

## A Discrete Event Simulation Model For Airport Runway Operations Optimization (Case Study)

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**Abstract :** Runways are the major infrastructure of airports around the world. Efficient operations of runways are key to ensure that airports are running smoothly with minimal delays. There are many factors that affect the efficiency of runway operations, such as the aircraft wake separation, runways system configuration, the fleet mix, and the runways separation distance. This paper aims to address how to maximize runway operations using a Discrete Event Simulation model. A case study of Cairo International Airport (CIA) is developed to maximize the utilizing of three parallel runways using a simulation model. Different scenarios have been designed where every runway could be assigned for arrival, departure, or mixed operations. A benchmarking study was also included to compare the actual to the proposed results to spot the potential improvements. The simulation model shows that there is a significant difference in utilization and delays between the actual and the proposed ones, there are several recommendations that can be provided to airport management, in the short and long term, to increase the efficiency and to reduce the delays. By including the recommendation with different operations scenarios, such as upgrading the airport slot Coordination from Level 1 to Level 2 in the short term. In the long run, discuss the possibilities to increase the International Air Transport association (IATA) slot coordination to Level 3 as more flights are expected to be handled by the airport. Technological advancements such as radar in the approach full airside simulation model could improve the airport performance where the airport is recommended to review the standard operations procedures with the appropriate authorities. Also, the airport can adopt a future operational plan to accommodate the forecasted additional traffic density in case of adding a fourth terminal building to increase the airport capacity.

**Keywords :** airport performance, runway, discrete event simulation, capacity, airside

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