



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Darren R. Reis	Project Number S0219
Project Title Why Not 50 Miles Per Gallon?	
Abstract Objectives/Goals I hypothesize Gas mileage can be considerably improved by greatly reducing both the rolling resistance and aerodynamic resistance to a small enough level such that a much more efficient electric motor can intermittently take the place of the highly inefficient, internal combustion engine at highway speeds. Methods/Materials My plan was a) to reduce the air resistance by re-shaping the vehicle and then, b) reduce the rolling resistance by cutting down the effective contact area of the tires. The goal was to get the two drag terms low enough so that I could switch off the gas engine at highway speeds and replace it with a much more efficient electric motor. But, when needed, the gas engine could be switched back on to accelerate the car with good performance. To test my hypothesis, I built a 7-foot wind tunnel, a microcomputer data logger and a 50 MPH radio control car and completed five separate experiments. Results After several months of testing, my final design concept for reducing the air resistance was a symmetric airfoil with a Kammback tail. After extensive testing in my wind tunnel, this airfoil has better than half the air resistance of a conventional sedan and would reduce the air resistance drag term from 100 lbs at 60 MPH to less than 50 lbs. Some of the testing I could do in my 30 MPH wind tunnel, but to really understand whether this concept would work, I had to take it to the field. Courtesy of NASA Ames, I conducted field-testing of my concept car on an R/C platform at one of their taxiways. I ran a control sedan test at 50 MPH and measured the power requirements via my data-logger and then did the same with my concept vehicle. Based on the real time data collected by the microcomputer I programmed, the power savings were the factor three improvement that I expected. Conclusions/Discussion So in summary, what we have is a new pioneer in highway transportation. By greatly reducing the air resistance and rolling resistance of a car at highway speeds, I can intermittently replace the very inefficient gas engine with an efficient electric motor. This electric motor efficiently powers the car on the highway such that the gas engine can be switched on and off when needed. The result of my research is that highway speed gas mileage can be increased from the typical 25 MPG today to well over 50 MPG.	
Summary Statement My project proves that by altering the shape and the propulsion of a car, great gas mileage can be achieved without sacrificing great performance.	
Help Received Dad helped wire and taught me BASIC; 2 Neighbors helped with the set up of the real world testing; Charlie Suangka helped improve the R/C car	