ANALYSIS OF OPTIMAL EXPANSION LEVEL OF A SINGLE RUNWAY AIRPORT

K.D.S.V. Siriwardena[1, *], H.L.K. Perera [1]

[1] Department of Civil Engineering, University of Moratuwa, Moratuwa

Air travel is rapidly increasing all over the world and airport capacities are crucial when serving this growing demand. When it comes to airport capacities, whether it is passenger or freight, runway capacity is the key determining factor among many. At the same time, adding a runway to an existing airport is an expensive process from the design itself to obtaining approvals, construction and completion, compared to any other developments associated with an airport such as passenger areas and other service areas. However, despite the cost and other negative external factors involved, most airport authorities tend to make a bold decision to add another runway to the existing airport without looking at optimising existing and future operations. This seems to be the case for the Bandaranaike International Airport (BIA) which made plans to add a second new runway to accommodate future traffic.

Therefore, the main aim of this research is to identify how to achieve the optimal expansion of a single-runway airport without adding a second runway. This is achieved by identifying critical parameters that affect the runway capacity and analysing ways to obtain the optimal capacity. Hence, the next appropriate solution to accommodate future traffic growth is to optimise current operations rather than physical expansion, due to drawbacks such as high capital costs, long implementation times, community opposition, and so on. After collecting the necessary data, an analysis was carried out to determine the current capacity and the utilisation of the runway in BIA. From the analysis, it was found that during a peak period more than 50% of the runway capacity is idling, meaning that it is been underutilised heavily at present. In other words, BIA can simply double the operations with the existing runway and now the question is whether BIA expects a growth more than this within the next 15-20 years.

Beyond finding out the truly available runaway capacity there are ways to optimise runaway capacities. One such option would be to assist air crafts to evacuate from the runaway in the shortest possible time so that they can conduct the next operations. This was found to be the next largest bottleneck hindering runaway capacity and as a result implementation of high-speed exits have been considered in this study using the REDIM software. In addition, the best departure and arrival sequences were discovered using Python code to utilise the time more efficiently as Runway Occupancy Time (ROT) differs according to the aircraft category. It can be concluded that the existing runway capacity can be further improved by optimising the current operations, as ROT was reduced by 10%.

Keywords: Single runway, Runway capacity, Optimisation, Airport capacity, Runway exits

* Correspondence: sajeesiriwardena@gmail.com

How to analyze optimal expansion level of a single runway?

Background

- Airport capacity increases as demand grows
- Runway capacity is crucial in improving airport capacity
- Main aim ➡ Optimal expansion of a single-runway airport without adding a second runway
- Objectives
  - ➡ Identifying critical parameters that affect the runway capacity
  - ➡ Analyzing ways to obtain the optimal capacity.

K.D.S.V.Siriwardena
Department of Civil Engineering
University of Moratuwa

Methodology

Case study

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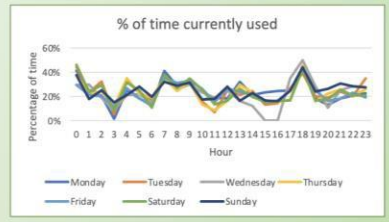
Bandaranaike International Airport (BIA)

Data collection

Period – 24 hours
Platform – 'flightradar24.com' website

Conclusions



BIA runway capacity is underutilized ➡ During peak hours 50% of time can be utilized

Runway exit optimization ➡ Introduction of high speed exits ➡ 10% improvement in Runway Occupancy Time

Aircraft Arrival/Departure optimization ➡ Using Python code an optimal aircraft sequence can be generated for a specific time