



**CALIFORNIA STATE SCIENCE FAIR  
2011 PROJECT SUMMARY**

<b>Name(s)</b> <b>Bryce W. Anglin</b>	<b>Project Number</b> <b>S0302</b>
<b>Project Title</b> <b>Just Wing It: A Comparison of the Effect of Aspect Ratios and Surface Areas on Aerodynamic Moment</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective is to compare wings varying in aspect ratios with a constant surface area and in surface areas with a constant aspect ratio to compare changes in aerodynamic moment from 0 degrees to 25 degrees angle of attack. My hypothesis is wings with larger surface areas will have a stronger aerodynamic moment and aspect ratio will not affect aerodynamic moment.</p> <p><b>Methods/Materials</b> Eight styrofoam wings were constructed following the outline of the NACA 2512 airfoil. Five of the wings varied in aspect ratio with constant surface area, two of the wings varied in surface area with a constant aspect ratio, and one of the wings shared the constant aspect ratio and surface area. Wings were tested in a home-constructed wind tunnel. Wings were attached on the front of a lever connected with a hinge to an elevated pediment-like surface that utilized stoppers to keep the lever between 0 and 25 degrees inclination. A counterbalance of coins was placed on the other side of the lever. Each wing was attached to the lever, placed in the center of the wind tunnel, and tested three times. For each test, a stopwatch recorded the time starting with the start of the fan and ending with the lever hitting the stopper at 25 degrees.</p> <p><b>Results</b> For varying aspect ratios, the worst moment produced occurred at the aspect ratio of 5.4. The best moment produced occurred at the aspect ratios of 7.1 and 1.8. As the aspect ratio increases, the aerodynamic moment sharply increases. As the aspect ratio decreases, the moment gradually increases. For varying surface areas, the largest surface area with 70.6 sq. inches produced the most moment. The surface area of 17.6 sq. inches produced the worst moment. As the surface area lessens, the aerodynamic moment decreases in force.</p> <p><b>Conclusions/Discussion</b> The data refuted the hypothesis. Although the hypothesis was correct that wings with larger surface areas have stronger aerodynamic moment, aspect ratios play an important role in producing aerodynamic moment.</p>	
<b>Summary Statement</b> My project was to compare variances in aspect ratios and surface areas of aircraft wings in terms of aerodynamic moment.	
<b>Help Received</b> Father helped construct wind tunnel and conduct testing; Mother helped design board.	