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(POSTER) Design and Construction of a Transportable Swimming Pool Flume to Aid in the Development UIndy Swimmers

Jared Hilt
hiltj@uindy.edu

Cara Brown
brown@uindy.edu

Dillon Hines
hinesd@uindy.edu

Joseph Herzog
herzogjb@uindy.edu

Najmus Saqib
saqibn@uindy.edu

See next page for additional authors

Presenter Information
Jared Hilt, Cara Brown, Dillon Hines, Joseph Herzog, Najmus Saqib, and Renny Fernandez

Design and Construction of a Transportable Swimming Pool Flume to Aid in the Development of UIndy Swimmers

Jared Hilt, Dillon Hines, Cara Brown, Najmus Saqib, Renny Fernandez, Rashedul Sarker, Suranga Dharmarathne and Joseph Herzog

R.B. Annis School of Engineering; University of Indianapolis, Indianapolis, IN

Introduction and Overview

A transportable swimming flume to improve the speed, endurance, and stroke techniques of swimmers is being developed. To guide our design processes, we used the implementation of the Design for Six Sigma (DFSS) methodology. The "endless pool" will create a non-turbulent swim current that allows stationary swimming. It will be a high-volume propellor system which has a variable speed to help all ranges of swimmers. After researching existing devices, we created CAD designs that were used in computational fluid dynamics simulations to optimize performance parameters like backflow, turbulence, and device dimensions.

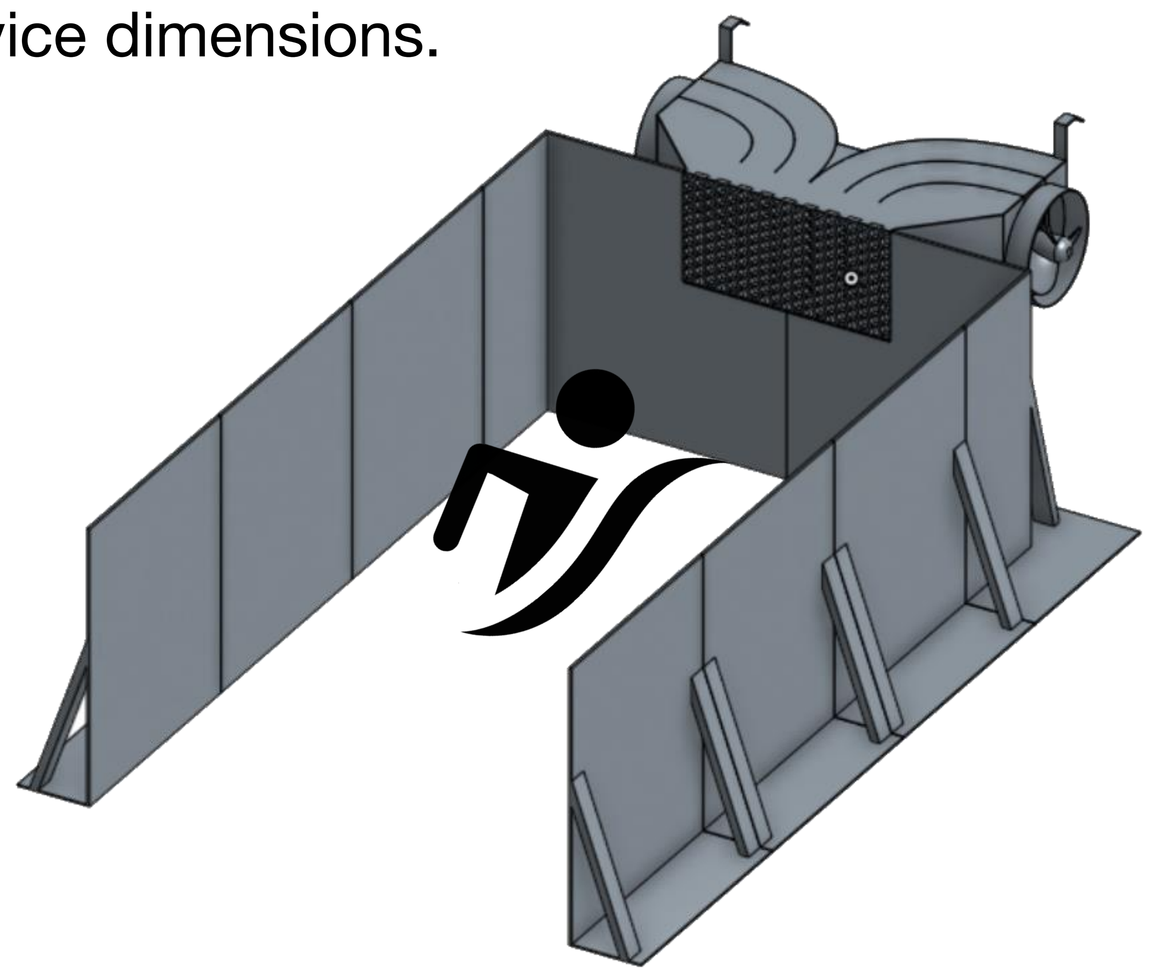

Fig. 1. Member of the Uindy Swimming & Diving Team

Fabricated system

The current fabricated system is a small scale prototype, which is being used to optimize and improve the design. Since the model is small scale, we are unable to directly compare results with what would happen to the full scale model, but we can observe and solve problems that we do encounter. The team can then anticipate problems we may encounter with the full scale model.

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Testing

When testing the designs, a pitot tube was used to measure the water's velocity exiting the casing. For tests I and II, the motors have eight speed settings, each moving water at different velocities.

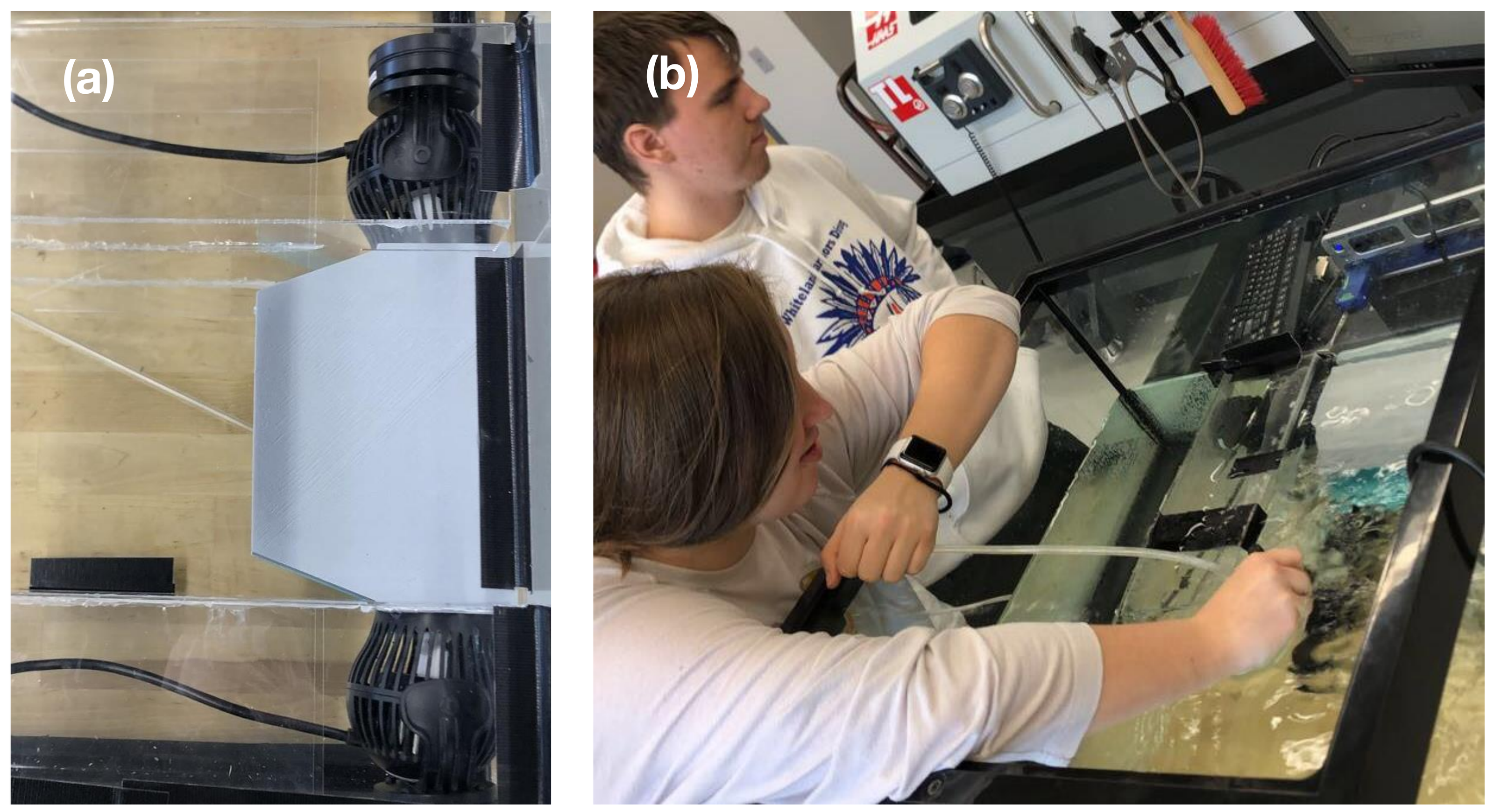

Fig. 2. (a) A top down view of the casing and false wall set up for test I. (b) Cara, bottom left, and Jared, top left, gathering velocity data for casing I.

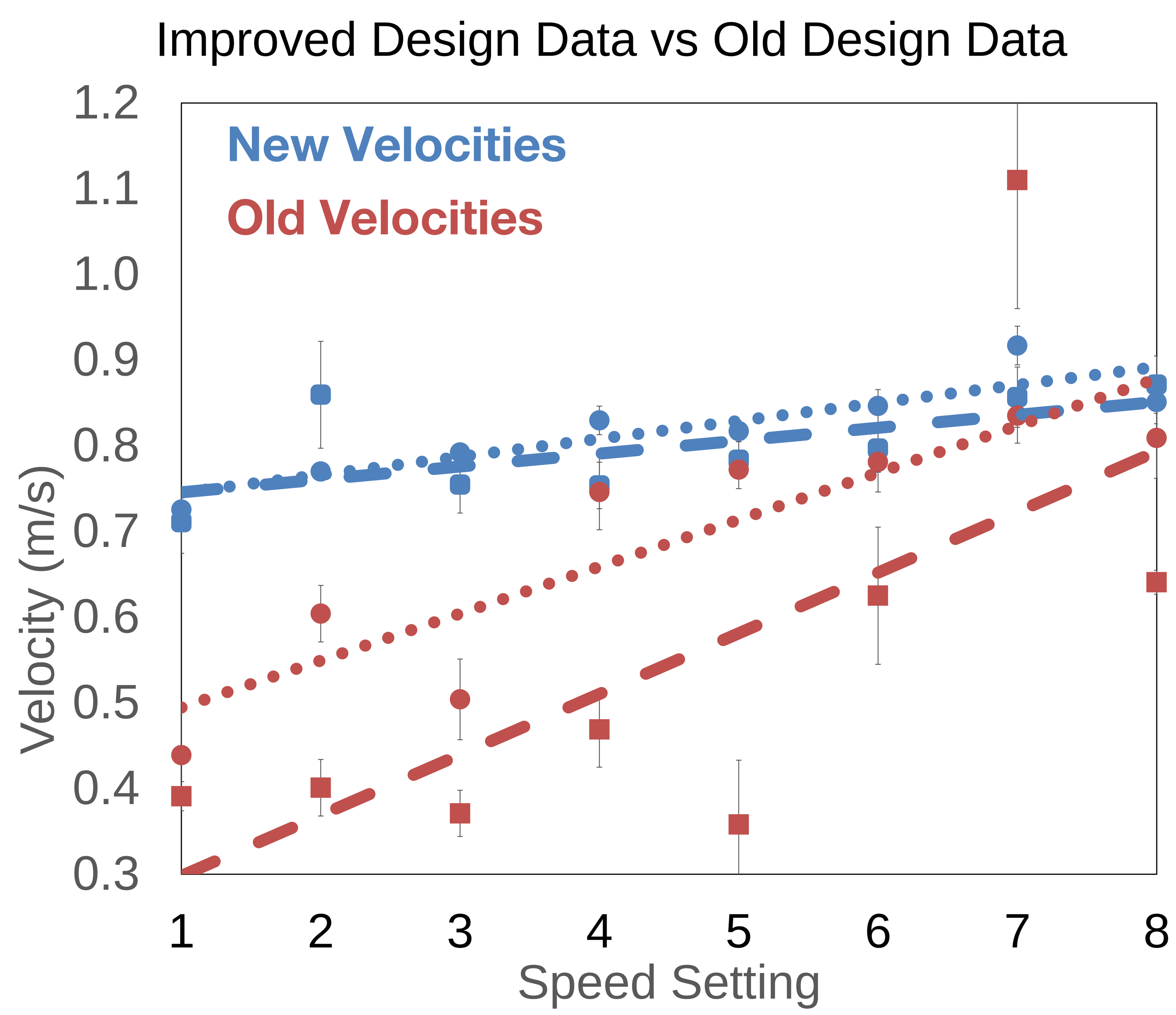

Fig. 3. The orange data points show the results for test I. The blue data points show the results for test II. Squares show the velocities from the middle of the output, Circles show the velocities from the side

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Optimization of Design

The first design, Figure (a), used only turning vanes, and created turbulent and irregular flow. To improve the design, flow straighteners were added, Figure (b). It was then found that the weight of the design far surpassed original design specifications. In order to reduce weight, the positions of the hydraulic motors was changed, and the now unneeded portion of the design removed.

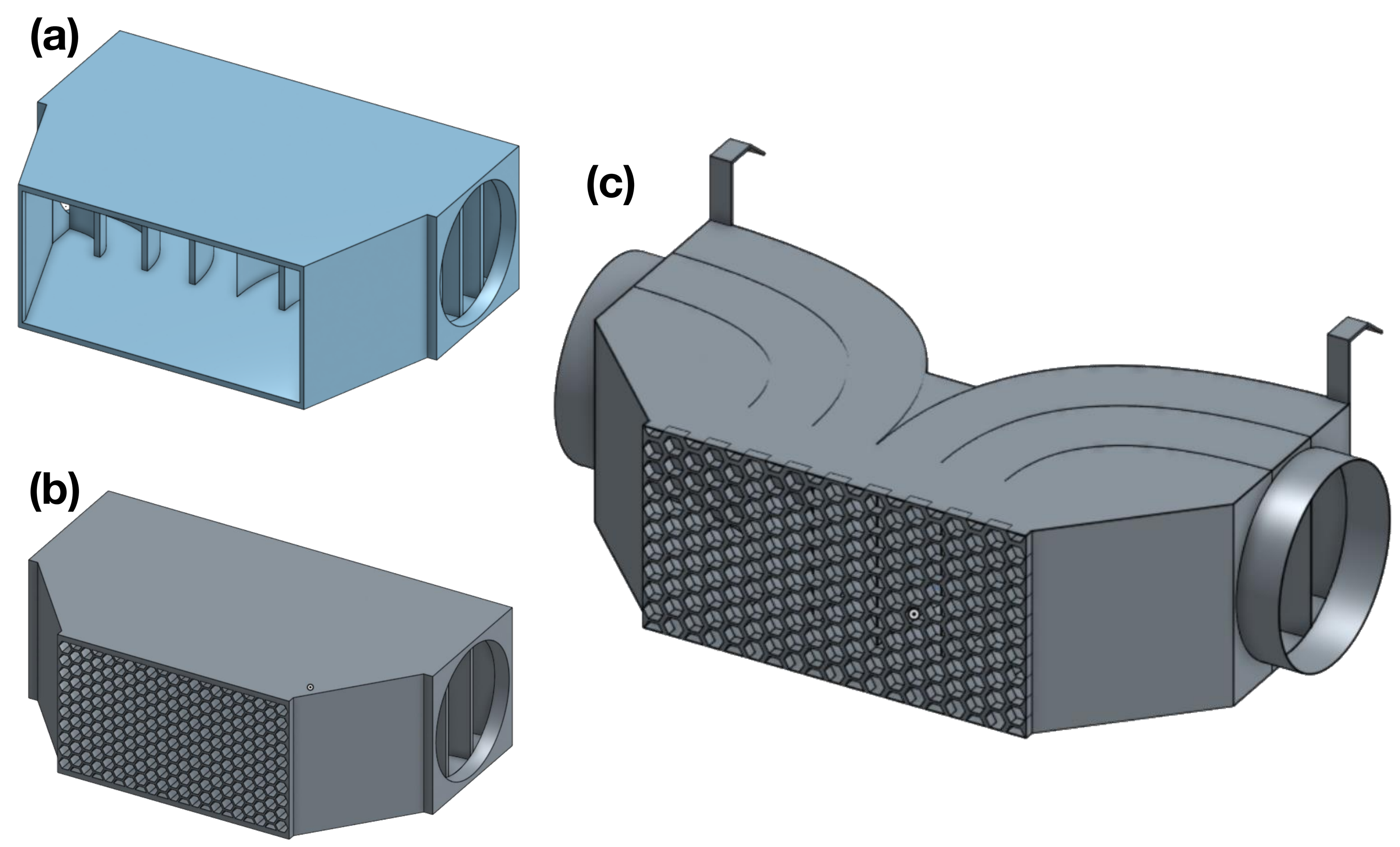

Fig. 4. (a) shows the design of casing I. (b) Shows the design of casing II. (c) shows the design of casing III.

Conclusion and Future Work

So far we have identified and solved various failures for the device, but continue to optimize and improve upon both the testing methods and model as well as integrating those changes into our final design. In the future we will continuing analyzing how the flow created by the device scales and confirming our predictions of the flow using computational fluid dynamics.