Engineering Demonstration

UVU MECHANICAL ENGINEERING
UTAH VALLEY UNIVERSITY

Kayden Knight, Jose Lugo, Jake Peterson, Cade Smith, Spencer Webber, Tim Wright Coach : Travis Moore

Sponsor: Smith College of Engineering and Technology

Problem Statement

Engineering students often learn fluid mechanics through theory but lack hands on tools to visualize real flow behavior. This makes concepts such as laminar flow, turbulence, and airfoil performance difficult to fully understand.

To address this, our team designed and built a hydro tunnel so that students can observe and interact with fluid flow.

Objective

- Design and build a hydro tunnel for educational demonstrations
- Visualize flow behavior around an airfoil
- Develop an adjustable airfoil control system
- Ensure safe, durable, and low maintenance operation
- Target Reynolds number $3\times 10^5 \sim 8 \times 10^5$

Analysis

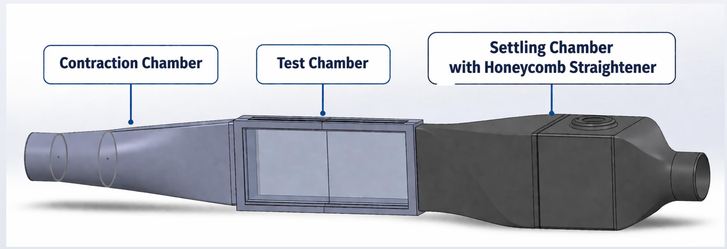
To ensure a realistic flow behavior, the Reynolds number was used:

$$Re = \frac{\rho V L}{\mu}$$

- Determines if flow is laminar or turbulent
- Range selected to represent low speed aerodynamic testing conditions
- Flow velocity selected to achieve desired Reynolds number range

Subsystems

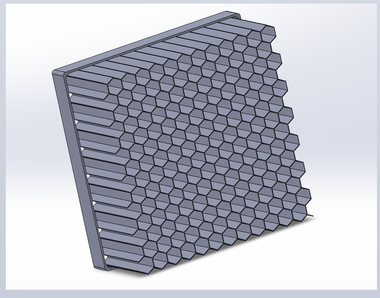
Hydro Tunnel System:



Pump System:

Two pumps were connected in parallel to achieve the desired flow rate



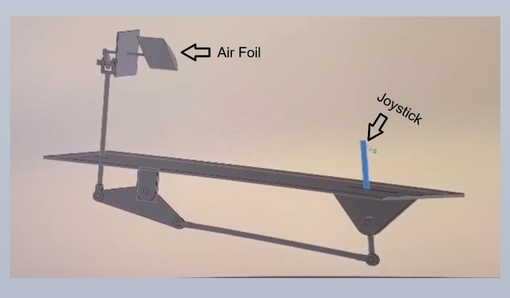


Flow Conditioning:

To reduce turbulent flow conditions a honeycomb straightener was used

Airfoil Controller:

Uses a joystick and push rods to change the airfoils angle of attack



Results

- Successfully demonstrated flow separation of an airfoil
- Shows uniform, straightened flow of the fluid in the test chambers
- Clear streamline visualization
- Interactive airfoil with controllable angle of attack
- Demonstrates approximate air flow characteristics in flight with Reynolds number of 5×10^5 and a flow rate of 6.5 ft/s



Final Build



RESEARCH POSTER PRESENTATION DESIGN © 2015
www.PosterPresentations.com