



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

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| Name(s) Ryan D. Sloane | Project Number 33808 |
| Project Title Going with the Wind | |
| Abstract Objectives/Goals To determine which factor of a wind turbine blade is responsible for efficiency, surface area or the shape of the blade. I tested eight different shaped blades that had equal surface area. My hypothesis was that if surface area was the deciding factor then all blade sets would have approximately the same output. But if shape turned out to be the most important factor then there would be different outputs produced by each blade. I started my project believing that shape would be the factor that influenced efficiency. I worked hard to design an experiment that had only a single variable of blade shape. Methods/Materials I constructed a wind turbine out of recycled printer parts that had an adjustable mandrel that could be used to test each blade shape at seven different angles. Using an electric meter I was able to measure the electrical output of each blade type in volts DC. Each blade type was tested at three different wind speeds created by a box fan array. The blades were made from thin scrap plywood and all different shapes had an equal surface area of 96 square inches. Each blade set created a power curve that could be compared to the others. I defined efficiency as the average output for each blade set at the three tested speeds. Results I was expecting the blade sets to have different outputs, but I was very surprised when the half circle shaped blade(#8) far outperformed the others. Of the eight tested shapes, one outperformed the group, six were fairly close in outputs, and one lagged the group. This experiment created a large amount of data that clearly defined the results. Conclusions/Discussion The half circle blade set(#8) far outperformed the rest of the test group. Shape was the factor that influenced output the most. My analysis is that the half circle when tested at 75 degrees formed a simple airfoil that increased efficiency by creating lift. I base this observation on the idea that most airfoils in aviation have a curved upper surface over a lower straight surface. If I continued this experiment I would examine blades with curved surfaces that would influence efficiency. | |
| Summary Statement Testing which factor influences wind turbine blade efficiency, shape or surface area? | |
| Help Received Father help construct the wind turbine.(Table saw and power tool operation.) | |