

The time spent boarding passenger airplanes must be minimized in order to ensure that airplanes can spend the maximum time in the air in order to maximize the associated revenue. Airlines must be aware of which boarding techniques will allow various sizes of planes to be boarded the fastest; the minimization of deboarding time is limited.

We design a simulation which replicates the behavior of passengers boarding airplanes of different sizes according to boarding procedures currently implemented by the airline industry as well as a plan which is not currently in use. Variables in our model are deterministic or stochastic and include walking time, stowage time, and seating time. Boarding delays are measured as the sum of these variables. We physically model and observe common interactions to accurately reflect boarding time.

We run 500 simulations for various combinations of airplane sizes and boarding plans. We analyze the sensitivity of each boarding algorithm, as well as the passenger movement algorithm, for a wide range of plane sizes and configurations. We use the simulation results to compare the effectiveness of the boarding plans. We find that for all plane sizes, the novel boarding plan Roller Coaster is the most efficient. The Roller Coaster algorithm essentially modifies the Outside-In boarding method. The passengers line up before they board the plane and then board the plane by letter group. This allows most interferences to be avoided. It loads the small plane 67% faster than the next best option, the medium plane 37% faster than the next best option, and the large plane 35% faster than the next best option.