College of Engineering
LAMAR UNIVERSITY

TotalEnergies GULFCON CMCo

HOVER LOVERS

Introduction

Background:
The goal of this project is to design and build a lightweight, electric-powered hovercraft capable of carrying a 200 lb load. It uses electric blowers/fans for both lift and thrust to travel over flat or uneven surfaces. The design integrates principles from fluid dynamics, mechanical systems, and electrical engineering. Testing focused on airflow efficiency and power consumption to ensure stable lift and control.

Objective:
To construct a lightweight hovercraft that demonstrates efficient lift and thrust performance for short-distance transport. The project aims to showcase the feasibility of small-scale hovercrafts in real-world scenarios such as an emergency access during flooding.

Constraints:
1. Mass of Craft < 125 lbs.
2. Speed of Vehicle = 15 mph
3. Runtime = 10 min.
4. Hover ≥ 0.1 inches

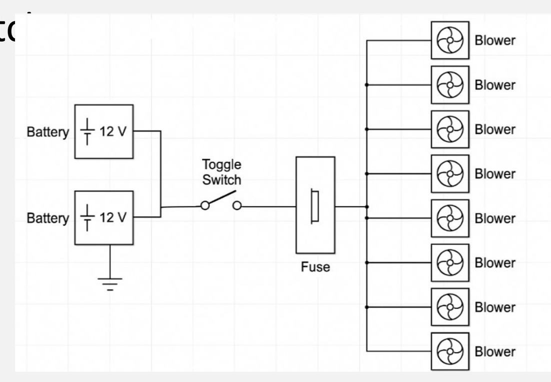
Electrical System

Standards:
- IEEE Battery Standards
- IEEE 6 Stage Project Standards
- SAE International Technical Standards

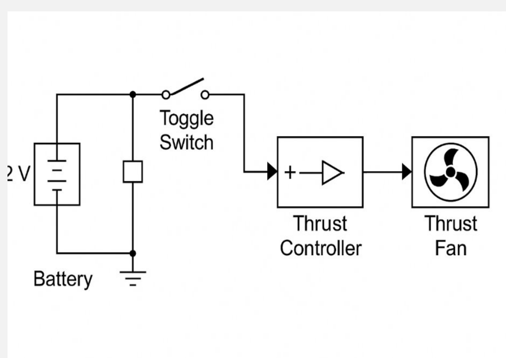
Technical Achievements:
- Designed circuits to accomplish safety, control and Reliability.

Design:
- 80 Amp Fuse protected circuits.
- 2x12 Volt 12 Ah LifePO4 Lithium batteries in series to provide 24 total Volts to all 10 Lift blowers.
- Marine Battery On/Off Switch for easy start-up & cut off, accessible to the driver.

Safety:
- Insulated wires to protect from heat and friction
- Fuse protected circuits
- Kill switc



LIFT CIRCUIT



THRUST CIRCUIT

Analysis 2 – CFD Calculations

Required Lift Force

Step 1: Calculate Required Lift Force

Since the hovercraft must balance its own weight, the lift force required is:

$F_{liftmax} = 300$ lb

Step 2: Required Pressure to Support the Hovercraft

Using the equation:

$P_{max\ req.} = F_{liftmax} / A_{hover}$

$A_{hover} = 4 \times 3 = 12$ ft²

$P_{max\ req.} = 300 / 12 = 25$ lb/ft² =1197 Pa

$$P_{max\ req.} = 1197\ Pa$$

Required Airflow for Lift

Step 1: Air Velocity Through Hover Gap and Holes

Using Bernoulli's equation:

$V = \sqrt{\frac{2P}{\rho}}$

$V = \sqrt{\frac{2(1197)}{1.225}} = 44.2$ m/s ≈145.04 ft/s

Step 2: Total Escape Area Calculation

$A_{total} = A_{gap} +$

= 14 × 0.0083 = 0.1162 ft²

$A_{holes} = 84 \times \pi\ (0.042/2)^2 = 0.1164$ ft²

$A_{total} = 0.1162 + 0.1164 = 0.2326$ ft²

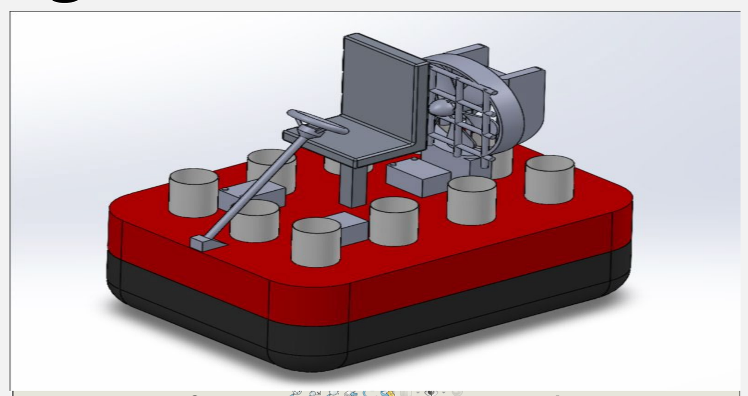
Step 3: Required Airflow for Lift

$Q = A_{hover} \times V = 0.2326 \times 145.04 = 33.7$ ft³/s ≈ 2022 *CFM*

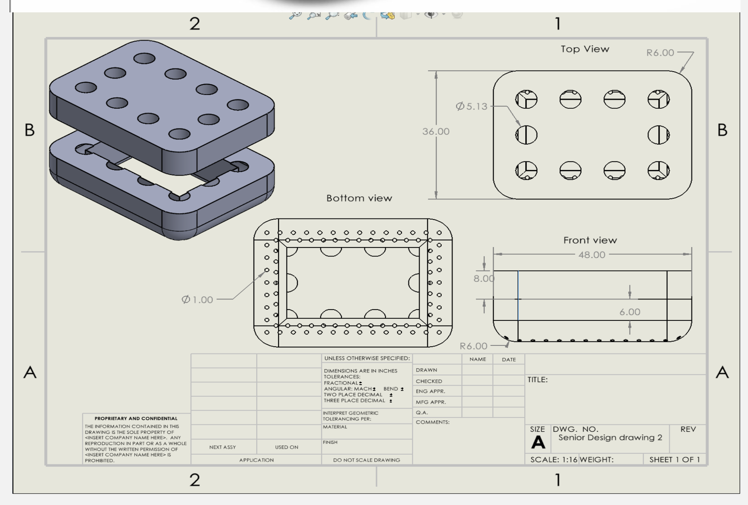
$$Q = 2022\ CFM$$

Mechanical Design Parameters

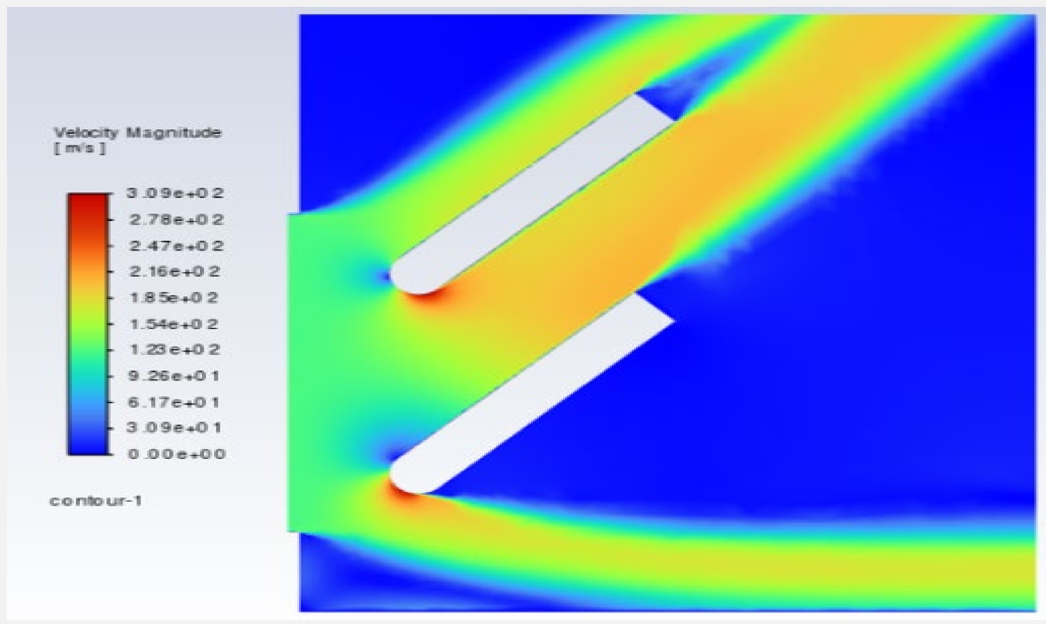
Hovercraft Designed Via SolidWorks:
- Length= 4'
- Width= 3'
- Height= 4'
- Rounded edges



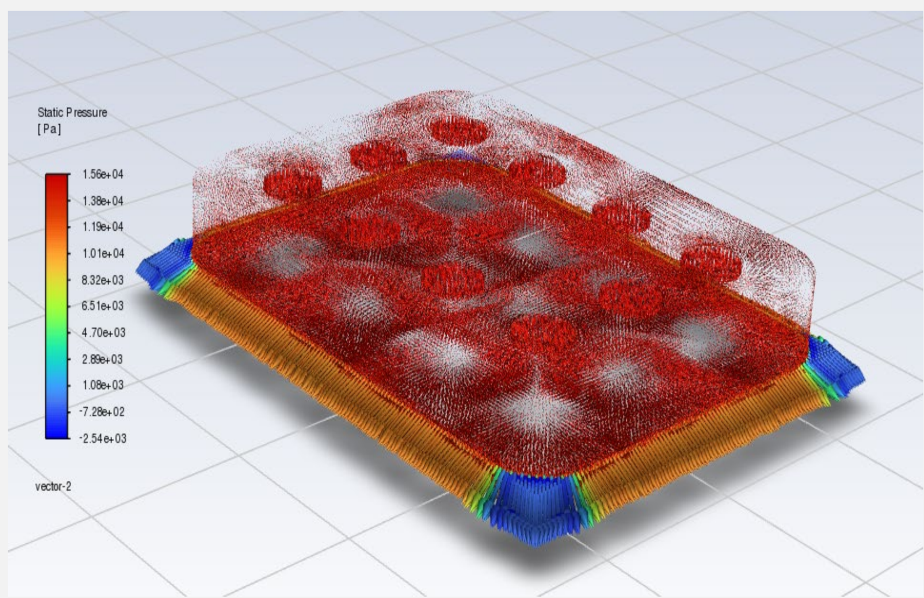
Skirt/Base Parameters:
- 10 holes for blower air flow
- Airflow evenly spilt 50/50 into hull and skirt
- 84 holes in skirt for better weight distribution
- Rounded skirt for better air flow

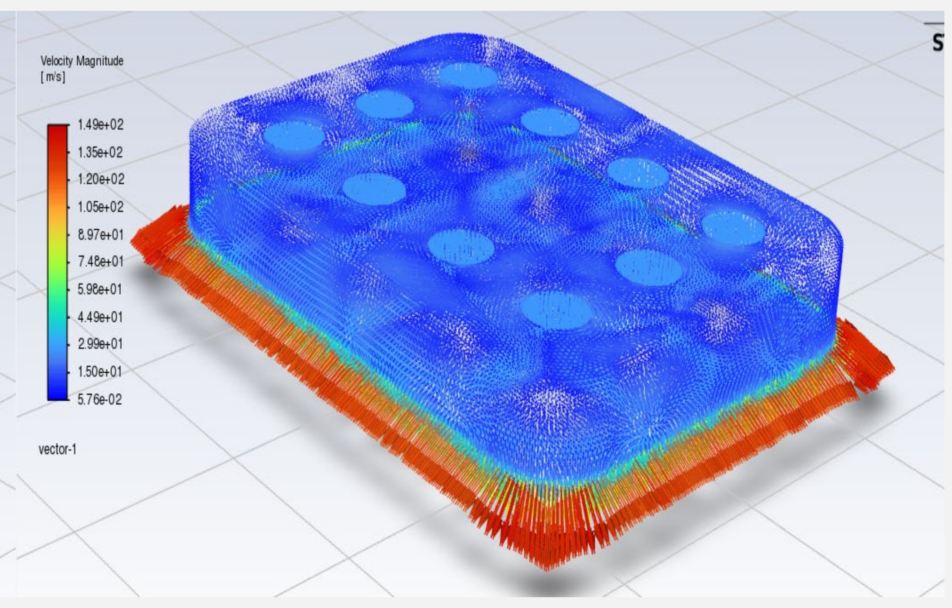


Analysis 1 – Lift & Flow



Velocity Magnitude of Rudders


Static Pressure Distribution


Velocity Magnitude through the Craft

Final Product

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