



**CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY**

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Project Title Project Pine Car: Mass and Propeller Variations on Vehicle Efficiency	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of the experiment was to know which variables such as mass and propeller pitch create an efficient air propulsion system on land. The experiment was to find a good combination between mass and propeller pitch that would create the most efficient propulsion system.</p> <p>Methods/Materials The experiment included 3 pine cars, 6 plastic wheels, 3 metal axles, 9 9-volt batteries, 1 205.11 cm long track, insulated wire, hobby motors, varied propellers, duct tape, stop watch, ruler, spray paints, clay, toothpicks, square wooden rods, tape measure, switches, hot glue, drill, Dremel tool, 9 washers, and a protractor. The experiment is first done by making the track with a narrower piece down the middle with a bumper on one side and a start on the other, pine cars are fitted with identical motors and varied propellers and weights to be tested. Afterwards, the cars are moved through the track, while being timed, testing weight sets and propeller pitch variations. Afterwards, the times were recorded, and the testing was completed. The independent variables were the weight sets, the propellers (size and pitch), the 25 degree uphill, and 25 degree downhill tracks. The controlled variables were the track length, the motor used, the car type, the material used in the car, and the kind of battery used. The dependent variable was the speed of the car.</p> <p>Results Propeller one with a 75 - 45 degree propeller proved to be the fastest at the straight track with no variation at 92.4 cm/s on the track average. Propeller one with no added weight went uphill fastest at 83.7 cm/s. On the downhill track however, the control propeller seemed to move the fastest 89.2 cm/s. When testing propellers with different weight sets, the fastest proved to be weight set one(6.9 g) with propeller two at 85.8 cm/s. On the downhill track, variation of weight set 1 and propeller 1 gave the fastest speed at 102.6 cm/s. On the uphill track, the variation with the fastest speed was 91.2 cm/s.</p> <p>Conclusions/Discussion When all of the testing was completed, it was concluded that the cars with a higher degree of pitch (75 - 45 degree pitch), larger size of propeller, and with few added weights can produce the most efficient air propulsion.</p>	
Summary Statement The objective of the experiment was to know which variables such as mass and propeller pitch create an efficient air propulsion system on land.	
Help Received Mr. Vanegas, and Mr. & Mrs. Abato-Earwood helped in tool use. Mr. Saramosing advised us on the project.	