CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

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Project Number

31420

Project Title

The Tubercle Effect: A Study of the Effect of Tubercles on the Wings of Planes on Flight Efficiency

Abstract

Objectives/Goals

This project was designed to test whether adding tubercles to the leading edge of wings on planes would allow it to travel farther while in flight. It is believed that the planes with bumpy tubercles will fly the farthest for both the sweptback and straight designs.

Methods/Materials

Materials: foam board (plane), rubber bands, pennies, paper clips, tape, a tape measure, a stopwatch, and a 20° slope launcher. There were two categories of wings: sweptback and straight, with three different wing types: Flat, Tubercle, and Spiky. The planes were tested with three different centers of gravity. The CG was moved forward/aft by taping pennies to the nose/tail of the plane. The planes were tested 10 times each with a new rubber band for each different plane trial. Testing proceeded by attaching a rubber band to a plane by a notch cut, pulling back to a preset point, and recording the flight time after launch. When it landed the distance was measured using the tape measure.

Results

(all calculations are done in units of feet)
Sweptback Wing/Straight Wing
Normal CG:
Flat Wing: avg. 21.85/11.30
Spiky Wing: avg. 21.58/11.31
Bumpy Wing: avg 19.40/11.49
Behind CG:
Flat Wing: avg. 8.37/8.85
Spiky Wing: avg. 9.17/7.61
Bumpy Wing: avg. 8.85/7.39
Forward CG:
Flat Wing: avg. 13.62/11.78
Spiky Wing: avg. 14.83/12.07
Bumpy Wing: avg. 14.36/9.59

Conclusions/Discussion

The data do not entirely support the hypothesis. In the straight wing category, the plane that flew the farthest was the Tubercle at normal CG and in the sweptback the smooth winged plane at normal CG flew the farthest. While the sweptback planes with the aft and forward CG did not fly as far, the tubercle design

Summary Statement

To test the efficacy of tubercles on the leading edge of wings on airplanes.

Help Received

Mrs. Banuelos for computer graphing assistance.

Preliminary