



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

<b>Name(s)</b> <b>Magnus B. Herrlin, IV</b>	<b>Project Number</b> <b>S0312</b>
<b>Project Title</b> <b>A Novel Method to Measure Surface Roughness by Using the Aerodynamic Magnus Effect</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Based on the results from my 2017 California State Science Fair project, I hypothesized that the aerodynamic Magnus Effect could be used to measure surface roughness, which is important in many engineering applications. This year, I set out to find if this is possible. My earlier project suggested that a rough surface increases the Magnus Effect.</p> <p><b>Methods/Materials</b> I tested my hypothesis by constructing a model of a Flettner rotor ship, which is a type of sailing ship that has vertical spinning rotors instead of sails. Rotor ships use the Magnus Effect for propulsion. I fabricated several exchangeable rotors with different grit roughnesses and measured the speed of the boat with each rotor under identical conditions. The rotors had all the same dimensions and they were ballasted to weigh the same.</p> <p><b>Results</b> After refining the test setup and procedure, I performed a total of 80 tests and applied a power curve fit to the data with excellent result. Having the relationship between rotor surface roughness and boat speed in mathematical terms (power function), I could successfully determine the roughness of an unknown rotor by measuring the speed of the boat and using the inverse of the power function.</p> <p><b>Conclusions/Discussion</b> The results from my experiment suggest that my hypothesis was correct; namely, that it is possible to measure surface roughness by using the Magnus Effect. Since none of my online searches uncovered such a use, I concluded that this project proposed something truly new and original.</p>	
<b>Summary Statement</b> In my project, I attempted to measure surface roughness by using the Magnus Effect.	
<b>Help Received</b> My science teacher helped me by reviewing my preliminary report and giving me some advice.	