

New scheduling system could help reduce flight delays

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Binghamton University Associate Professor of Systems Science and Industrial Engineering Sang Won Yoon contributed to this research. Credit: Binghamton University, State University of New York

Scheduling and coordinating air traffic can be difficult, but [taking the](#)

[airlines' and passengers' delay costs into account can actually save airlines money and result in fewer delays](#), according to a new study from Binghamton University, State University of New York.

With New York Gov. Andrew Cuomo's recent proposal to transform New York City's John F. Kennedy International Airport, researchers at Binghamton University decided to look into how to make airports more efficient. They did so by incorporating the actual cost of a delayed [passenger](#) into the equation.

Currently, decision support systems (DSS) are used to help direct flights and air traffic in hopes of preventing delays. Most of these systems use parameters such as time or distance to manage and determine the optimal schedule.

Associate Professor of Systems Science and Industrial Engineering Sang Won Yoon, along with Binghamton University Ph.D. student Duaa Serhan and NASA aerospace engineer Hanbong Lee, developed two models that consider the actual cost incurred when passengers and flights are delayed.

Delay [costs](#) can include numerous things such as fuel consumption, maintenance, crew costs, taxiing and additional travel time—all of which are included in the models.

"Airports mainly focus on increasing the runway throughput and, in general, most other papers focus on delay as a time, but they don't consider the actual cost of the delay," said Serhan, a graduate student in industrial and systems engineering who developed the models for the paper.

The researchers explained that there are normally two perspectives used when scheduling aircraft and that these perspectives focus on different

parameters to either maximize or minimize. The first perspective is the airport itself, which is typically owned by the government and regulated by the Federal Aviation Administration (FAA). The second is that of the airlines or the companies operating the actual aircraft.

"From the airport's perspective, the runway throughput is the most important, so they want to quickly send out as many aircraft as possible," said Yoon. "From the airline company's perspective, they just want to minimize the delay." The airport tries to choose a schedule based on which one allows the most aircraft to leave in a given period, while the airlines want to minimize the amount of time the aircraft spends at an airport.

The researchers decided to take into account a third and often-overlooked perspective: the passengers.

Passenger delay costs can take many forms. The delay costs can represent things like missed connections or the cost associated with rebooking or compensation.

"Time is a cost, but airline companies also have to reroute passengers. If they miss the flight, then they have to schedule a new flight or provide a voucher. There are also immeasurable costs, like missing a call with your family, or a business meeting," said Yoon.

It's these immeasurable human costs that can sometimes be hard to quantify and are difficult to include in calculations, but nonetheless are something almost everyone has experienced.

"You can have the passenger missing something important. For example, I almost missed a conference last year. So, you can miss opportunities as well," said Serhan.

In the researchers' models, these inconveniences were captured by their classification of three types of delay costs: passenger delays, passenger missed connections and additional operating costs.

Two models were developed and tested under various [air traffic](#) scenarios and compared against three other commonly used scheduling methods.

One of the models that took the passengers' perspective into account displayed the overall lowest airline and passenger [delay](#) cost, reducing the costs by a minimum of 6.4 percent compared to the other methods. It was also able to reduce the number of flight delays by 8.6-65.4 percent when compared to two of the other reference models, and performed similarly to the third reference [model](#).

As for what comes next, the researchers said they are looking at the effect of weather.

"What we are investigating now is changing air terminal configurations based on the weather uncertainty. We are working on routing and scheduling aircraft when there are uncertain weather conditions, and trying to minimize delays," said Serhan.

The article was published in the *Journal of Air Transport Management*.

More information: Duaa Serhan et al, Minimizing airline and passenger delay cost in airport surface and terminal airspace operations, *Journal of Air Transport Management* (2018). [DOI: 10.1016/j.jairtraman.2018.07.001](https://doi.org/10.1016/j.jairtraman.2018.07.001)

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