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OPTIMIZATION OF AVIATION EMISSIONS THROUGH ALTERNATIVE ROUTING STRATEGIES

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Abstract

The significant increase in air transportation expected over the coming decades, combined with the initiation of the emissions trading system (EU-ETS) within European aviation, is increasing the requirement for airlines to find new levels of efficiency in their operating practices leading to reduced emission levels. Technological developments are expected to lead to substantial reductions in fuel burn and emissions over the long term, including aircraft design optimization and the use of alternative fuels. However in short term, enhancements to aircraft routing and air traffic control are some of the most promising areas for improvements.

This paper will present an alternative routing strategy for certain long haul journeys that could lead to significant reductions in carbon dioxide (CO_2) emissions and fuel consumption. The paper analyses 7 traditional long haul routes departing from London Heathrow (LHR) to 5 North American destinations, Mumbai and Singapore. The traditional 'non-stop' routes are compared to a new 'multiple stage' routing strategy utilising an intermediate hub that splits the journey into 2 phases. The 2nd phase is completed using short haul aircraft (B737, A320), which benefit from increased efficiency when compared to traditional long-range aircraft for example the B747-400. Of the 7 routes analysed, 6 showed CO_2 and fuel consumption reductions per passenger per flight ranging from 2.1% to 13.7%. Furthermore, introducing a 50% blend of Fischer-Tropsch (F-T) biofuel, resulted in estimated CO_2 reductions of as much as 16.6% with cost savings relating to EU-ETS biofuel exemption and emission reduction estimated at between $10-19 per passenger considering current costs of carbon credits.

Key words: airline routing, aviation emissions, CO_2 reductions, ETS

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