CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
Ryan D. Sloane

Project Number
J0125

Project Title
Lift Off: Testing Airfoils

Abstract

Objectives/Goals
What is the most important factor for a wing to make lift,the thickness of the airfoil or where the thickest point is located? I ran two trials in a wind tunnel measuring the lift generated. I hypothesized that airfoil thickness will be more important than where the thickest point is located. I tried to prove that airfoil thickness will be the factor that affects the flow of air traveling over the wing and creates the most lift.

Methods/Materials
All wings are constructed from wood and tissue paper the same way you would build a flying scale model. Great care is givin so that all are identical except for the variable of airfoil thickness and location of thickest point. All wings were tested the same way,at a constant airspeed, in a wind tunnel we built of wood and cardboard, powered by four box fans. I ran trials for each variable. Mounting the wings inside the viewing chamber of the wind tunnel and measuring the amount of mass lifted when the wing achieved level flight.

Results
Airfoil thickness had more effect on lift than where the thickest point was located. Location of the thickest point of the airfoil generated a smaller range of mass lifted. Thicker airfoils lifted the most mass. Five of the airfoils succesfully tested,the airfoil with the greatest thickness generated no lift.

Conclusions/Discussion
Though the airfoil with greater thickness lifted the most weight, supporting my hypothesis, the most interesting fact was that every airfoil shape had very different flight characteristics. Some were very stable in flight. The airfoil that was the most symetric was the most stable. The wing that lifted the most had a very unstable leading edge. It would seem that wing shape is very important in how lift is generated and an aeronautical engineer would have to choose what shape would be needed to get the lift and flight characteristics required. A fast military jet would need a very different wing than a very large cargo transporter. I am sure that if I changed any of the variables my results would be much different.

Summary Statement
What factor of an wing's shape affects generating lift the most, thickness or location of thickest point?

Help Received
My father helped me build the wind tunnel in our garage.