Problem Area & Importance

According to a study conducted on airlines in Europe by AirInsight, for every minute a carrier saves on the ground, operating profit margins increase 0.43 per cent. And according to Boeing, since 1970 the speed at which passengers board planes has actually slowed by more than 50 percent - mainly due to increased passenger carry-on luggage, and what a fiddle it is to stow. Delays in airplane turnaround time amounted to an estimated loss of $29 billion in the US in 2007. It is imperative for airlines to reduce this "period of time that the aircraft is on the airport ramp, from blocks on at the aircraft arrival to blocks off at the aircraft departure" to maximise their profits amidst stiff, growing competition in the industry. The table below elucidates the financial impact of boarding times.

Boarding method	**Average board time B[min]**	**Annual Cost**	**Savings**
1. Traditional	1. 30,33	1. $498.170.25	1. -
2. Non-traditional (2 carry-on)	2. 19,78	2. $324.886.5	2. 35%
3. Non-traditional (1 carry-on)	3. 15,18	3. $249.331.5	3. 50%
4. Non-traditional (no carry-on)	4. 8,18	4. $134.356.5	4. 73%
5. 2 Doors Non-traditional (2 carry-on)	5. 14,78	5. $242.761.5	5. 51%
6. 2 Doors Non-traditional (1 carry-on)	6. 10,18	6. $67.206.5	6. 66%
7. 2 Doors Non-traditional (no carry-on)	7. 3,18	7. $52.231.5	7. 90%

* McFadden, 2008

Factors that influence turnaround time include passenger deplaning, baggage/cargo loading/unloading, fueling, airplane maintenance, and passenger boarding. Of all the aforementioned factors, passenger boarding is the most challenging because airlines have the least control over

passengers. Therefore, it would be beneficial to the airlines strategy team if they can be convinced, with the aid of logical and accurate simulation programs, that a certain boarding strategy prevails over the others. Hence, addressing this issue would significantly reduce the unnecessary billion-dollar losses caused by a trivial, avoidable operational inefficiency.

As mentioned in the project description, these are the prevalent boarding techniques: Back-to-Front, Random Strategy & Outside-in. A multitude of publicly available research studies have been conducted on these techniques. However, few of them offer a comparison of the aforementioned strategies with an implementation on an accessible programming language. Moreover, model complexity is correlated to accuracy. Many of the existing methods fail to capture nuances of the boarding system, which can drastically affect model performance. These unidentified gaps, coupled with a passion for simulation modelling, motivated us to tackle the problem.

This problem is not limited to the airline industry. Managers of transportation systems around the world are constantly seeking ways to improve customer experience by reducing costs and waiting times. Our code is structured in a modular fashion such that it may be extrapolated for future implementation on a case-by-case basis. The models may be used to analyse bus, train or even ship boarding strategies by other developers. While our project may not address the complex issue at hand, we're hopeful that it may inspire others to improve upon existing strategies. We also intend for our project to serve as an educational tool for students seeking a practical understanding of simulation analysis.