



# CALIFORNIA STATE SCIENCE FAIR 2010 PROJECT SUMMARY

<b>Name(s)</b> <b>Matthew Wong</b>	<b>Project Number</b> <b>J0132</b>
<b>Project Title</b> <b>Searching for Stability</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective of my project was to determine if winglets on an airplane improved stability. If so, what shape and angle of winglets would make an airplane the most stable. I hypothesized that 90-degree winglets would increase stability the most.</p> <p><b>Methods/Materials</b> A wind tunnel and five balsa wood airplanes were designed and constructed for testing. Each airplane had varying shapes and angles of winglets (no winglets [control], 90-degree winglets, 135-degree winglets, wing fences, and a curved wing). To test for stability, methods of testing roll, pitch, and drag were developed. Each airplane was tested accordingly. All data was recorded and reviewed, and conclusions were drawn.</p> <p><b>Results</b> The airplane with no winglets had the greatest variations of movement in the roll and pitch tests as well as the greatest amount of drag. The airplanes with 135-degree winglets and wing fences had smaller variations in the roll and pitch tests, and less drag than the airplane with no winglets. The airplanes with 90-degree winglets and a curved wing had the least variations of pitch and roll, and the least amount of drag compared to all of the other airplanes. Lower variations of movement indicate a more stable airplane.</p> <p><b>Conclusions/Discussion</b> Overall, I concluded that winglets do increase stability. Based on the results of my tests, the airplanes with 90-degree winglets and the curved wing proved to be the most stable. To further support my hypothesis, the airplane with no winglets proved to be the least stable. Factors that could have affected the outcome of the experiment were the airplanes' center of balance, and the weight of the airplanes. Another factor that could have affected the outcome was the calibration of the pull-spring scales used during testing. I found the planning, design, and construction phases of my project as rewarding as the testing process used to prove my hypothesis.</p>	
<b>Summary Statement</b> My project was to determine if winglets increased the stability of an airplane, and if so, what shape and angle of winglets would increase stability the most.	
<b>Help Received</b> Jon Welte (Hiller Aviation) helped answer some preliminary questions about my project. Parents assisted in driving me to purchase materials. They also helped with cutting some of the materials.	