

Mathematicians develop a new 'third way' to improve airplane boarding

November 13 2012, by Rob Payne



An airliner lands at sunset

Lead researcher Dr Tie-Qiao Tang said while modelling had previously been done on factors such as luggage congestion, routing, and takeoff runway scheduling, his study was the first to look at boarding.

He said the area could help an industry under constant pressure to increase efficiency.

"Air passenger transportation in China has increased to 200 million in 2010 from less than 10 million in 1950. However, the increase of the supply of [air transportation](#) is much slower than that of its demand. Thus, in practice, certain conflicts between supply and demand often occur, leading to airline congestions, passenger-[luggage](#) congestions and mixed traffic problems," Dr Tang said.

He said researchers created models using pedestrian flow theory that compared three styles of boarding: random boarding; the current boarding system of assigned seating; and the new way that took into account passengers' individual properties, such as maximum speed and luggage.

"Each passenger has their own individual properties. For example, each passenger's luggage has a different attribution and thus has different influences on boarding behaviour; the time that the passenger's ticket is checked at the gate is different; the time that the passenger deals with his or her carried luggage is different; seat conflicts have different effects on the passenger. Each passenger has a different [optimal speed](#), maximum speed and safe distance."

Results showed random boarding was the most inefficient, with queue-jumping, aisle congestions and jams before the gate as well as between the gate desk and plane.

Boarding by assigned seating was better, but still inefficient, as only passengers in the front of the queue could board at their '[maximum speed](#)' and seat conflicts occurred.

However, the new third way – with seat numbers assigned based on the passenger's optimal speed, the attributions of their carried luggage and tickets checked automatically using [electronic equipment](#) at the gate so as to avoid slowdowns in motion – was proven optimal, with no [congestion](#), jams, overtaking, queue jumping, seat conflict or wasted time.

While Dr Tang said no airline had yet agreed to put the theory into practice, he is open to collaborations to make the 'third way' a travel reality.

'An aircraft boarding model accounting for [passengers](#)' individual properties' by Tie-Qiao Tang, Yong-Hong Wu, Hai-Jun Huang and Lou Caccetta was published in *Transport Research Part C*.

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