CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
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Project Number
J0117

Project Title
What Is the Best Nozzle Angle for My Airplane?

Abstract

Objectives/Goals
Over the past several years, I have been thinking about different ways of using wind as a source of power. I wondered if a lot of wind could be directed so that more power could be produced.
Applications of nozzles can be used to increase the efficiency of various forms of transportation. I wanted to find if there is an optimum nozzle angle that will produce a maximum amount of thrust (force) when air is passed through.

Methods/Materials
I measured the takeoff thrust by using a rubber band attached to the back wheel of my remote-controlled airplane. I measured the thrust by recording how far the rubber band stretched. I constructed a nozzle made from an embroidery hoop, construction paper and tape, and attached it to my electric powered airplane. I changed the nozzle angle and measured the resulting thrust (distance traveled). I repeated the experiment eight times for each nozzle angle and recorded the results. I decreased the nozzle angle by about 2 degrees for each experiment. I analyzed the data by first averaging the results from each run and then plotted the averaged amounts onto a line graph.

Conclusions/Discussion
The data showed the best nozzle angle to produce maximum amount of thrust was no nozzle at all (open configuration). After applying the nozzle apparatus, the optimum nozzle angle was 176-degrees. Further development of this experiment would focus on the 176-degrees nozzle angle using different materials. I hope that this type of research would lead us to future improvements in methods of transportation.

Summary Statement
To find if there is an optimum nozzle angle that will produce a maximum amount of thrust (force) when air is passed through.

Help Received
My dad helped me with the engineering of my project, including understanding of some basic triganometry (how to use the tangent to find the measurements of angles).