CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
Michael J. Lawler

Project Number
J0116

Project Title
Maximum Angle of Attack Before Stalling

Abstract

Objectives/Goals
I wanted to find out the angle of attack that would stall an airplane wing. I thought of this idea watching my dad fly and wanted to learn more about how wings create lift and when they stop lifting or #stall#.

Methods/Materials
To measure a wings stall angle can be done either mathematically or experimentally I chose the experimental method. To test a wing I had to build a wind tunnel. I made the wind tunnel out of 1x2 lumber and wax panel boards. I chose wax boards inside the tunnel to minimize turbulence of the airflow. I installed a viewing port in the area where I attached my wing and marked angles on the opposite wall of the wind tunnel to visually measure the angle of the wing. I attached strings of yarn to the wing to tell whether the airflow over the wing was laminar or turbulent. Laminar flow indicates that the wing is creating lift and the strings of yarn would lay flat on the wing. Turbulent flow is indicated by the yarn fluttering above the wing and indicates a stalled condition.

Results
I found the maximum angle of attack to stall my wing was 45 degrees with a wind velocity of 4.5 MPH. I extended my experiment by increasing wind speed to see if the stall angle would change. I increased the wind speed to 6.5, 10.2 and 17 MPH. The wing stalled at the same angle for all wind speeds.

Conclusions/Discussion
An airplane wing will stall at the same angle of attack regardless of wind speed. This angle is approximately 45 degrees.

Summary Statement
Measure wind speed and air flow over a wing to physically observe (yarn tufts) detach at wing stall angle.

Help Received
Father used table saw