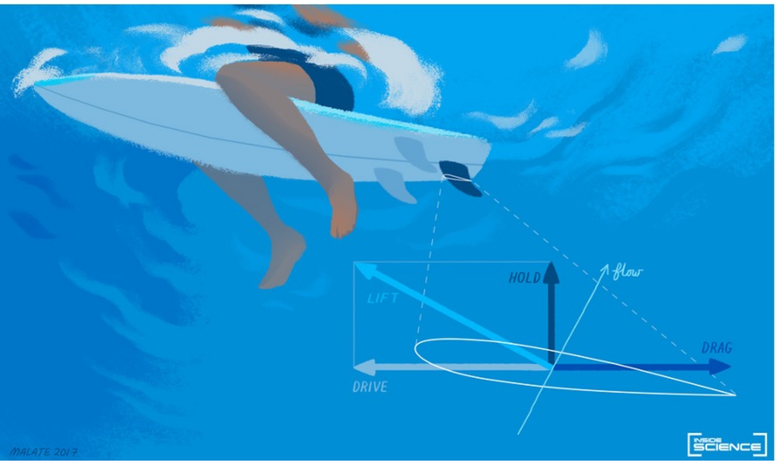
Hydrodynamic Analysis of Surfboard Fin Performance

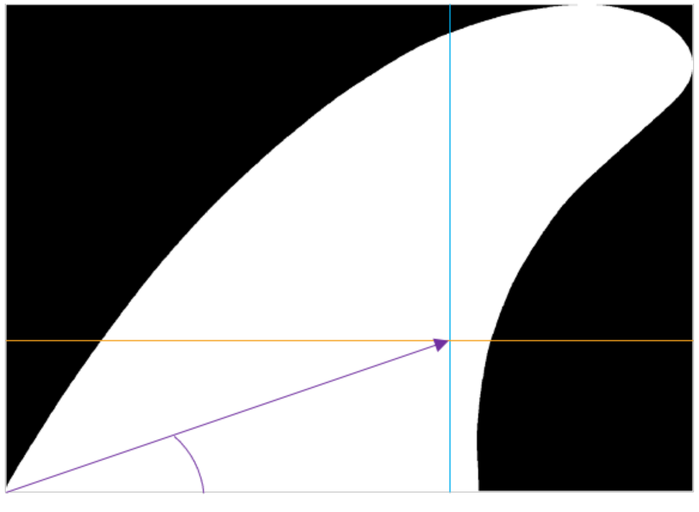
By: Brent Hewitt
Faculty Advisor: Dr. Robert Bittle
TCU Department of Engineering

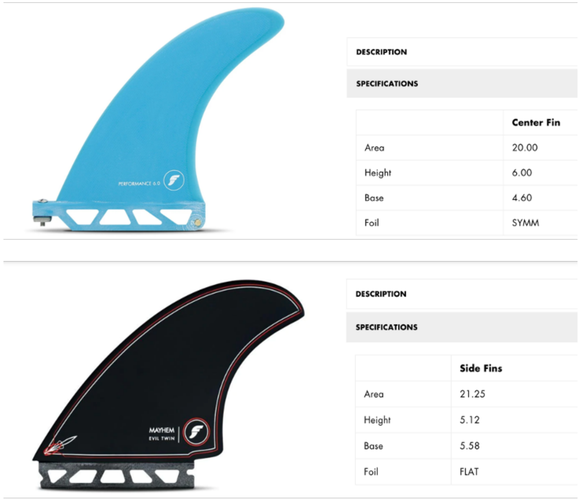


Depth Ratio			
	Captain Fin (7)	FCS (6)	Futures (8)
Number of t-Tests	28	21	36
Not Statistically Significant	71.43%	57.14%	30.56%
Significant at alpha = 0.10	28.57%	42.86%	69.44%
Significant at alpha = 0.05	17.86%	28.57%	52.78%
Significant at alpha = 0.01	10.71%	19.05%	33.33%
Width Ratio			
	Captain Fin (7)	FCS (6)	Futures (8)
Number of t-Tests	28	21	36
Not Statistically Significant	60.71%	57.14%	61.11%
Significant at alpha = 0.10	39.29%	42.86%	38.89%
Significant at alpha = 0.05	25.00%	38.10%	36.11%
Significant at alpha = 0.01	21.43%	9.52%	22.22%
Rake Ratio			
	Captain Fin (7)	FCS (6)	Futures (8)
Number of t-Tests	28	21	36
Not Statistically Significant	53.57%	61.90%	55.56%
Significant at alpha = 0.10	46.43%	38.10%	44.44%
Significant at alpha = 0.05	35.71%	38.10%	27.78%
Significant at alpha = 0.01	25.00%	14.29%	22.22%
Angle			
	Captain Fin (7)	FCS (6)	Futures (8)
Number of t-Tests	28	21	36
Not Statistically Significant	21.43%	28.57%	30.56%
Significant at alpha = 0.10	78.57%	71.43%	69.44%
Significant at alpha = 0.05	75.00%	66.67%	61.11%
Significant at alpha = 0.01	75.00%	61.90%	44.44%

Abstract

Hydrodynamic Analysis of Surfboard Fin Performance set out to analyze how the outline and size of a surfboard fin can impact performance. Performance analysis involved running images from the manufacturer's website through a MATLAB code that would process the image to determine an appropriate, numerical method, based on fluid dynamics, to explain categorical differences between fins. After testing for differences between categories for the following performance metrics: the vertical line of action, the horizontal line of action, the ratio between the tip area and the rest of the fin, and the resulting angle created by comparing the vertical and horizontal lines of action, the angle was found to be the most statistically significant factor for determining fin categories. Moving forward, users can input an image, along with the fin dimensions, to determine the performance characteristics of a fin, without having to purchase a fin. This project explains the underlying equations that are utilized, the fundamental assumptions that are made, how the results are generated, and how users can interpret the results.





Background

Surfboard fin manufacturers provide qualitative information, along with dimensions, for surfers to be able to determine which surfboard fins would best provide them with the desired performance. However, if one has issues with a fin in the form of the fin sliding uncontrollably, it can be very difficult to determine what aspect of the fin is causing this performance difference. This project seeks to define what factors determine the categorical differences within surfboards and then provide a numerical, data-driven metric for surfers to determine which fins will deliver the desired effect.