CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
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Project Number
J0123

Project Title
Dimples on Wings

Abstract

Objectives/Goals
My objective is to determine if airplanes will stall, or suddenly lose necessary lift, at a steeper angle of attack if the dimple design of a golf ball is applied to the airfoil's surface.

Methods/Materials
2 identical airfoils made from balsa wood are tested in a homemade, open-circuit wind tunnel approximately 4 feet long. It is powered by a vacuum cleaner blowing into the front and a house fan pulling the air from the rear. Strings taped on the top of the airfoil (known as tufts when applied this way) indicate stall. To test, I slowly increase the airfoil's pitch while the tunnel is running and record its angle of stall. I do this 15 times while the airfoil is still smooth, I then add dimples to the top of the airfoil and test it 15 more times. I repeat with the second airfoil to ensure valid data.

Results
The airfoils slightly performed better dimpled over smooth in every comparison regarding stall.

Conclusions/Discussion
Test results show that dimpled wings stall at a slightly steeper, yet consistant, angle of attack. Research following my experimentation indicate that dimples may create friction on a wing's surface hindering its performance. If this problem is solved this concept can theoreticly shorten take-offs and landings (STOL) and allow aircraft to be more manuverable; futhermore, I believe that my experiment has supported my hypothesis that dimpled wings stall at a steeper angle of attack than a traditional smooth wing.

Summary Statement
This project verifies if the dimples that reduce a golf ball's drag can also increase an airpane's critical angle of stall.

Help Received
Pilot answered introductory questions; Grandfather supplied advice and tools; Built wind tunnel with tools and supervision of Uncle; Father took pictures; Mother helped with display.