



**CALIFORNIA STATE SCIENCE FAIR  
2006 PROJECT SUMMARY**

<b>Name(s)</b> <b>Taylor R. Hill</b>	<b>Project Number</b> <b>S0106</b>
<b>Project Title</b> <b>Tailgate Efficiency in Relation to Vehicular Aerodynamics</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The goal of my project was to determine through controlled experiments if it is more aerodynamically efficient to drive with the tailgate down, tailgate up, or with no tailgate at all. Whichever method makes the truck the most aerodynamic, deductively, is the vehicle that consumes less gas, making the vehicle more efficient.</p> <p><b>Methods/Materials</b> Using a 1:16 scale model truck to represent the vehicle and a 9" fan, I simulated the travel of air over a truck in motion. I then focused the air through a funnel to focus it to the front of the vehicle in order to get the proper simulation of actual driving conditions. I then placed 5 incense sticks in front of the vehicle to create smoke. It was then possible to view the air's travel over the vehicle by observing the travel of the smoke over the truck. I repeated the experiment three times with each different scenario. After completing the three test trials I did a final trial with a food scale under the vehicle to show any extra weight due to drag that was added to the vehicle. I also tested the wind speed from the fan using an anemometer to show how fast the vehicle would be traveling if in motion.</p> <p><b>Results</b> After doing the experiment three times with each method, I proved that it is actually more aerodynamically efficient to drive with the tailgate off than it is to drive with it up or down. When the tailgate was down the wind traveled over the cab but would land directly on the tailgate pushing the bed down and causing more drag in the rear of the vehicle. The second method tested was with the tailgate up. This method created an eddy in the bed of the vehicle and almost all incoming air circulated over the bed of the truck because the eddy pushed the incoming air over the bed. The most efficient was with the tailgate off. The air traveled over the cab, over the bed, and didn't touch the rear of the truck.</p> <p><b>Conclusions/Discussion</b> After completing the experiment I determined that my hypothesis of driving with the tailgate down was not correct. Driving with the tailgate down in fact decreases the vehicles aerodynamic efficiency by creating drag on the bed of the vehicle which adds more weight to the rear. In fact, this was the least efficient method because I presume it would cause the vehicle to use more gas to maintain the same speed. If you were looking for the best way to save money on gas, driving with the tailgate off would prove most effective.</p>	
<b>Summary Statement</b> My project is an experiment testing whether it is more aerodynamically efficient to drive a truck with the tailgate up, down, or completely off.	
<b>Help Received</b> No outside help received.	