CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
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Project Number
35894

Project Title
Evaluating Bernoulli's Principle through the Use of a Hovercraft

Abstract

Objectives/Goals
We evaluated two different Plenum designs. One design utilized a six hole pattern, a second design utilized 12 holes. The surface area through which the air escaped through our holes was kept constant.(18.8 square inches). Our hypothesis speculated that the smaller hole design would carry more weight.

Methods/Materials
Our design called for altering the diameter and the number of holes through which gas can escape in a 41in round 3/4in thick plywood board. Bernoulli's principle states that the smaller the orifice, the greater the velocity and therefore the lower pressure. Will will make six holes each of 1 inch in diameter. That will give a gas escape surface area of

6 x Pi x 0.5^2 = 4.71 in^2

We will then make another model in which the gas will escape with 24 holes each of 0.5 inches in diameter.

12 x Pi x .707^2 = 4.71 in^2

Because Bernoulli's principle deals with pressure differentials, it is our hypothesis that smaller more numerous holes will enable to craft to hover more effectively than larger, but less numerous holes.

All holes will be made in a circular pattern approximately 2.5 feet from the center of the plywood. The leaf blower will be placed in the center of the plywood.

Results
Two trials were performed using the 6 hole (surface area = 18.8 sq in) design from 0 to 250 pounds. At zero load the height mean was 2.55 inches; at 250 pounds the mean was 1.6 inches. The slope of the line was y = -0.0037x+2.5188.

The 12 hole design (surface area =18.8 sq in) at zero load had a mean height 2.97 inches; at 250 pounds the mean was 2.25 inches. The slope of the line was y= -0.0029x + 2.9888, and less steep than the 12 hole design. The slope of these data were significantly different from each other ($p<0.01$).

Conclusions/Discussion
We built a 41 inch diameter inch hovercraft that utilized Bernoulli's principle. We found that the smaller holes were more effective than larger holes (of the same surface area) in elevating a board above a concrete floor with 0 to 250 pounds of weight. Our findings support the hypothesis that the faster air

Summary Statement
Bernoulli's Principle is evaluated through the use of a hovercraft with two different size orifices for air to escape.

Help Received
Frank Frisch, my father, helped with the construction of the hovercraft.