

UNIVERSITI TEKNOLOGI MARA

**DEVELOPMENT OF A PROTOTYPE
OF SPOILERS ON A FORMULA
STUDENT RACE CAR**

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ABSTRACT

This study focuses on the aerodynamic analysis and design optimization of a spoiler and mounting bracket for a Formula Student race car. The problem is the need to improve the car's performance through the addition of spoilers and mounting brackets to support the spoiler. The objective of the project is to design and fabricate a spoiler and mounting brackets. Computational Fluid Dynamics (CFD) simulations testing is employed as methodologies to analyze the airflow, visualize flow patterns, calculate drag and lift forces, and validate the proposed design modifications. The expected result of the project is designing a functional spoiler and mounting brackets that address the budget and manufacturing limitations. A measurable improvement is expected despite the design's simplicity. The outcomes of this project will contribute to the development of better-performing Formula Student race cars, providing valuable insights for future designs and competitions.

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CHAPTER ONE

INTRODUCTION

1.1 Background of Study

The Formula Motorsports Education Competition (FMEC) is a recurring event conducted by the Engineering Department of the Faculty of Technical and Vocational at UPSI on an annual basis. This competition provides a platform for student teams to engage in fierce competition with the objective of emerging as winners. To achieve victory, each team must demonstrate exceptional performance, particularly in terms of car performance. This entails implementing various performance enhancements, such as advanced design developments, to optimize aerodynamics performance. The primary objective of this project is to design and fabricate a spoiler system for a Formula Student Race Car.

A spoiler is an aerodynamic device typically mounted on a vehicle, such as a car, to enhance its performance and stability. It works by disrupting the airflow around the vehicle, creating downforce to improve traction and grip on the road. This added downforce results in better handling, reduced lift at high speeds, and improved stability, particularly during cornering. Spoilers are often used in racing cars and high-performance vehicles to optimize aerodynamics and achieve higher speeds and superior maneuverability. Their design and placement are crucial for maximizing their effectiveness and minimizing drag while enhancing a vehicle's overall performance.

A spoiler is essential in a Formula Student race car for several reasons. By disrupting and controlling airflow, spoilers generate downforce, improving tire traction and stability during high-speed cornering. This ensures the car can maintain optimal contact with the track, reducing the risk of skidding or losing control. Additionally, spoilers can be crucial in managing air resistance and drag, helping the car move efficiently through the air, which is vital for achieving top speeds. Ultimately, a well-designed spoiler is integral to the success of a Formula Student race car, both in terms of performance and safety.