



CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

Name(s) Matthew Wong	Project Number J0132
Project Title Perfect Pitch	
Objectives/Goals The objective of my project was to investigate what type of rear horizontal stabilizer would increase the pitch sensitivity of a small, general aviation airplane. I hypothesized that a straight rectangular stabilator would increase the pitch sensitivity of an airplane the most.	
Abstract Methods/Materials Four unique horizontal stabilizers were designed and constructed, and each mounted to four identical airplane models that I also built. Each stabilizer was a different shape and type: a straight stabilator, a swept-back stabilator, a straight stabilizer with elevators, and a swept-back stabilizer with elevators. My designs allowed the elevators and stabilators to tilt for each testing procedure. Materials used were balsa wood and paper clips. To test and measure for pitch sensitivity, I developed a testing method to simulate the airplane's ability to pitch-up and pitch-down. For a controlled testing environment, I designed and constructed a wind tunnel using plexiglass. I updated and improved one of my previous wind tunnel designs to suit this project's testing procedures. These unique designs and original testing methods enabled me to gather measurable data. All data was recorded, graphed, and analyzed; conclusions were drawn.	
Results The airplane with the straight stabilator had the most pitch variation for both pitch-up and pitch-down tests. The airplane with the stabilizer with elevators and the airplane with the swept-back stabilator both had less pitch variation than the plane with a straight stabilator. The airplane with the least amount of pitch variation was the plane with a swept-back stabilizer with elevators. For this project, a greater amount of pitch variation indicated increased pitch sensitivity.	
Conclusions/Discussion I concluded that the straight rectangular stabilator was the most pitch sensitive, thus supporting my hypothesis. A factor that could have affected the outcome of my experiments was the difference in surface areas between the straight rectangular designs and the swept-back designs. The straight stabilizers had more surface area, and could have increased pitch variation. The knowledge and experience I gained from this project have allowed me to add to research from previous aeronautic projects and, more importantly, add to my understanding of airplane design and construction for future projects.	
Summary Statement My project was to determine what type of rear horizontal stabilizer increases the pitch sensitivity of a small, general aviation airplane.	
Help Received My parents assisted in driving me to purchase the materials. They also helped me with cutting some materials.	