



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) Bryton A. Horner	Project Number J0111
Project Title Fuel Troubles: Improving Car Aerodynamics and Fuel Efficiency through Dimples	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Objective: The objective is to determine if golf-ball style dimples can be used to improve the aerodynamics of a car.</p> <p>Methods/Materials Materials and Methods: Three versions of a 2 x 7 inch model car were compared. One had a smooth surface, one had only the bottom dimpled, and one was completely dimpled. A 5 x 5 x 16 inch wind tunnel was constructed. A 10 inch diameter circular fan and contraction cone allows 70 mile per hour wind to be drawn through the test section. A digital force gauge is used to measure and record the drag force generated. A smooth wooden ball was first compared with a dimpled wooden ball in order to ensure that the test setup was working. The models were tested and drag force results compared.</p> <p>Results Results: The dimpled ball was found to produce 27% less drag than the smooth ball showing that the test setup was working. The bottom dimpled car produced 33% less drag than the smooth car. However the completely dimpled car produced only 15 % less drag than the smooth car.</p> <p>Conclusions/Discussion Discussion: As it turns out, dimpling only the bottom of the car was the most effective aerodynamic improvement. I believe this is because dimpling the bottom reduced the vacuum gap at the back of the car. However once I dimpled the entire surface, the drag went back up. Maybe the excess dimples spoiled the airflow too much or maybe too many dimples create excess skin friction. More tests would be needed. I think a golf ball needs the entire surface dimpled because it is spinning through the air, so all sides are exposed. A car doesn't because it remains in the same position. Additional tests were performed on a tractor-trailer shape and an Aptera wheel cover and the results were similar. Partial dimpling improved the aerodynamics but too much dimpling worsened it.</p>	
Summary Statement Can the aerodynamics of a car be improved with golf-ball style dimples.	
Help Received Dad helped with construction and dangerous cutting. I assembled it. Borrowed schools digital gauge.	