

Advancing the Science for Aviation and Climate

# ACACIA

## Deliverable 5.1

**Title: Strategic roadmap and agenda available for scientific assessments, i.e., IPCC, WMO**

**Lead partner: CICERO**

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### 1 Summary

This Deliverable has been strongly affected by the COVID-19 situation. The timelines for the international processes to which we relate our strategic road map have been or are under revision due to the unpredictable situation internationally.

ACACIA aims to produce scientific results available for the assessments carried out by the Intergovernmental Panel on Climate Change (IPCC). IPCC is now in its sixth cycle and has produced three Special Reports and is now preparing reports from the three Working Groups as well as a Synthesis Report. As informed in the calendar at the IPCC website, the time schedule for IPCC reports and activities is subject to changes due to the COVID-19 pandemic. A main goal for ACACIA will be to provide significant contributions to the literature available for scoping and writing of the reports in the next cycle of the IPCC.

ACACIA may also produce scientific papers relevant to the 2022 UNEP/WMO Scientific Assessment of Ozone Depletion. Papers to be considered in this assessment must be accepted by end of May 2022.

## 2 Roadmap

ACACIA has four aims for scientifically based and internationally harmonised policies and regulations for a more climate-friendly aviation system. (1) We will improve scientific understanding of those impacts that have the largest uncertainty, in particular, the indirect effect of aviation soot and aerosol on clouds. (2) We will identify needs for international measurement campaigns to constrain our numerical models and theories with data and we will formulate several design options for such campaigns. (3) Putting all aviation effects on a common scale will allow providing an updated climate impact assessment. Uncertainties will be treated in a transparent way, such that trade-offs between different mitigation strategies can be evaluated explicitly. This helps our final aim (4) to provide the knowledge basis and strategic guidance for future implementation of mitigation options, giving robust recommendations for no-regret strategies for achieving reduced climate impact of aviation.

To this end, ACACIA brings together research across scales (from plume to global scale), from the laboratory experiments to global models, and it proceeds from fundamental physics and chemistry to the provision of recommendations for policy, regulatory bodies, and other stakeholders in the aviation business. Additionally, ACACIA will cooperate with international partners, both research institutions and organisations.

By producing scientific papers on climate impacts of aviation, the scientists in ACACIA will contribute to the scientific basis for assessments such as IPCC and UN Emission Gap Report. In addition to this, several of the participants in ACACIA are involved in the writing of the coming IPCC assessments reports. Two of the authors were also involved in the UNEP Emission Gap Report 2020.

### 2.1 IPCC

ACACIA's time schedule does not allow for a significant part of our papers to be accepted in time for the cut-off dates for literature (<https://www.ipcc.ch/calendar/>) to be considered by the IPCC in the current cycle (the 6<sup>th</sup> cycle). A main goal for ACACIA will be to provide significant contributions to the literature available for scoping and writing of the reports in the next (7<sup>th</sup>) cycle of the IPCC.

#### **Related to IPCC Working Group I The Physical Science Basis:**

The paper by Skowron et al. (2021) developed within ACACIA highlights the importance of background concentrations when estimating aviation climate impact of nitrogen oxides.

#### **Related to IPCC Working Group III Mitigation of Climate Change:**

Information about timeline and delays have been shared with ACACIA participants.

In the paper by Matthes et al. (2021), developed from within the ACACIA consortium, results from a multi-model sensitivity study were published before the cut-off date for literature to be considered by IPCC WG III. The paper shows that flying lower leads to a

reduction of radiative forcing of non-CO<sub>2</sub> effects together with slightly increased CO<sub>2</sub> emissions and impacts, when cruise speed is not modified. In the paper by Skowron et al. (2021) developed within ACACIA it is investigated how further efforts leading to greater fuel efficiency, and therefore lower CO<sub>2</sub> emissions, may be preferable to reducing NO<sub>x</sub> emissions in terms of aviation's climate impacts.

## 2.2 *UNEP/WMO Scientific Assessment of Ozone Depletion*

ACACIA may also produce scientific papers relevant to the 2022 UNEP/WMO Scientific Assessment of Ozone Depletion (<https://csl.noaa.gov/assessments/ozone/2022/>). Papers to be considered in this assessment must be accepted by end of May 2022.

## 3 **Other activities**

Expert meetings and various activities that may be relevant to ACACIA will be announced.

We will inform about timeline for preparation of AR7 when this has been decided.

ACACIA will publish literature on topics for which there are knowledge gaps, missing literature, and large uncertainties. It will be important to publish in time to be available for scoping and writing of the IPCC reports in the 7<sup>th</sup> cycle.

ACACIA will follow the program for Conference of the Parties (COPs) under the UNFCCC (<https://cop23.unfccc.int/conference-of-the-parties-cop>) and consider options for organizing or participating in side-events related to aviation and climate change.

## 4 **References:**

Matthes, S., Lim, L., Burkhardt U., Dahlmann, K., Dietmüller, S., Grewe, V., Haselrut, A., Hendricks, J., Owen, B., Pitari, G., Righi, M., Skowron, A. (2021): Mitigation of Non-CO<sub>2</sub> Aviation's Climate Impact by Changing Cruise Altitudes *Aerospace* 8, 36, doi: 10.3390/aerospace8020036

Skowron, A., Lee, D.S., De León, R.R. et al. (2021): Greater fuel efficiency is potentially preferable to reducing NO<sub>x</sub> emissions for aviation's climate impacts. *Nat Commun* 12, 564, doi: 10.1038/s41467-020-20771-3