



California Science Center
CALIFORNIA STATE SCIENCE FAIR
2001 PROJECT SUMMARY

Your Name (List all student names if multiple authors.)

Gregory P. Schuster

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J0933

Project Title (Limit: 120 characters. Those beyond 120 will be ignored. See pg. 9)

Keep On Truckin: Studying Aerodynamics of Cab & Air Deflector Designs to Reduce Fuel Consumption & Improve Air Quality

Division

X Junior (6-8) _ Senior (9-12)

Preferred Category (See page 5 for descriptions.)

9 - Fluid Mechanics/ Aerodynamics/ Thermophysics

Abstract (Include Objective, Methods, Results, Conclusion. See samples on page 14.)

Use no attachments. Only text inside these boxes will be used for category assignment or given to your judges.

OBJECTIVE: Study the aerodynamics of a truck by changing cab and air deflector designs, the use of which could reduce fuel consumption and improve air quality.

METHODS: I prototyped a wind tunnel and a truck/trailer model successfully. Then I built a wind tunnel with three sections into which I inserted a leaf blower. I constructed a 1/20th scale model of a semi-truck. To the cab chassis, I attached one of two truck cabs to study#VARIABLE 1: CAB DESIGN with study values of #1: Conventional Cab and #2: Cab-Over-Engine Design. To experiment with air deflectors, I made 5 balsa models which could attach to my truck cab. These models represented VARIABLE 2: AIR DEFLECTOR DESIGN with study values of #1: large curve, #2: small curve, #3: large triangle, #4: large panel and #5: small panel. To control my procedures, I designed a Log Sheet with a checklist and places to record my data. Beginning with VARIABLE 1 I installed the first cab, Conventional Design, placed the truck in the wind tunnel and attached it to my spring scale apparatus registering a gram reading representing the wind resistance of the truck model. My assistant turned on the leaf blower and I took the scale reading which I recorded. I repeated the test and recorded the results. Then, I changed out the cab to Cab-Over-Engine Design. Using the cab with the best performance (Conventional), I began testing VARIABLE 2 by attaching my first air deflector to that cab and continued testing for each study value. When finished, I set up the experiment again and repeated my entire experiment two more times beginning with the cab design to prove repeatability of my experiment.

RESULTS/CONCLUSIONS: My hypotheses were (1) different cab designs will have differing aerodynamic properties (2) the Conventional Cab will have the best performance (3) air deflectors will improve aerodynamics (4) the large curve deflector (study value #1) will be the best. My first two hypotheses were correct#there were differences and the Conventional Cab performed the best. My third hypothesis was partially correct. Two deflectors worsened performance, while three improved it. My fourth hypothesis was incorrect. The large curved deflector was not the best; the small curved (study value #2) had improved performance with a scale reading of 2 grams down from 52 grams without the deflector!

Summary Statement (In one sentence, state what your project is about.)

I studied truck designs testing two variables: cab shape & air deflector shape, and discovered that my Conventional Cab with the small curved deflector had the best aerodynamics, which could lead to improved fuel consumption & air quality.

Help Received in Doing Project (e.g. Mother helped type report; Neighbor helped wire board; Used lab equipment at university X under the supervision of Dr. Y; Participant in NSF Young Scholars Program) See Display Regulation #8 on page 4.

My father, Kerry Schuster, helped me saw lumber for the wind tunnel and assisted in the shop. My mother, Ann, assisted with the leaf blower and both my parents reviewed my project report. Aamico Scientific of San Diego helped with the spring scale and Hobbies, Toys and More of Lake Elsinore helped with the truck model wheels and axles.