Parameter Estimation

Key Parameters: Wait Delay & Baggage Stow Time

- Walking Delay: the average time it takes a passenger to pass a row (unit: milliseconds).
- Luggage Delay: the average time spent by individual passengers to store their luggage in the overhead compartment (unit: milliseconds).
- Middle Seat Delay: the delay time a window passenger should wait at the row until middle/aisle passengers who are already seated within that row get up (unit milliseconds).
- Aisle Seat Delay: the delay time a window or middle passenger should wait at the row until aisle passenger who is already seated within that row gets up (unit milliseconds).

Table 2. Various delay values [22].

Parameter	Time	Unit
Walking delay	2270	ms
Luggage Delay	18,000	ms
Two passengers get out of seats	4200	ms
Middle passenger gets out of seat	3600	ms
Aisle passenger gets out of seat	3000	ms

Jafer, Shafagh & Mi, Wei. (2017)

- Clearing Time: the time range passengers spend on storing their luggage in the overhead compartment or underneath the seat in the front (unit: seconds).
- Getting out of Seat: the time range a passenger takes to get up from their seat, allowing other passengers to sit within that row (unit: seconds).
- Passenger Flow Rate: the range number of passengers that enter the aircraft at a certain amount of time (unit: passenger per second).

Table 1. Basic parameters ranges [22].

Parameter	Range	Unit
Walking Speed	0.27–0.44	[m/s]
Clearing Time	6–30	[s]
Getting out of seat	3–4.2	[s]
Passenger flow rate	0.2–1	[pax/s]

Jafer, Shafagh & Mi, Wei. (2017)

Using these valuable research insights, we set the following rules & assumptions for our models:

System Limitations

- 180 seats divided by single aisle with 3 seats on either sides
- Time taken for 1 iteration = 2.27 seconds
- Each cell can be occupied by a maximum of 1 passenger
- Cabin crew do not interfere with the boarding process

Passengers' Behaviour

- Take 1 iteration to move from one cell to next
- Do not skip cells
- Travel at same speed, regardless of physical ability
- Are unrelated to each other
- Only move forward while in the aisle
- Do not overtake one another
- Enter with a single luggage with 50% probability
- Do not switch seats
- Always go to the correct seat

Wait Delays

- Stow Luggage: 8 iterations
  4 cases
- Case 1: Middle seater blocked by aisle seater, 3 iterations.
- Case 2: Window seater blocked by aisle seater only, 4 iterations.
- Case 3: Window seater blocked by middle seater only, 5 iterations.
- Case 4: Window seater blocked by aisle & middle seater, 6 iterations.

Groups

1. Back-to-front: Back section, Middle section, Front section
2. Outside-In: Window Seats, Middle Seats, Aisle Seats

Back-to-Front & Outside-In Boarding strategies:
Passengers queue up such that there is an interval of 10 iterations (22.7 seconds) between groups. That is, once the last passenger of each group enters the aircraft, the simulation is paused for 10 iterations before the first passenger of the next group enters the aircraft.