



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Daniel R. Cox	Project Number 31093
Project Title Aspect Ratio and Its Effect on Sail Efficiency	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals In my project, my goal was to find out if changing the aspect ratio between the sides of a sail without changing surface area changed the amount of force output. I also wanted to find out the ideal aspect ratio for sails.</p> <p>Methods/Materials A special wind tunnel, outfitted with a cart tethered to a spring scale to measure force, was built in order to have consistent airflow. Five sails of different aspect ratios, but the same area, were built out of the same materials in exactly the same fashion. Each sail was placed on the cart at the same angle, moving the cart, and therefore pulling on the spring scale tethered to it, measuring force.</p> <p>Results The 4:1 (height to width) sail was by far the most efficient. There was an upward trend of force from 1:1 to 4:1, which then dropped off at 5:1.</p> <p>Conclusions/Discussion A 4:1 sail is by far the most efficient sail. These results show that when possible, it is best to use a 4:1 sail on ships in order to maximize force generated.</p>	
Summary Statement In my project, I constructed a wind tunnel, vehicle, and various sails, to determine which aspect ratio in sails with equal surface area provided the greatest force output.	
Help Received Father helped with power tools for wind tunnel construction; mother helped with shopping for cart parts.	