CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
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Project Number
J0126

Project Title
What A Drag!

Abstract

Objectives/Goals
Can a functional wind tunnel be constructed that allows the aerodynamic testing of automotive models? Will this testing match known aerodynamic values for modern vehicles? Can a model be constructed that is aerodynamically superior? What design features would this model incorporate?

Methods/Materials
Construct wind tunnel using plans from the internet. Build five model cars out of styrofoam blocks. Test each car ten times to determine aerodynamic force measured in ounces on a postal scale. Compare these values to known aerodynamic coefficients. Use derived information to begin independent testing of aerodynamic features. Cut and shape styrofoam blocks in pursuit of aerodynamically superior body shape. Analyze the effects of various features.

Results
The aerodynamic forces measured were similar to the results I hypothesized. The cars in order of least force to greatest drag force were: EV1, Toyota 2000GT, Porsche 911, Chevrolet Z28, and Hummer H2. The EV1#s average force was .64 ounces. The Toyota 2000GT#s average was .88 ounces. The Porsche 911#s average was .89 ounces. The Chevrolet Z28#s average was 1.08 ounces. The Hummer H2#s average was 1.30 ounces. These values were proportional to the real aerodynamic coefficients for these vehicles that I found on the internet. Independent testing of aerodynamic features is in progress currently.

Conclusions/Discussion
The author concludes that the cars tested in the wind tunnel for drag force had similar results to the published aerodynamic coefficients of real cars found on the internet. Some cars had more drag than they should have but they were ranked similarly. Testing procedures required great precision. The controlled variable was the air velocity in the wind tunnel, because the velocity of the wind stayed the same throughout the testing. The manipulative variables were the car shapes, sizes, and frontal area. A controlled variable was aerodynamic force of the Hummer. Because it was the car with the most drag, I tested the Hummer first to see the results and then at the end just to make sure that the results didn#t change. The responding variables were the measurement of the force on the postage scale. To add to my project, I installed strings to the wind tunnel to see if the flow is straight (laminar) or wavy (turbulant). The Hummer caused very turbulent airflow. The EV1 was very aerodynamic and kept the wind flow mostly laminar.

Summary Statement
This project uses a self-made wind tunnel to test the aerodynamics of model cars and to discover which features decrease wind resistance.

Help Received
Dad helped me build the wind tunnel