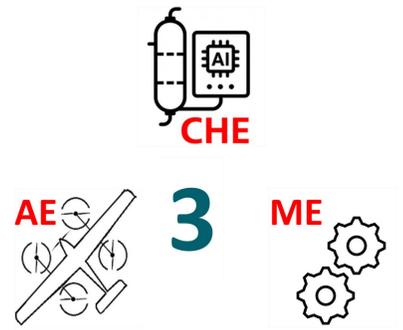# Hydrogen-Powered Sports Car (HydraGen)

CHE

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Background

The transportation industry is increasingly turning to environmentally friendly solutions to reduce carbon emissions. Hydrogen-powered vehicles offer a promising alternative due to their fast refueling, high energy efficiency, and zero emissions. This project explores the core engineering principles and computational techniques involved in designing a high-performance sports car powered by hydrogen fuel.

Problem Statement

Hydrogen fuel cell vehicles currently face limitations for use in high-performance sports and racing applications, primarily due to slow acceleration and limited top speed. Our project aims to overcome these challenges by integrating a supercapacitor system, aerodynamic optimization, lightweight materials, and advanced hydrogen propulsion technology.

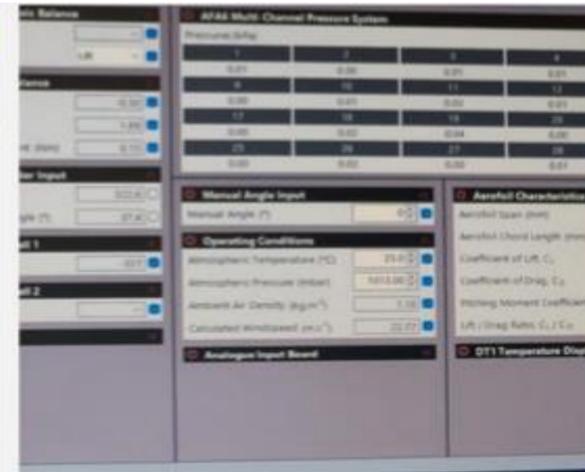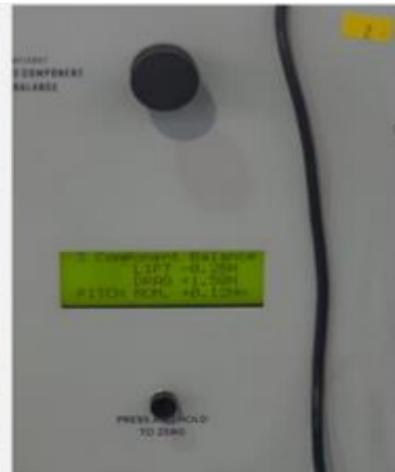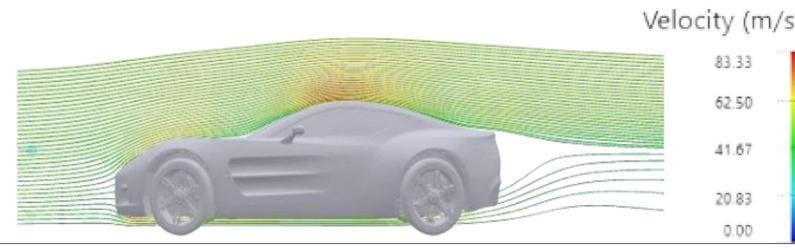## Prototype Design

3D Printed Body

Hydrogen Cylinder

Hydrogen Fuel Cell

Testing

Wind Tunnel Testing

Computational Fluid Dynamics

Velocity (m/s)
83.33
62.50
41.67
20.83
0.00
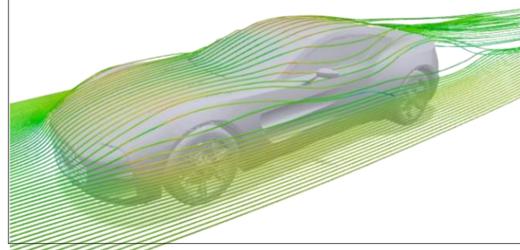
Constraints and Specifications

Constraints:
- High-Efficiency Fuel Cell
- Compact Design
- Environmental Impact

Specifications:
- Electric motor with 150-200kw and 8000-10000rpm
- Fuel efficiency of at least 60%.
- Hydrogen tanks must support 35 bar pressure
- Top Speed of 250+ km/h with the integration of the supercapacitor
- 0-100 km/h Acceleration in < 6 seconds
- Range of 600 km per refuel.
- Refueling Time: < 5 minutes
- Lift coefficient (CI): **-0.2 to -0.3**
- Drag coefficient (Cd): **0.2 to 0.4**

Conclusions

The prototype demonstrates that hydrogen-powered sports vehicles can achieve high performance while maintaining environmental sustainability. Through aerodynamic optimization, advanced materials, and hybrid propulsion systems, our design shows strong potential for real-world application.