CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
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Project Number
S0104

Project Title
Up, Up, and Away! Vortex Generators and Increased Angles of Attack

Abstract

Objectives/Goals
To determine which design and set up of vortex generators allows for the greatest angle of attack at a low airspeed velocity before a wing stall occurs.

Methods/Materials
Place vortex generators at desired angles and distances from leading edge of model wing, using earthquake putty to hold them in place. Place inside of wind tunnel, using wind tunnel insert. Turn on wind tunnel. Using a hooked rod, hold the trailing edge of the wing so that the chordline is parallel with the freestream velocity. Slowly lower the wing#s trailing edge until the strings on the wing indicate a stall. Record the height of the trailing edge. Use trigonometric functions to calculate the angle of attack.

Results
Triangular vortex generators are more effective at increasing angle of attack before a stall on the occurs than rectangular vortex generators are; vortex generators are least effective when placed on the leading edge, more effective 2cm back, and most effective 4cm back; they are more effective when parallel to each other than when angled. The individual series that proved to be the most effective had rectangular vortex generators placed 4 cm back from the leading edge, parallel to each other. The least effective was the control group (no vortex generators used), followed by rectangular vortex generators placed on the leading edge of the wing, parallel to each other.

Conclusions/Discussion
The most effective use of vortex generators was almost half way back on the model wing, which was behind where the thickness of the wing was the greatest. They tended to be more effective when parallel rather than angled, especially with the rectangular vortex generators, probably because they were too long to be effective. When five of the vortex generators were used and all were angled, they seemed to make an effective screen rather than simply bringing the air through in vortices. Triangular vortex generators were able to be effective when angled because they taper to the surface of the wing, allowing the air flow to follow the contour of the wing without being blocked by the vortex generator. This is also why triangular vortex generators were, on average, more effective than rectangular vortex generators.

Summary Statement
The project explores the use and most effective design and set up of vortex generators to prevent a wing stall at a low airspeed velocity.

Help Received
Mrs. Marilyn Usher (high school physics teacher) was the project supervisor.