Aim
To improve the prediction ability of an existing Velocity Prediction Program for a Hydrofoiling moth

Objectives
- Understand existing program and solution process
- Evaluate inaccuracies in the program
- Modify program to improve prediction
- Improve the functionality of the program

Introduction
A velocity prediction program is used to simulate changes and give a predicted boat speed for set conditions, enabling them to test and develop the design without building a model. Although this does not replace the physical testing that would be required to confirm the effectiveness of the changes, it does allow the designer to check that the design would be faster and enable them to quickly try a variety of design options.

This project was a continuation of the work by previous students Connor Banks and Shane Mcdermot, to develop a Velocity prediction program that will accurately predict the performance of a Hydrofoiling moth. The VPP was initially created by Banks in Matlab and could perform basic velocity prediction but was not very accurate due not considering a few of the forces that affect the moth, when foiling.

From this Mcdermot then developed the program further by improving prediction through introducing more force models and reducing the overall sensitivity of the program. He also increased the functionality of the program by adding in a function to allow the angle of anhedral to change. At the end of his project, he stated that further development was required to improve the VPP further.

Discussion of Results
Initial output from VPP—Red showing no convergence

The initial data shows results for the less than 8 knot wind range, the reason why the modified data is not showing results for this is due to the initial data of the depowering variable twist was greater than one meaning that more than 100% of the available sail area was being used. Therefore, the results in the initial data are not valid. For the values that have converged on both VPP setups, there is a slight difference with the original VPP predicting slightly lower speeds than the new VPP. The program now produces accurate values across a wide range of wind speeds. Although there are more convergence errors in the new data, which is due to the code not allowing a depowering value of greater than 1.

Final output from VPP—Yellow showing no convergence

When the North Sails data is compared against the final output from the VPP. You can see that there is a small difference between the North Sails values and the ones generated by the VPP. This suggests that there is still work to do in improving the prediction accuracy of the program, especially considering that no result is generated when the wind is at 140. Some difference was expected due to the foil setup and sail equations being potentially different. This would obviously affect the overall speed output. Another potential difference was crew weight, if the crew was heavier this gives more righting moment enabling the boat to go faster and depower less.

Recommendations for project continuation
- Find a solution to the depowering function problem
- Comparison against real world data