

UNIVERSITI TEKNOLOGI MARA

THESIS TITLE

**DESIGN AND DEVELOPMENT OF
MINI WIND TUNNEL FOR
REPLICATE AIRPLANE**

ALISA SYAFIQA BINTI JASMI

Dissertation submitted in partial fulfillment
of the requirements for the degree of
Diploma
(Mechanical Engineering)

College of Engineering

March 2022

ABSTRACT

Wind tunnel is a tool used in aerodynamic research to study the effects of wind moving over the solid object. Present study, low velocity wind tunnel was designed and fabricated to reduce the drag and lift forces. A typical open circuit wind tunnel consists of motor and fan unit, settling chamber, contraction cone, test section and diffuser. The main work of the wind tunnel is to improve the design according to the aerodynamic shapes. Inside test section the wind velocity was measured about 36 m/s and pressure 36 bar. A replicate airplane model was placed parallel to the wind flow direction, velocity and pressure was measured. This mini wind tunnel is made for experiment purpose as we will see and learn how the flow of air through airplane. But this project, we will use mist/fog instead of air and also replicate airplane will be used. The objective is to understand the important aspect of designing and fabricate mini wind tunnel and designing and fabricating a mini wind tunnel for airplane model. For the scope of study is to develop mini wind tunnel to represent real size wind tunnel condition and to design, fabricate and evaluate wind tunnel performance. Also, for the outcome, we will see how the air flows through an airplane but for this study, we use mist instead of smoke and a replicate airplane.

ACKNOWLEDGEMENT

Firstly, I wish to thank God for giving me the opportunity to embark on my diploma and for completing this long and challenging journey successfully. My gratitude and thanks go to my supervisor, Dr Ab Aziz Bin Mohd Yusof for helping and guide me during this project

Finally, this dissertation is dedicated to my father, Jasmi bin Mohd Tahir and mother, Nah binti Ahmad for the vision and determination to educate me. This piece of victory is dedicated to both of you. Alhamdulillah.

TABLE OF CONTENTS

	Page
CONFIRMATION BY SUPERVISOR	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF ABBREVIATION	x
CHAPTER ONE : INTRODUCTION	1
1.1 Background of Study	Error!
Bookmark not defined.	
1.2 Problem Statement	1
1.3 Objectives	1
1.4 Scope of Work	2
1.5 Significance of Study	2
CHAPTER TWO : LITERATURE REVIEW	3
2.0 Introduction	3
2.1 Information on existing products, patents, standards	3
2.1.1 Open Circuit Wind Tunnel	3
2.1.2 Closed Circuit Wind Tunnel	5
2.2 Product Design Specification	6
2.3 List of Components Used	8
CHAPTER THREE : METHODOLOGY	12
3.1 Introduction	12
3.2 Prototype drawing and bill of material, BOM	12
3.3 Calculation and computational analysis	14

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Not many people know about Wind Tunnel, what is wind tunnel, what is the function of wind tunnel. By this project, we will see how the researcher do an experiment to an airplane by seeing the flow of air. But, for this project, we will used smoke instead so we can see clearly how the flow of air through the replicate airplane.

The fabrication activities in conjunction with design verification have been conducted to fabricate the tunnel by referring to sketch drawings. Fabrication activities included the main components of the tunnel such as the nozzle, settling chamber, test section, diffuser, fan base and tunnel base. Fabrication stages have been done after all the design stages have been completed. [5]

Method of flow visualization that has been identified for the tunnel is by using smoke wire system. A cooling fan will be used to flow the smoke

1.2 Problem Statement

Wind Tunnel are large tubes with air blowing through them which are used to replicate the interaction between air and an object flying through the air or moving along the ground. The wind tunnel moves air around an object, making it seem like the object is really flying. Thought out the study, student will understand the important aspect of designing and fabricate mini wind tunnel. A testing will be carried out to test the mini tunnel using airplane model. Better understanding in the aspect of design, fabricate, and simple analysis will be obtained at the end of the study

1.3 Objectives

This project is conduct to:

- a) Understand the important aspect of designing and fabricate mini wind tunnel.
- b) Designing and fabricating a mini wind tunnel for airplane model.