UNIVERSITI TEKNOLOGI MARA

DESIGN AND FABRICATION OF SMALL-SCALE WIND TUNNEL FOR AERODYNAMIC ANALYSIS

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ABSTRACT

This project entails the construction of a wind tunnel designed to facilitate the understanding and visualization of aerodynamic properties by observing airflow patterns. The primary objective is to create a practical educational tool for schools and universities, fostering interest and a deeper comprehension of aerodynamics among students and educators. The wind tunnel is engineered with portability and flexibility in mind, ensuring it can be easily used, stored, and set up in various educational settings. This dissertation provides a comprehensive overview of the project's background, evaluates it against existing products, and details the fabrication process. By doing so, it highlights the significance of this wind tunnel as an accessible and effective means of teaching aerodynamic principles.

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CHAPTER ONE
INTRODUCTION

1.1 Background of Study

A wind tunnel is a tube-shaped facility where engineers simulate airflow over an object, such as a vehicle or aircraft, to study its aerodynamic behaviour. This controlled environment helps researchers understand how air interacts with the object, providing valuable insights for design and optimization such as forces, lift, drag, and movement of fluids, which are essential for optimizing the performance and efficiency of various objects and structures. These wind tunnels come in various sizes and configurations, ranging from small-scale educational models to large, industrial grade facilities used for testing full-scale aircraft and vehicles.

Despite Malaysia aerospace industry experiencing rapid growth and engaged in various critical activities, including maintenance, repair, manufacturing and education. The industry only maintained and average growth rate of 5% over the past decade. This is mainly because exposure to aerodynamics are not easily accessible. Compared to more established aerospace hubs, the number of dedicated aerodynamic facilities remains relatively limited. [3]

Nowadays, there are lots of efforts to attract more people into discussing about aerodynamics. There have been many discussions about cutting-edge developments in aerodynamics, such as advances in aircraft design, Formula 1, or renewable energy technologies like wind turbines. Highlighting how aerodynamics contributes to progress and innovation can spark interest.

However, the topics mentioned were mostly catered towards enthusiast and people who were an expert in said fields. Therefore, we need more tools and representations that will be easier for the average person to understand. Besides that, introduction to the small-scale wind turbine at a younger age could promote students' interest in STEM education. A small-scale wind tunnel works best for this situation because a wind tunnel can provide a lot of information and explanation just from visual data alone.