeling, technology, fuel sensitivities, and recent approaches for evaluating tradeoffs.

The report will include recommendations for research to inform policymakers on appropriate metrics and methods to assess contrail-related climate impact and for research into technical and operational solutions to mitigate the impacts of AIC/PC. It will focus on understanding the importance of AIC/PC and the meaningfulness of various contributors to climate change so that federal agencies and industry can take further action to manage the important contributors. The prioritized research agenda developed by the committee will inform a contrail management strategy for the Nation.

Specifically, the committee will:

1. Consider the following:
  - a. The current goals, guidance, and plans by government, industry, and other relevant entities to reduce global aviation CO<sub>2</sub> and non-CO<sub>2</sub> emissions.
  - b. How the science of AIC/PC has changed over the last decade.
  - c. The current state-of-the-art satellite imaging and modeling capabilities for identifying, characterizing, and predicting the formation of contrails and persistent contrail cirrus and how a change in altitude might reduce the climate effects.
  - d. The role of sustainable aviation fuels (SAF), alternative fuels (e.g., hydrogen), and state-of-the-art and future engine (propulsive power generation) technologies in impacting CO<sub>2</sub> and non-CO<sub>2</sub> emissions.
  - e. The suite of aviation climate metrics and assumptions that includes the anthropogenic warming effects, such as CO<sub>2</sub> emissions and non-CO<sub>2</sub> impacts (nitrogen oxides and aviation-induced cloudiness).
2. Address the following:
  - a. What capacity building is needed in terrestrial, airborne, and spaceborne data/imagery and modeling systems to improve the understanding and assessment of the climate effects of contrails, aviation-induced or modified cirrus clouds, and their climate impacts?
  - b. What capability may be needed for real-time relative humidity forecasting and measurements by aircraft in flight akin to wind, temperature, and speed, which are typically reported by aircraft? What are the advantages, disadvantages, and potential synergies between satellite and aircraft-based measurement?
  - c. What future research is needed to narrow the uncertainty and improve confidence in understanding the contrast between aviation-induced cloudiness and water vapor?
  - d. What future research would help characterize the impact of sustainable aviation fuels and other energy carriers on aviation-induced cloudiness?

3. Formulate a national research agenda to advance the scientific understanding of non-CO<sub>2</sub> emissions and AIC/PC impacts from commercial aviation, including but not limited to aviation fuels and propulsive power-generating technologies. The agenda should include:
  - a. The significant scientific, technical, economic, and policy challenges associated with this vision.
  - b. A proposed research agenda consisting of a set of research projects, identified by priority groupings, that, if successful, could enable this vision.
  - c. The agenda should be developed considering the resources and organizational partnerships required to complete the projects included in the plan.
  - d. As appropriate, describe the potential contributions of U.S. research organizations, including NASA, other federal agencies (NOAA, FAA, DOE, etc.), industry, airlines, and academia. In addition, describe the operational roles of NOAA and FAA relevant to the formulation of a national research agenda. Finally, describe potential opportunities for international collaboration.