AVIATION INDUSTRY COULD CUT CLIMATE IMPACT BY 20% IN FIVE YEARS

News / Airlines

The findings of a new paper could provide impetus for the aviation industry to drastically reduce its climate impact with only minimal changes to aircraft equipment and infrastructure.

The University of Bristol paper, published in the journal *Aerospace*, suggests modification to air traffic control procedures and aircraft operations could reduce the climate impact of aviation by as much as 20 per cent in the next five to 10 years.

Lead author Kieran Tait, who completed the review of the latest aviation emissions science, said: “Aircraft non-CO2 emissions are responsible for over two-thirds of aviation’s net climate impact, yet due to the focus on decarbonisation in policymaking - which is essential to meet net zero targets - mitigation of these emissions is often overlooked.

“Flight route modifications in the form of climate optimal routing, to avoid climate-sensitive regions, and formation flight, in which two aircrafts fly one behind the other (separated by ~2km) could hold the key to drastically reducing aviation's climate impact.”

There are two main contributors to aviation's non-CO2 climate impact – aircraft condensation trails (contrails) and emission of nitrogen oxides (NOx). The warming effect of non-CO2 emissions strongly depends on the chemical and meteorological state of the atmosphere at the instant they are released.

Contrails account for 51 per cent of aviation’s total climate impact. Where the air is very cold and humid, the water vapour in the contrails condenses around particulates to form ice crystals which trap heat and have a net-warming effect. Similarly, emissions of NOx react with chemicals in the atmosphere to generate ozone and reduce methane. However, the generation of ozone tends to outweigh the methane reduction, leading to a net warming effect.

“While climate optimal routing may require a longer flight, and therefore an additional one to two percent fuel burn, avoiding climate-sensitive areas could actually reduce the overall climate impact of a flight by around 20 per cent.

?“In formation flight, the follower aircraft flies in the wake of the leader aircraft, receiving an upwash which reduces the required lift and results in a five to eight per cent decrease in fuel burn. It also has the additional benefit of overlapping of aircraft exhaust plumes, and the accumulation of emissions contained within them.

?“The next step is to analyse global air traffic data to identify high-density airspace hotspots (such as along flight corridors), where implementation of the formation flight concept would be most appropriate,” said Mr Tait.

This paper gathers the latest evidence of the aviation industry’s climate impact and says, “this is how we can make a real and significant difference, right now.”

"The aviation industry has a lot to gain from taking these findings on board and making the small but crucial changes to air traffic control and aircraft operations that will have such a significant impact," said Dr Steve Bullock, Associate Professor of Aerospace Engineering, who supervised Mr Tait’s research.

Paper:

‘Aircraft Emissions, Their Plume-Scale Effects, and the Spatio-Temporal Sensitivity of the Atmospheric Response: A Review,’ by Tait, K et al. in Aerospace.

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