



# CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

<b>Name(s)</b> <b>Omena C. Mushale</b>	<b>Project Number</b> <b>S0320</b>
<b>Project Title</b> <b>Engineering and Testing Wings</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> I wanted to create wing designs that would generate more lift than the conventional wing for commercial planes. My question was: Will a wing with a curved leading edge or a straight leading edge generate more lift? My hypothesis was that if wings can generate lift with a straight leading edge, then wings can generate more lift with a curved leading edge. So I applied my research of the leading edge of a wing to the creation of many different wing designs, hoping that they would out-perform the conventional wing.</p> <p><b>Methods/Materials</b> I decided to use the CAD program Autodesk Inventor Professional 2014 to digitally create my control wing and wing designs. Then I had them printed out using a 3D printer that Mr. Green owns, the Cube 3D printer. After printing, I applied wood filler to my articles and sanded it with 150-grit and 400-grit sandpaper to smoothen the articles as much as possible. This is so that there is as little error as possible according to the printing of the articles. I then tested my articles in a small wind tunnel. I used a force sensor from which the wing hung to measure the amount of lift, in newtons. I used Logger Pro Lite 3.3 to get the data from the sensor. I used Microsoft Excel 2013 to create tables and graphs of the data. I kept the wind tunnel speed the same for all the trials.</p> <p><b>Results</b> The conventional wing had an average lift of 0.29 newtons. The conventional curved wing had an average of 0.42 newtons.</p> <p><b>Conclusions/Discussion</b> The data supports the hypothesis that the wing with a curved leading edge generates more lift. Throughout the 30 seconds for each wing, the difference between the control and the conventional was about 0.1 newtons. The sanding of the test articles were not to perfection, of course. Also, the conventional wing with a curved leading edge was slightly thicker than the control wing, so it may have altered the results. Along with that, during testing the wing was at a 0° AOA, so it may not have generated the maximum lift that it could have generated.</p>	
<b>Summary Statement</b> My project is about altering the edge of an airplane wing to see if the wing produces more lift than a conventional wing.	
<b>Help Received</b> Mr. Green, physics teacher, provided the 3D printer and help on testing; Mr. Poe, woodshop teacher provided the wind tunnel and helped with testing; Robotics mentors and teammates helped with designs;	