ZURICH UAS RACING

Development of Rear wing of a Formula student Car

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Formula Student (FS)

The internationally highly regarded engineering competition Formula Student (FS) challenges teams of students to design and build a formula racing car and compete against other universities in various disciplines. The various competitions offer an exceptional opportunity for students to apply their academic knowledge in a practical setting.

Introduction Bachelor-Thesis

Aerodynamics is a decisive factor for the performance of a Formula Student vehicle, directly influencing handling, efficiency, and lap time. Among all aerodynamic components, the rear wing plays a central role in generating downforce, balancing the aerodynamic load distribution, and ensuring vehicle stability at high speeds.

For the upcoming 2027 season, a new ruleset will introduce design changes and additional constraints that affect the aerodynamic package. To meet these requirements, this Bachelor Thesis focuses on the design, simulation, and validation of a new rear wing that complies with the updated regulations while improving aerodynamic performance.

The project will combine CFD and FEM analyses to ensure an optimal balance between aerodynamic efficiency, structural rigidity, and adjustability, contributing directly to the development of the team's next-generation Formula Student car.

Goal

The goal of this project is to develop, simulate, and validate a rear wing concept that fulfils the new Formula Student 2027 rule-draft and integrates seamlessly into the vehicle's overall aerodynamic concept.

The design should achieve increased downforce, maintain structural rigidity and adjustability, and demonstrate efficient interaction with other aerodynamic components such as the front wing, undertray, and sidepods.

The results of this thesis will form an essential part of the aerodynamic development process for the upcoming car, providing validated data and design solutions for the complete aero package.

Objectives:

- **Regulation Review:** Analyse the 2027 Formula Student rule-draft to define design boundaries and key constraints for rear wing development.
- **Concept Development:** Generate and evaluate several wing concepts with respect to aerodynamic performance, manufacturability, and integration into the vehicle.
- **CFD Simulation:** Perform computational fluid dynamics analyses to assess downforce, drag, and flow interaction with other aerodynamic components.
- **Structural Analysis:** Use FEM simulations to evaluate the stiffness, strength, and deflection behaviour of the rear wing under aerodynamic loading.
- **Design Optimization**: Optimize geometry and mounting for maximum aerodynamic efficiency and structural rigidity.
- **Collaboration:** Work closely with the aerodynamics team to ensure proper interaction between the rear wing and the complete aerodynamic system.

- **Documentation:** Summarize all findings, methods, and results, and provide recommendations for manufacturing and implementation on the new car.

If you are interested in this project thesis, we kindly ask you to get in touch with us:
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