



**CALIFORNIA STATE SCIENCE FAIR  
2003 PROJECT SUMMARY**

<b>Name(s)</b> <b>Erik R. Van Esselstyn</b>	<b>Project Number</b> <b>S0108</b>
<b>Project Title</b> <b>Decreasing Drag Using the Piezoelectric Effect</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The experiment is testing the effectiveness of piezoelectric transducers, special ceramic disks that produce ultrasonic waves by converting an electric current into mechanical energy, when their effect is applied to the stern of a moving hull.</p> <p><b>Methods/Materials</b> The experiment was set up using a test hull made out of a Tupperware container, which would be tested in a 15ft stretch of a pool. The two piezoelectric disks and their circuit boards were attached inside the container, with a silicone sealed hole that provided the contact between the disks and the water at the stern of the hull. Wires from the circuit boards connected to an extension cord which traveled up through a sealed hole in the top of the container where it connected above the pool to a power support line, eventually going to the 48 volt end of a transformer. Back at the test hull, a 34ft tow line was attached to the bow which traveled across the pool, through a block at the water level, up to the top of a 15ft extension ladder where there was another block, and finally down to a 2lb weight. When the weight was released from the top of the ladder, the hull would be pulled through the water at a uniform rate for 15ft until the weight hit the ground. The tests were timed.</p> <p><b>Results</b> The average time for the control testing runs was shorter than the average time for the tests with the piezoelectric nebulizers turned on.</p> <p><b>Conclusions/Discussion</b> My hypothesis was that the piezoelectric transducers would have a positive effect in decreasing the amount of drag of the hull through the water, and my hypothesis turned out to be correct because the ultrasonic waves produced by the discs worked to push and break apart the water at the stern of the hull, decreasing the suction effect and the overall drag.</p>	
<b>Summary Statement</b> This project is an insight into the application of piezoelectric technology in the marine environment.	
<b>Help Received</b> APC International donated both piezoelectric nebulizers, dad helped set up testing scheme	