A new airport system to save time, money and carbon emissions

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Aviation engineering specialists have secured a £1 million research grant to develop a pioneering new aircraft routing and scheduling system that could see operations increase by 50% at some of the world's busiest airports.

Funded by the UK's EPSRC (Engineering and Physical Sciences Research Council), the new TRANSIT (Towards a Robust Airport Decision Support System for Intelligent Taxiing) project will be led by the University of Lincoln, UK. It will see researchers and industry experts working together for three years to develop a new on-the-ground system that will reduce aeroplane taxi times, operating costs and environmental impact at airports around the world.

With increasing global demand for air travel and overloaded airport facilities, the inefficient movement of aeroplanes – or airport taxiing operations - is identified as a major contributor to unnecessary fuel burn and a substantial source of pollution. TRANSIT research will have the potential to increase airport capacity, while reducing the environmental impact of the growing aviation sector.

The project is in collaboration with University of Sheffield, University of Stirling, and Cranfield University, and also involves major industry partners, including Rolls Royce, Air France KLM, BAE Systems, Manchester Airport and Zurich Airport.

Dr Jun Chen, an expert in artificial intelligence and control systems from

the University of Lincoln's School of Engineering and Principal Investigator for TRANSIT, said: "There is an imminent need to make better use of existing aviation infrastructure as air traffic is predicted to increase 1.5 times by 2035. As many airports are operating at or near to maximum capacity, we understand that infrastructure must be improved. In addition, inefficient operations lead to delays, congestion, and increased fuel costs and noise levels inconveniencing all stakeholders, including airports, airlines, passengers and local residents.

"Ensuring efficient movement of aircraft on the ground is a key way to save time, reduce costs and improve carbon emissions, so the critical problem we need to address is the balancing of these conflicting objectives. By modelling aircraft and their movements more accurately, we believe that highly efficient taxi routes can be generated while still maintaining safety standards. TRANSIT aims to develop realistic and cost-effective methodologies in order to build a system capable of making intelligent decisions to meet these multiple objectives."

Dr Michal Weiszer, Research Co-Investigator for TRANSIT and Research Fellow at the University of Lincoln, and Dr Chen, have previously published extensive research into ways of calculating the quickest and most fuel efficient routes for moving aircraft on the ground. In the academic journals *Transportation Research* and *IEEE Transactions on Intelligent Transportation Systems*, they investigated different aspects of a decision support system for taxiing aircraft such as efficient speed instructions and pre-computation of optimal routes.

The TRANSIT project will build on this work and produce a new algorithm to quickly compute the most suitable route for guiding aircraft from one location to another, using data from airports around the world. Once it has been built, the algorithm will then be tested by professional pilots using a cutting-edge simulator at Cranfield University. It is hoped that the TRANSIT system will eventually be adaptable for different

sized airports all over the world, and could even pave the way for automated taxiing.

Dr Weiszer said: "The routing and scheduling of aircraft ground movements is a critical issue for the aviation industry. Although ground movement represents only a small fraction of the overall flight, the inefficient operation of aircraft engines at taxiing speed can account for a significant fuel burn. This applies particularly at larger airports, where ground manoeuvres are more complex. It is estimated that fuel burnt during taxiing alone represents up to 6% of fuel consumption for short-haul flights, resulting in 5m tonnes of fuel burnt per year globally.

"This obviously creates a large financial as well as environmental cost, so we hope to build a robust system that will have a significant impact on these figures."

The TRANSIT research will take into account engine performance, airframe dynamics and uncertainty related to air traffic; all of which are limitations currently ignored when routing and scheduling aircraft.

More information: More information: www.transitproject.co.uk/

Provided by University of Lincoln