January 18, 2024

XXXXXXX
FAA Administrator
Federal Aviation Administration
800 Independence Avenue, SW
Washington, DC 20591

XXXXXXX
Assistant Administrator for Policy,
International Affairs, and Environment
Federal Aviation Administration
800 Independence Avenue, SW
Washington, DC 20591

Re: *Reducing Global Warming by Getting Rid of Contrails*

Dear Mr. XXXXXX and XXXXXXX,

We write regarding action the Federal Aviation Administration ("**FAA**") can and should take to drastically reduce aviation's climate impact. For the reasons discussed below, we ask the FAA to adopt a policy to encourage and incentivize the U.S. aviation sector to prioritize the elimination of warming aircraft condensation trails ("**contrails**") which have a significant influence on the environment.

Our organization, End the Lines ("**ETL**"), supports the aviation industry's path to achieve zero emissions. We believe eliminating contrails is an achievable, quick, and effective means of immediately and significantly reducing aviation's climate impact. As we approach 2050, ending contrails is a necessary step to reach the goal of keeping global temperature increases below 2°C above pre-industrial levels.

First, we would like to thank the FAA for implementing the ambitious 2021 Aviation Climate Action Plan ("**the Plan**").[1] The Plan is a positive step towards achieving our goals. We also thank the FAA for acknowledging in the Plan that: 1) "persistent linear contrails produced in the wake of aircraft contribute to net climate warming;" 2) warming effects from aviation induced cloudiness "could be comparable or even higher than those due to aviation CO_2;" and 3) "contrail-induced cirrus clouds (aviation induced cloudiness) also affect the solar and terrestrial infrared radiative budget of the atmosphere."[2]

[1] https://www.faa.gov/sites/faa.gov/files/2021-11/Aviation_Climate_Action_Plan.pdf.

[2] *Id.*

We also appreciate that "the United States is taking action to improve the level of scientific understanding for non-CO_2 climate impacts of aviation emissions to support future policy decisions."[3] In an effort to do so, we are pleased the FAA is: 1) "currently funding research to improve its understanding of the non-CO_2 climate impacts of aircraft;"[4] 2) developing "a contrail avoidance tool to evaluate and optimize the benefits, costs, and practicality of contrail avoidance to minimize aviation climate impacts,"[5] and 3) encouraging "improvements in aircraft operations throughout the National Airspace System (NAS) by the U.S. Government (USG) and by airlines flying more optimal trajectories for reduced fuel use and contrail impacts."[6] With this letter we hope to encourage the FAA to take more aggressive action to build upon this progress.

A. Why? Contrails Warm the Planet More Than CO_2

A 2020 study conducted by researchers for the European Union concluded airplane contrails warm the planet twice as much as CO_2 emissions.[7] Another 2020 study examined aviation's impact on climate change from 2000 to 2018 and concluded contrails account for 57% of the entire climate effect of aviation.[8] Researchers explained, "[T]o halt aviation's contribution to global warming, the aviation sector would need to achieve net-zero CO_2 emissions and declining non-CO_2 radiative forcing (unless balanced by net negative emissions from another sector): neither condition is sufficient alone."[9] Reaching aviation's emissions goals by 2050 is only achievable if we focus on eliminating warming contrails. The good news is that we can eliminate contrails quickly if the industry makes targeted changes to how we fly.

B. How? We Can Eliminate Warming Contrails with Targeted Minimal Deviations to Flight Paths of a Small Percentage of Existing Flights

[3] *Id.*

[4] *Id.*

[5] https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/09/fact-sheet-biden-administration-advances-the-future-of-sustainable-fuels-in-american-aviation/.

[6] https://www.faa.gov/sites/faa.gov/files/2021-11/Aviation_Climate_Action_Plan.pdf.

[7] https://eur-lex.europa.eu/resource.html?uri=cellar:7bc666c9-2d9c-11eb-b27b-01aa75ed71a1.0001.02/DOC_1&format=PDF.

[8] https://www.sciencedirect.com/science/article/pii/S1352231020305689.

[9] *Id.*

The seminal 2020 study by Roger Teoh and colleagues analyzing Japanese airspace showed that only 2 to 2.5% of flights contributed to 80% of warming from contrails.[10] In a subsequent study, the team determined that only changing the altitude of a small number of flights to avoid flying through the ice-supersaturated regions with high humidity would significantly reduce the climate effects of aviation.[11]

On October 22, 2021, BBC journalist Beth Timmins published an article quoting researchers from Imperial College of London, German Aerospace Centre (DLR), Royal Aeronautical Society, and the Carnegie Institution for Science, who concurred that adjusting flight elevation for very few flights by just a few thousand feet would be sufficient to significantly reduce aviation's climate impact.[12] This method of contrail avoidance could be the most cost effective and quickly achievable way to successfully mitigate aviation induced warming.[13]

C. Who? Different Teams Have Run Trials to Show Contrail Avoidance Works

In 2021, the German Aerospace Center (DLR) partnered with EUROCONTROL Maastricht Upper Area Control (MUAC) to carry out the world's first live contrail prevention trial.[14] Researchers used satellite image analysis to target a small number of nighttime flights predicted to cause warming contrails. They directed pilots to climb or descend 1,000 to 2,000 feet during the flight to avoid contrail formation. Based on this trial they discovered that contrail prevention is operationally possible.

SATAVIA, a private UK company, uses their advanced weather prediction model to target what they believe are the 5% of flights that are responsible for 80% of contrails' influence on the climate.[15] In 2022, SATAVIA and Etihad Airways began weekly contrail avoidance programs for flights across Etihad's route network allowing Etihad to eliminate thousands of tons of carbon dioxide equivalent ("**CO2e**") climate

[10] https://pubs.acs.org/doi/10.1021/acs.est.9b05608.

[11] https://doi.org/10.3390/aerospace7090121.

[12] https://www.bbc.com/news/business-58769351.

[13] https://www.nature.com/articles/d41586-021-01339-7.

[14] https://www.eurocontrol.int/article/reducing-impact-non-co2-climate-impact-eurocontrol-muac-and-dlr-partnering-contrail.

[15] https://green.simpliflying.com/p/adam-durant-ceo-satavia#details.

impact.[16] As a result, Etihad signed the world's first multi-year contract integrating SATAVIA's software into their routine flight operations.[17]

American companies are also implementing effective contrail avoidance strategies. "Google Research teamed up with American Airlines and Breakthrough Energy to bring together huge amounts of data — like satellite imagery, weather and flight path data — and use AI to develop contrail forecast maps to test if pilots can choose routes that avoid creating contrails."[18] American Airlines' pilots flew 70 contrail avoidance flights over 6 months and were able to reduce contrails by 54%. The contrail avoidance flights only burned an additional 2% of fuel. "This suggests that contrails could be avoided at scale for around $5-25/ton CO2e using our existing predictions, making it a cost-effective warming-reduction measure, and further improvements are expected."[19] Other U.S. based airlines including Southwest, United Airlines, Alaska Airlines, and Delta Airlines have also expressed interest in joining the effort to stop contrails and their harmful climate impact.[20]

ETL respectfully requests that the FAA adopt a policy or amend the existing climate Plan to encourage and incentivize the U.S. aviation sector to take advantage of the aforementioned technology and prioritize contrail avoidance. As demonstrated above, with just small changes to a small percentage of existing flights, the U.S. could drastically reduce aviation's environmental impact. We ask that you please respond and share how the FAA will do more about contrail avoidance.

Sincerely,

Michael Caldwell
Executive Director

[16] https://www.etihad.com/en-us/news/etihad-and-satavia-sign-multi-year-commercial-agreement-to-deliver-contrail-management-and-future-carbon-credits-within-day-to-day-operations.

[17] *Id.*

[18] https://blog.google/technology/ai/ai-airlines-contrails-climate-change/#footnote-1.

[19] *Id.*

[20] https://phys.org/news/2022-12-airlines-contrails-environmental-problem.html