Real-time data sharing can make airports greener and more efficient

May 18 2015

Aviation engineering experts have revealed a new framework that could reduce delays, improve efficiency and cut pollution at major international airports.

With increasing air traffic, rising [fuel costs](#) and stricter environmental targets, more efficient airport ground operations are needed for sustainable air transportation.

Dr Michal Weiszer, together with Dr Jun Chen and Dr Giorgio Locatelli at the School of Engineering, University of Lincoln, UK, have proposed a more systematic and holistic approach which would see waiting times reduced for passengers and aid more environmentally friendly operations.

This new model, detailed in the academic journal Applied Energy, combines the scheduling and routing of aircraft, 4-Dimensional Trajectory (4DT) optimisation (the integration of time into the 3D aircraft trajectory), plus runway and airport bus scheduling. It focusses on different objectives, in particular detailed [fuel consumption](#) at different power settings which was not considered in previous studies. It was tested on real-world data at Doha International Airport, which closed in 2014 to make way for the new commercial airport Hamad International Airport.

Lead author Dr Michal Weiszer, Research Fellow at Lincoln's School of Engineering, said: "By 2030, it is forecasted that the number of airline

passengers globally will double to about 6 billion per year. Without action, 12 per cent of flights could not be accommodated because of lack of airport capacity. This, together with the global effort to meet ambitious environmental targets such as ensuring ground operations in Europe are emission-free by 2050, combined with rising fuel costs, is pushing the airlines and airports to reduce fuel consumption and their operational costs as much as possible.

"In this study we tested a new concept, which is the cooperation and sharing of real-time data between airports, aircraft operators, ground workers and air traffic control in order to reduce delays, improve the predictability of events and optimise resources. As the proposed approach is better in terms of performance, economic and environmental criteria, we believe this is a helpful tool to provide information for decision makers at airports."

Previously, problems in sustainable air transportation, such as ground movement of both aircraft and vehicles, runway scheduling and ground services, were treated in isolation since information, such as landing time, pushback time and aircraft ground position, are held by different organisations with sometimes conflicting interests.

As these problems are interconnected, the Lincoln team's creation of a multi-objective algorithm to provide a systematic framework to optimise efficiency, environmental assessment and economic analysis, greatly informs the body of work surrounding sustainable air travel.

The researchers believe the most benefit would be obtained by large and busy airports, where the runway needs to be used as efficiently as possible, with high volume traffic on the airport surface and increased need of ground services. Airports that face strict environmental regulations, therefore placing more focus on fuel consumption, may also find the proposed approach beneficial.

Planning can now be reviewed to further improve airport capacity and decrease excessive waiting times for passengers.

The study paves the way for a number of further research developments which will be investigated by the team in Lincoln. Future research will focus on including emissions into the optimisation framework, improving realism in the planning process and considering changing economic costs depending on busy or quiet periods of the day.

More information: "An integrated optimisation approach to airport ground operations to foster sustainability in the aviation sector." *Applied Energy*. DOI: 10.1016/j.apenergy.2015.04.039

Provided by University of Lincoln