Simulating hydrodynamic flow of different materials through the SimScale GmbH Computational Fluid Dynamics software to deduce less drag for maritime vessels

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Progress Report V

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Materials and Methods

Materials that are going to be utilized include the programs Fusion 360 and SimScale GmbH. SimScale will be used as our test apparatus. It can make fluids undergo motion in either the air or the water. For our purposes, we will be using the program underwater for fluids to undergo motion through an object to a certain degree regarding hydrodynamics. Fusion 360 was used to create a 3D object to run a simulation through. The 3D object was previously finalized and resembles a propeller.

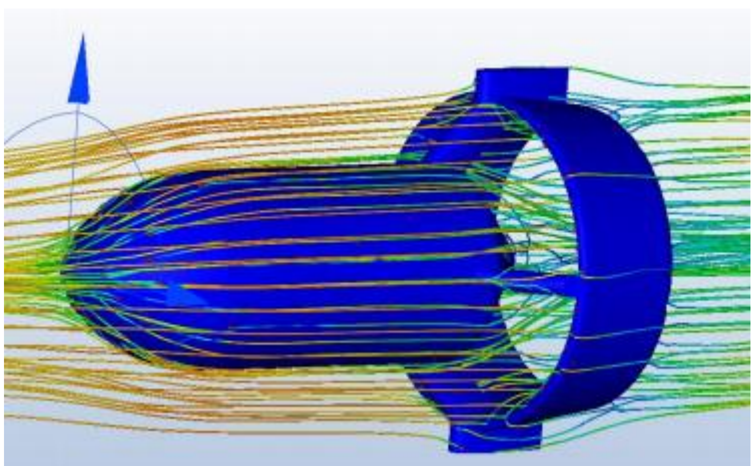

Figure 1. Finalized Object Shape

The simulation is supposed to show the flow of a fluid moving into contact with an object. It will show different lines that represent various instances of the fluid moving. The majority of the lines move around the object due to the object being a solid which can’t run a fluid through it. The lines will converge back into their original positions after being pushed but certain lines curve in towards the object due to a lack of pressure ate the back of the object. The fluid will flow into the area of low pressure and creates turbulent waves as per Figure 2.

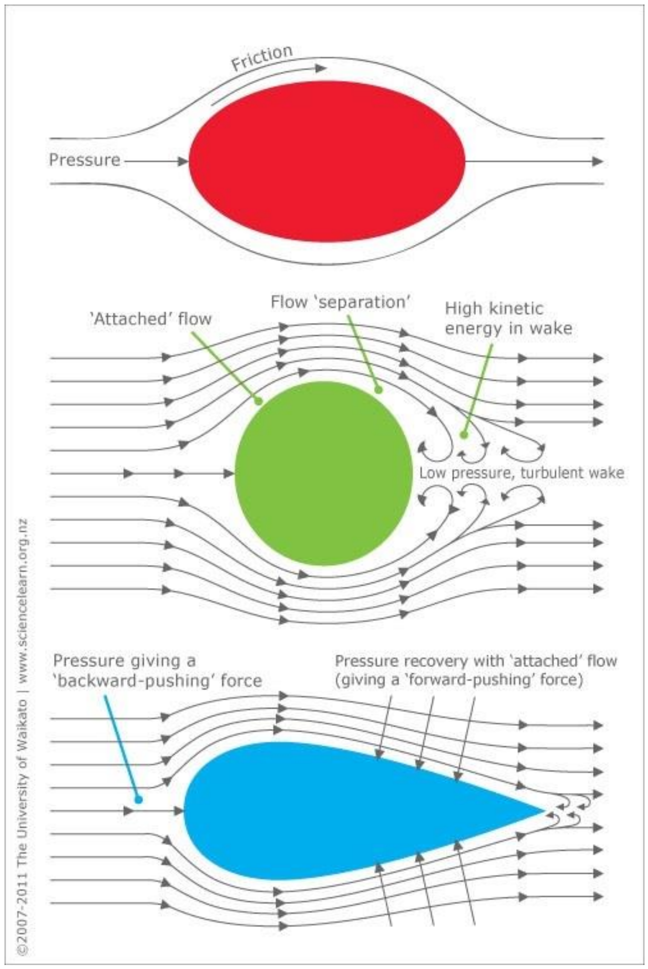

Figure 2: Simulation Concept

We subjected the object to a simulation to test various aspects. So far we've been testing the program; we haven't moved into relevant data yet. Examples of other objects placed into the simulation shows flow as according to Figures 3 and 4. The different colors highlight areas of higher and lower flow speed and pressure. We will continue testing to achieve a greater understanding of what the program has to offer.

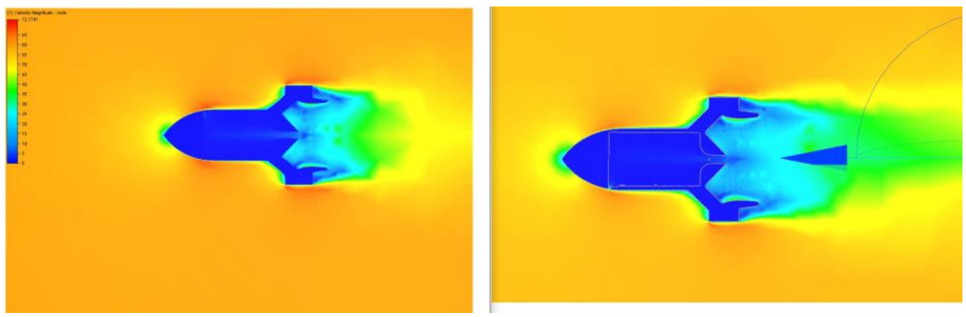

Figure 3: Side views of an object's propellers subject to flow of a fluid in SimScale.

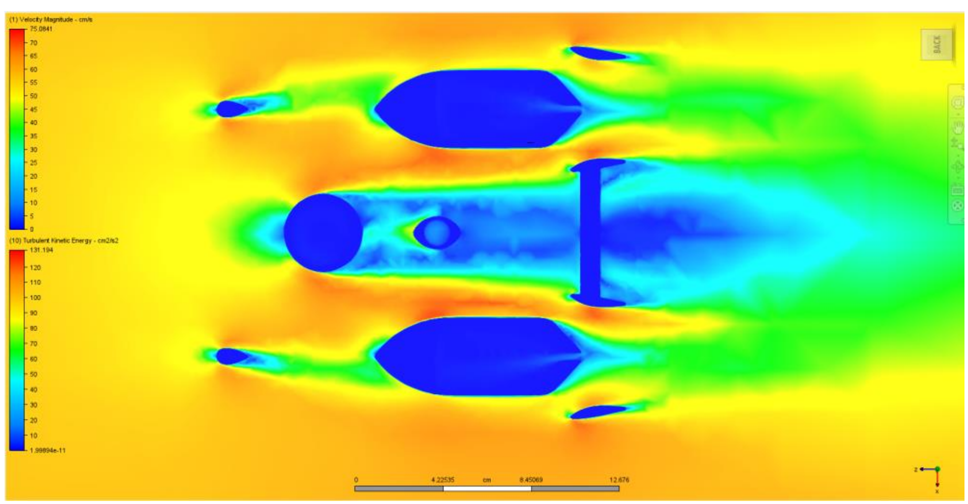

Figure 4: Top view of the full object (body + propellers) subject to a flow of fluid in SimScale.

Research is still being conducted but results should be apparent in time. We have focused our efforts towards mastering the software and understanding the data it produces and how it can be applied to our research. Above is a sample object we have been simulating and from this we are able to produce sample data for learning purposes. The software has quite a big learning curve, and many sample CAD object such as this will have to be created and implemented in order to achieve mastery of the software.

For the future, we plan to continue to gain knowledge of the software by testing different sample objects and materials. The data produced by the simulations in quite complex, and further experimentation and “toying” is required to be able to properly conduct our research and comprehend the data that is produced. If we feel confident in our skills with the software in the coming weeks, we may move onto designing the CAD object that will be used throughout our research and will remain static.

Data and Results

No data or results have been acquired yet.

References

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