

Open letter: Addressing contrails is a no-regrets decision that will help slow climate change

There is no denying it: we find ourselves in a climate emergency. The World Meteorological Organisation [confirmed](#) that 2023 was the warmest year on record, with the global average near-surface temperature at 1.45°C above the pre-industrial baseline¹. Earlier in 2023, the [IPCC](#) assessed that by the mid-2030s there would be a 50% chance of the world reaching a rise of at least 1.5°C.

Certain sectors of the economy are drivers of the climate emergency. Transport is one of them. And within that, aviation. That problem needs only a few facts and figures to underline its seriousness. Global aviation traffic doubled between 2005 and 2019 and its CO₂ emissions grew by 40%. And that just covers part of the problem. Planes cause much more warming than just through their CO₂ emissions

Non-CO₂ effects of aviation, such as nitrogen oxides and contrails, warm the planet [at least as much as aviation's CO₂](#). The climate impact of these effects [has been known for more than 25 years](#).

Contrails - created by aircraft flying through cold and humid air - are the most significant of aviation's non-CO₂ effects. Most contrails dissolve within a few minutes, but in certain conditions, they can persist in the atmosphere, spread out, and become artificial cirrus clouds with a net warming effect. [A landmark study](#) estimated that the effective radiative forcing (ERF) from contrails in the year 2018 was larger than the ERF from the CO₂ present in the atmosphere from aviation emissions since 1940.

Nonetheless, little effort has been made in the last decades to mitigate the warming effects of contrails. To date, [the aviation industry has not been proactive](#) in dealing with the problem.

Crucially, if decisive action is taken, these effects may be partly mitigated in a faster and more [cost-effective](#) way than other climate issues, thanks to slightly rerouting a [small number](#) of targeted flights. This would entail minimum impact on the aviation industry and passengers, and a negligible risk of doing more climate harm than good.

Moreover, the effects of contrails on the climate are short lived, so addressing them would deliver short term climate benefits, very much needed in the race to meet the goals set out in the Paris agreement.

Recognising the impact of non-CO₂ effects, particularly contrails, on our warming climate and the urgent need for action, we, aviation and climate scientists, call upon global decision makers to implement solutions to tackle non-CO₂ effects of aviation on top of decarbonisation efforts. This starts by better awareness-raising of the general public on their climate impact. Airline passengers

¹ With a margin of uncertainty of ± 0.12 °C

should be informed of the full climate impact of flying when booking a flight and companies performing business flights should include non-CO₂ in their corporate reporting. Performing large scale contrail-avoidance trials, supported by applied research, will also be pivotal. Finally, and most importantly, we recognise the importance of a policy framework, underpinned by a robust monitoring system, to reduce warming contrails and other non-CO₂ effects. This will ensure that mitigation measures are quickly adopted, as soon as they are ready.

This is a no regrets approach that will help to slow climate change by a significant margin. Delaying action would be a critical error.

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