

Science for Environment Policy

Air traffic management to balance CO₂ emissions and noise pollution

Speed constraints for aircraft are put in place, at some airports, to minimise noise pollution in local areas, however, such practices can be very fuel-inefficient. New research has now shown that relaxing departure speed limits could substantially reduce CO₂ emissions, while maintaining acceptable noise levels.

The aviation industry is a major contributor to emissions of greenhouse gases, in particular, CO₂. The Intergovernmental Panel on Climate Change has estimated that the greatest fuel efficiency savings for planes could be made during the departure and arrival stages of a flight. Although the focus of most research has been on arrival, departure is also important; a flight within Europe may use between 25-30% of fuel needed for the entire journey during this short stage from take-off to the top of the climb, when the aircraft can begin to cruise.

In this study, researchers used real flight data from Gothenburg Landvetter airport, Sweden, to develop an analytical model. This model predicted CO₂ emissions and noise levels experienced in areas surrounding the airport under five departure scenarios. These included speed limits of 205, 210 (the existing limit) and 220 Knots Indicated Airspeed (KIAS) for a distance of 18.5km over the ground. The further two categories included were 250 KIAS until reaching an altitude of 10,000 feet and 'free speed', under which there was no speed constraint.

Results indicated that the increased fuel efficiency gained under the 250 KIAS scenario resulted in a 105kg reduction in CO₂ emissions during the departure stage. Furthermore, this increased efficiency came at the cost of only a small increase (2 dB) in noise levels on the ground at distances between 11 and 18.5km from the airport. For distances over 26 km, a decrease of 1.5 dB was expected.

Entirely removing speed constraints reduced CO₂ emissions during departure by 180kg, however, noise levels increased by 4 dB between 18.5 and 26km from the airport. Although the size of the total area experiencing noise of approximately 70 dB did increase when speed constraints were removed, and, although such noise levels are considered particularly high and dangerous for health, noise exposure at such levels is acceptable under Swedish regulations.

These results suggest that relaxing departure speed constraints for aircraft could decrease CO₂ emissions without causing a prohibitively high rise in noise pollution in this case, only because populated areas were more than 10km from the airport specified, where noise was predicted to decrease. However, the researchers do caution that the rise in noise levels much closer to the airport, especially if constraints are removed completely, may create problems for airports in more heavily-populated areas.



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