

**UNIVERSITI TEKNOLOGI MARA**

**TECHNICAL REPORT**

**AIRCRAFT BOARDING STRATEGY BASED ON  
MIXED INTEGER LINEAR PROGRAMMING  
APPROACH**

**MUHAMMAD RAHIMI BIN MOHD RASID (2021119055)  
MUHAMMAD NUR IMAN HAIQAL BIN ROSLI (2021340925)  
NUR HAZWANI HUSNA BINTI MOHD HASRIN (2021340793)**

**P6S22**

**Report submitted in partial fulfilment of the requirement for degree of  
Bachelor of Science (Hons.) Mathematics  
College of Computing, Informatic and Media**

**FEBRUARY 2023**

## ACKNOWLEDGEMENTS

In the name of Allah, The Most Beneficent and The Most Merciful.

Alhamdulillah, we are very grateful to Allah S.W.T for giving us His blessings, and strength that has been given to us throughout the completion of this Final Year Project, MSP660 (Aircraft Boarding Strategy Based on Mixed Integer Linear Programming Approach).

We would like to express our deepest gratitude to our dearest Final Year Project supervisor, Dr. Maznah Banu Binti Mohamed Habiboo Raman for the continuous support, patience, motivation, and guidance in overseeing the progress of our project from the beginning until the completion of our project. The time that she has shared with us and her immense knowledge helped us in completing this Final Year Project. We also would like to express our sincere thanks to our coordinator for this subject, Dr. Zahari Bin Md Rodzi for his constant reminder and guidance throughout this semester.

Besides, we would like to thank our friends and everyone who has been contributed to completing this project. We also want to take this opportunity to thanks each other for never giving up and always trying our best until the end. Last but not least, special thanks and appreciation to our parents for their cooperation, encouragement, and support during the completion of this Final Year Project from the beginning until the end.

## TABLE OF CONTENTS

<b>ABSTRACT .....</b>	<b>1</b>
<b>CHAPTER 1: INTRODUCTION.....</b>	<b>2</b>
1.1 Introduction.....	2
1.2 Research Background .....	2
1.3 Problem Statement.....	3
1.4 Research Objectives.....	3
1.5 Scope of the Research.....	3
1.6 Significance of the Research.....	4
1.7 Conclusion .....	4
<b>CHAPTER 2: LITERATURE REVIEW .....</b>	<b>5</b>
2.1 Introduction.....	5
2.2 Linear Programming.....	5
2.3 Mixed Integer Linear Programming .....	6
2.4 Application of Linear Programming.....	6
2.5 Application of Mixed Integer Linear Programming.....	7
2.6 Boarding Interferences.....	8
2.7 Linear Programming on Boarding Interferences .....	9
<b>CHAPTER 3: RESEARCH METHODOLOGY.....</b>	<b>10</b>
3.1 Introduction.....	10
3.2 Research Analysis.....	11

3.3 Research Design.....	12
3.4 Seat Interferences.....	14
<b>CHAPTER 4: RESULTS AND DISCUSSION .....</b>	<b>21</b>
<b>CHAPTER 5: RECOMMENDATION AND CONCLUSION.....</b>	<b>26</b>
Recommendation .....	26
Conclusion .....	26
<b>REFERENCES.....</b>	<b>27</b>
<b>APPENDIX .....</b>	<b>30</b>

#### **LIST OF FIGURES**

FIGURE 1: FLOWCHART OF METHODOLOGY .....	10
FIGURE 2 SEAT ARRANGEMENT OF BOEING 737-800-(738).....	11

#### **LIST OF TABLES**

TABLE 1 EXAMINING AISLE AND MIDDLE INTERFERENCES. ....	15
TABLE 2 SOLUTION FOR BOARDING PATTERNS OF 4 GROUPS.....	21
TABLE 3 SOLUTION OF SEAT AND TOTAL INTERFERENCES FOR 4 GROUPS. ....	22
TABLE 4 SOLUTION FOR BOARDING PATTERNS OF 5 GROUPS.....	22
TABLE 5 SOLUTION OF SEAT AND TOTAL INTERFERENCES FOR 5 GROUPS. ....	23
TABLE 6 SOLUTION FOR BOARDING PATTERN OF 6 GROUPS.....	24
TABLE 7 SOLUTION OF SEAT AND TOTAL INTERFERENCES FOR 6 GROUPS. ....	24

## ABSTRACT

There is a lot of competition in the airline industry, which is trying to improve efficiency and customer satisfaction for passengers while also making more money and improving its own systems. One way to reach these goals is through the boarding process, which adapts to changes. Commercial airlines try to cut down on boarding time, which is one of the longest parts of a plane's turn time, so that the plane can fly for longer. In order to cut down on boarding time, it is important to make sure that passengers don't bump into each other too much. This can be done with a boarding policy that controls the order in which people get on the plane. Here, the passenger boarding problem and the different ways people board a single-aisle plane and how that can cause problems has been figured out. Mixed integer linear programming was used to cut down on the time it takes for passengers to board is being offered. In this study, the way people get in each other's way and slow down boarding times on a single-aisle plane is being observed. It gives a new mixed-integer linear programme to reduce these conflicts as much as possible. Then, some mathematical models are being used to look at a short-haul Boeing 737-800 (738). The results suggest that the window-to-aisle boarding pattern with 4 groups of passengers should be used because it has the lowest total seat interferences and objective function value.