Summary

When a passenger arrives at an airport by airplane, he will spend a large amount of his time waiting for his baggage. This waiting occurs during the reclaim process, where the baggage arrives at a belt conveyor, from which the passenger can then pick up his bag.

In 2007 a new airplane made its first commercial flight, the airbus A380. This double-deck aircraft can transport 35% more passengers compared to the previous largest passenger aircraft, the Boeing 747. Because of this increase, the reclaim process will take an even longer time to complete. In 2004, A.G. Barros investigated this problem using queuing theory [3]. The result of this research is that a decrease in total throughput time is possible if a dual conveyor system is used. The baggage can be split over the two conveyors, for example using the deck that the passenger travelled on during flight.

The reclaim process consists of a circular conveyor, where one loader places the bags on the conveyor at a fixed location. The passengers are located alongside this conveyor and will pick up their bag from the conveyor when it passes them.

The goal of this research is to verify the results of Barros using discrete simulation, after which the process can be investigated further. Because the simulation model can be more detailed than the analytical model from Barros, a larger understanding of the process can be acquired. Also the influence of the assumptions made by the model from Barros is investigated, like neglecting of the influence of an almost completely filled conveyor. When the conveyor is almost completely filled with bags, the speed at which new bags can be deposited on the belt will decrease.

In the paper of Barros, no accurate results are presented, apart from a number of graphs. To be able to compare the simulation model properly with the analytical model from Barros, the analytical model had to be reproduced. Therefore, the analytical model has been reproduced, using the descriptions in the paper. Unfortunately the documentation is not complete, as some values of variables are missing. Therefore is was not possible to reproduce the analytical model exactly. It was still sufficient to use the results as a starting point for the simulation.

The simulation model models the conveyor as a series of discrete positions. These positions can each contain a maximum of one bag, which will move a single position after a certain time. This time is dependent on the size of the bags, as well as the speed of the conveyor.

To validate the model, experiments are done with simplified parameters, which reduce the difference between the simulation model and the analytical model to a minimum. These experiments show that the two models don't return the exact same results, but the general behaviour of the models do match.

Next experiments are done with realistic parameters. It is shown that the assumptions from Barros have significant influence on the result, resulting in an 18% decrease in conveyor length when comparing it with the realistic parameters.

The experiments with realistic parameters also show that a dual conveyor system does provide a decrease in total throughput time, as well as a shorter total conveyor length.

The most important recommendation in this report is to investigate the influence of multiple loaders on a single conveyor. This was the biggest advantage that the dual conveyor system had compared to

the single conveyor system. Because of the two loaders, the system is able to find a free spot on the conveyor faster than the single loader. A system with multiple loaders on a single conveyor might be able to provide the same benefit, while using only a single conveyor.