EVALUATION OF RAPID EXIT TAXIWAYS LOCATING PROCEDURES

By

Eng. Ossama Saleh Ahmed Bughdady

A Thesis Submitted to the
Faculty of Engineering at Cairo University
In Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
In
Civil Engineering-Public Works

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Title of Thesis: Evaluation of Rapid Exit Taxiways Locating Procedures

Key Words: Rapid Exit Taxiways, RET, Runway occupancy time, ROT, REDIM, Three segments method

Summary:

This research aims to recommend the most suitable method used in locating Rapid Exit Taxiways. A Rapid Exit Taxiway is a taxiway connected to the runway with an acute angle, allowing exiting of aircraft at higher speeds, thus, minimizing runway occupancy time. The available locating procedures are set by ICAO, and FAA. Full description of each locating procedure was done, showing the important parameters controlling each method. Moreover, an analysis was undertaken using a real fleet mix, using the available locating procedures, and the most appropriate method was determined.

ACKNOWLEDGMENTS

I would like to express my gratitude to ALLAH, for giving me the strength, guidance, and patience to go through this research work. I am so thankful he gave me the blessing to increase my knowledge and believe in myself.

I am so grateful to have Prof. Ahmed Atef Gadallah for his support throughout the execution of this research.

I would also like to deeply thank Dr. Omar Osman. He has been my teacher, who provided me with guidance and information in the airport design field. He has been supporting me with technical information and guidance all through this research. He passed his passion with airports to me that made me so interesting in learning more and more about this field.

I would also like to show my gratitude for my mother, for being beside me all the way. She is my first model in this life. She made me believe in myself, and taught me that impossible is nothing, and without her I wouldn't become the man I am.

I am also so thankful to DAR AL-HANDASAH, the place that I consider home, they provided me with everything I needed to get this work done. A special thanks to all my friends and co-workers for giving me guidance and spiritual support through this research.

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NOMENCLATURE

Term	Definition
ATC	Air Traffic Control
EEAA	Egyptian Environmental Affairs Agency
EIMP	Environmental Information And Monitoring Program
FAA	Federal Aviation Administration
ICAO	International Civil Aviation Organization
OTP	Optimum Turn Off Point
OTS	Optimum Turn Off Segment
REDIM	Runway Exit Design Interactive Model
RET	Rapid Exit Taxiway
ROT	Runway Occupancy Time
VT	Virginia Tech Institute
WAROT	Weighted Average Runway Occupancy Time

ABSTRACT

The overall efficiency of the airfield is measured by the individual efficiency of its components. The most critical airfield element is the runway, since no more than one aircraft is allowed to be occupying this element at the same time. Thus, minimizing the time an aircraft would stay on the runway "which is referred to as Runway occupancy time (ROT)" has been always the interest of both designers and airport operators. Many approaches were adopted in locating aircraft exits from the runway with the minimum time possible, such as the three segments method, which was set by ICAO, and a software called REDIM, developed for FAA. The main purpose is to optimize the location of Rapid Exit Taxiways (RET), to facilitate aircrafts exit from the runway at high speed.

The problem, however, is that each approach is based on specific assumptions, leading to different results, which might be confusing and misleading to designers, and no recommendation over the usage of any approach is provided.

Rapid exit location analysis for an operating runway at Cairo International Airport was undertaken. Exits location was determined using ICAO's three segments method and FAA's REDIM software, and other approaches. The results are then compared, to be able to give a judgmental decision over the best approach for application, showing the advantages and disadvantages for each, and suggesting the most appropriate method to be followed and under which condition. The overall conclusion suggests that FAA's REDIM software is the preferable approach for the determination of RETs optimum locations.

CHAPTER 1 : INTRODUCTION

1.1.Airport Efficiency:

The capabilities of any transportation system to process the transported unit are the measures of the system efficiency. The performance of the system is highly dependent on the individual efficiency and the performance of its components.

The airside portion of the airport system consists of the following elements:

- Runways
- Taxiways
- Apron gates

The efficiency of each of those components is very important to increase the overall airport capacity. An integrated design that counts for all the factors that might cause delay, decrease the capacity, and decrease the efficiency is a must.

There are many factors affecting the airfield capacity, and some of them are not as important as the others, the most important factors listed by (AV & Pavlin)[6] are:

- The number, orientation , seperation, and the configuration of the runways system and the taxiways.
- The shape and size and arrangement of stands in the apron gates.
- The size and the mix of aircraftsusing the facilities
- Noise impact which may limit the type and timing of operations in the airport.
- Air Traffic Control regulations.
- Runway Occupancy Time.

The runway is considered the most important element in the airside. It is considered the bottleneck of the entire airport, since no more than one aircraft is allowed at the runway at the same time. A great attention is given to the time that each aircraft will spend utilizing the runway, this time is referred to as runway occupancy time or ROT.