Design and Fabrication of Wind Turbine

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Introduction

Project Purpose:

- to design and fabricate a turbine rotor blade
- to design and create the support structure
- to determine the power output of the turbine
- to determine the stiffness of the support structure

Goals:

- to create an efficient, visually appealing turbine.
- to create a solid, sturdy structure.

Introduction

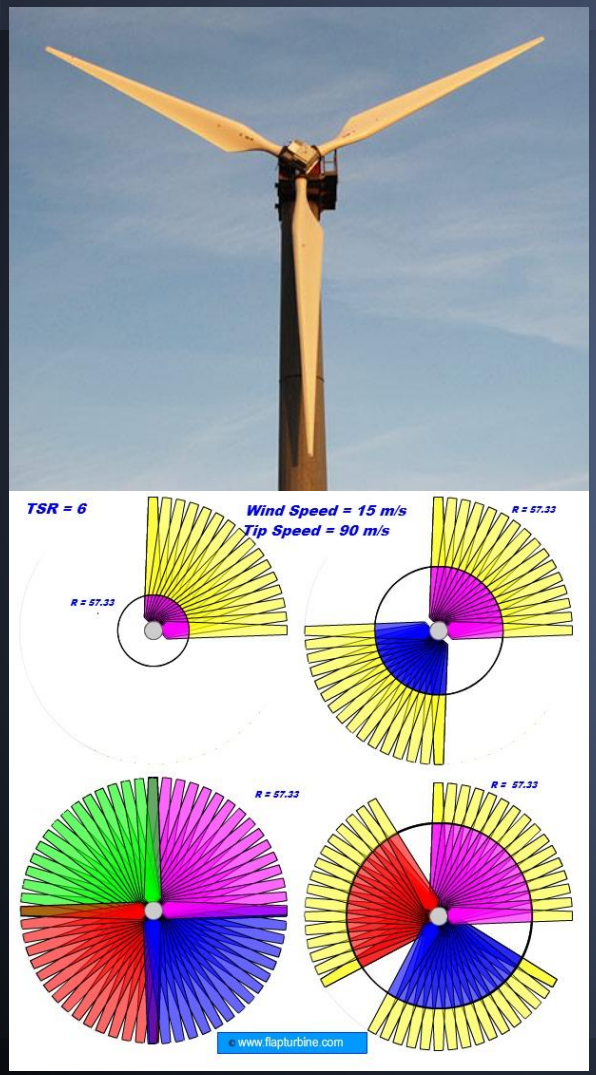
Design constraints and variables for blade:

- Blade length
- Blade weight
- Blade thickness
- Blade shape
- Blade number
- Angle of attack

Design constraints and variables for structure:

- Materials and structural integrity

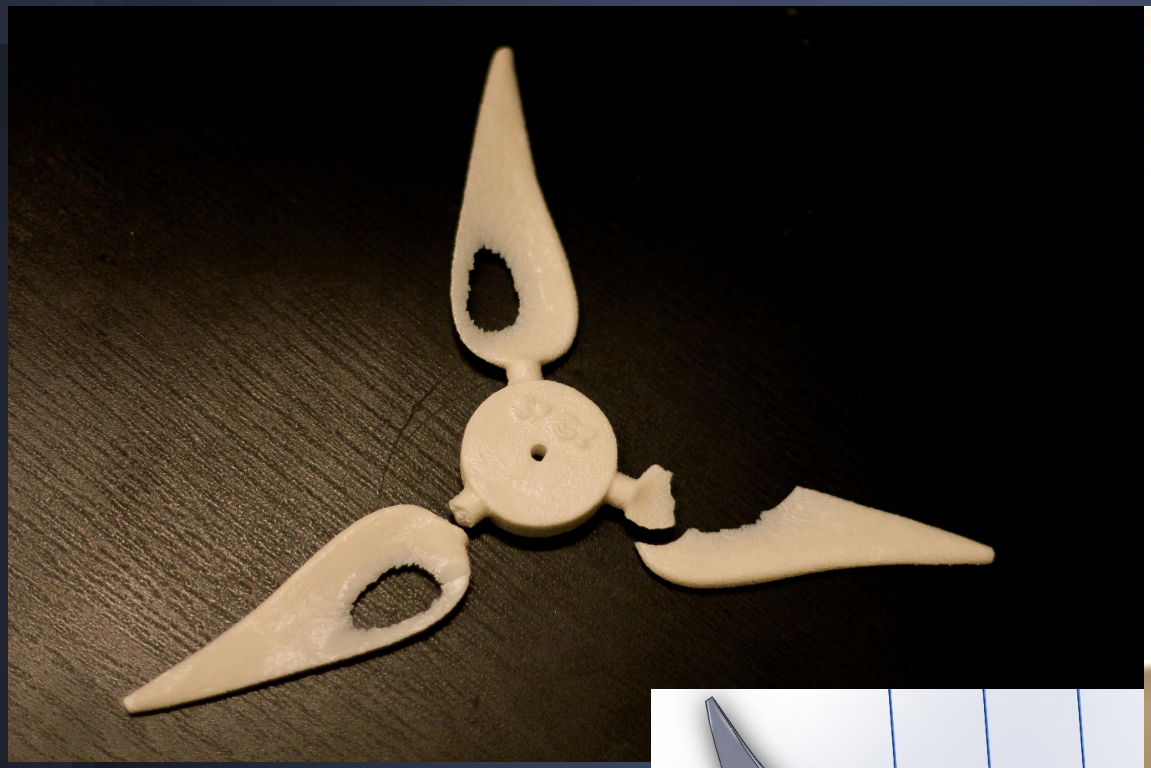
Design of Turbine Blade



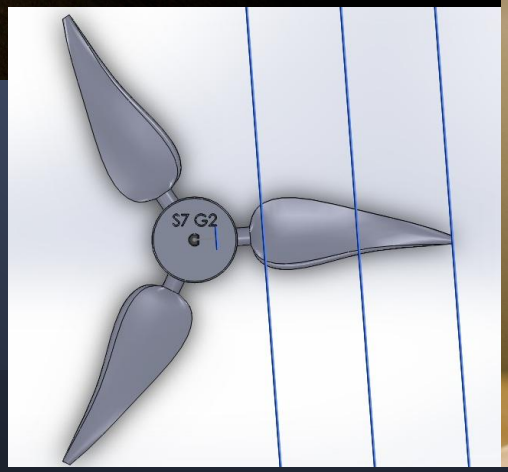
We tried to emulate a design that was would provide high efficiency according to this model.

We found that a 3-bladed design would provide the most effective energy output due to area of wind sweep without increasing drag.

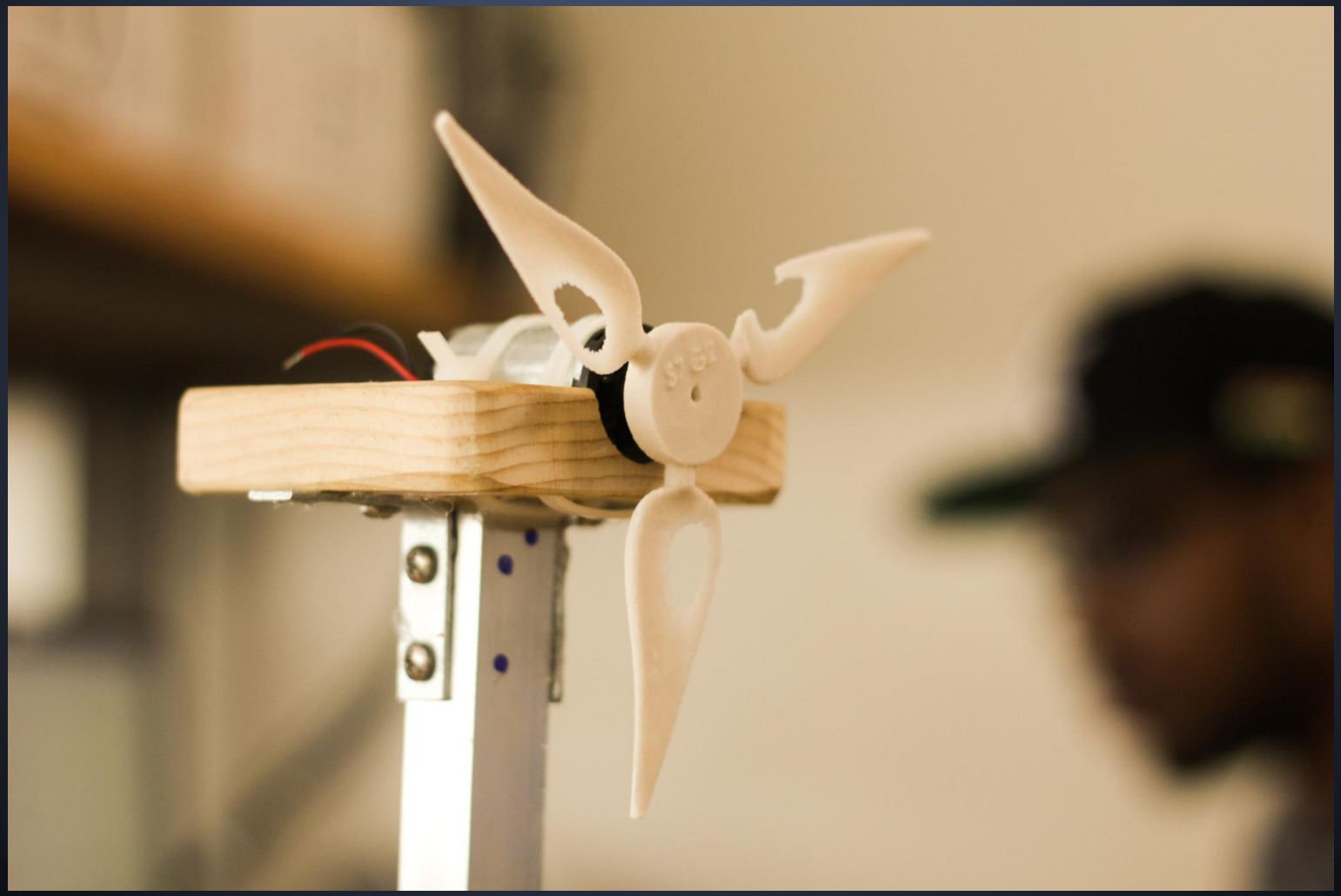
Replacement of Turbine Blade



R.I.P S7 G2

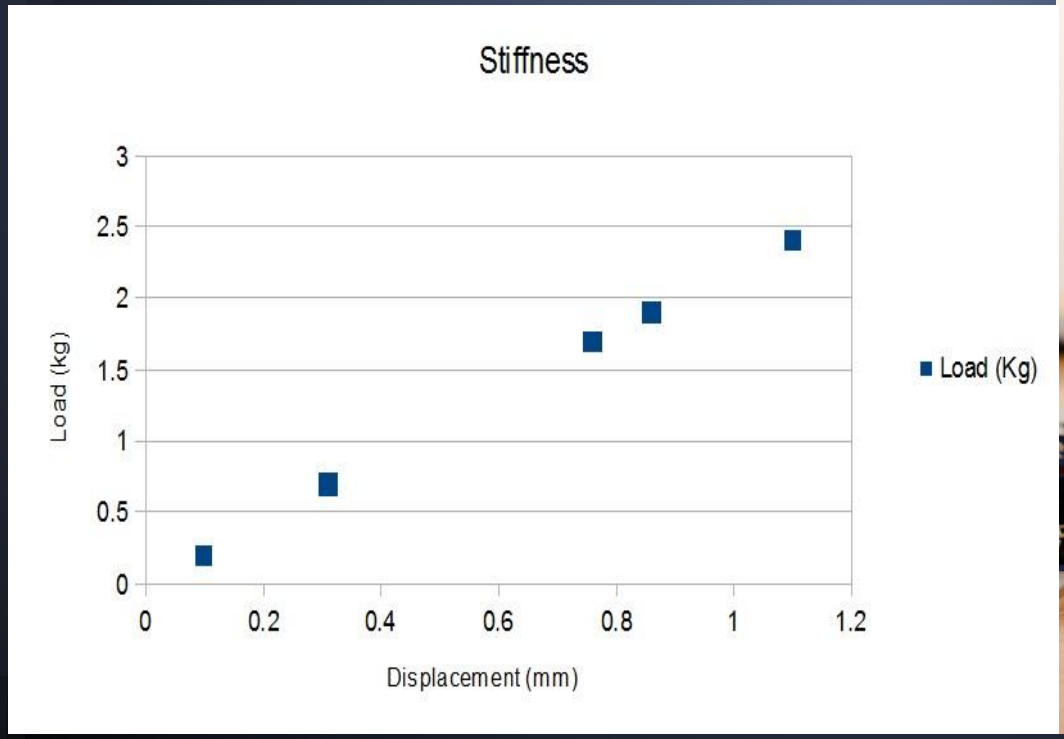


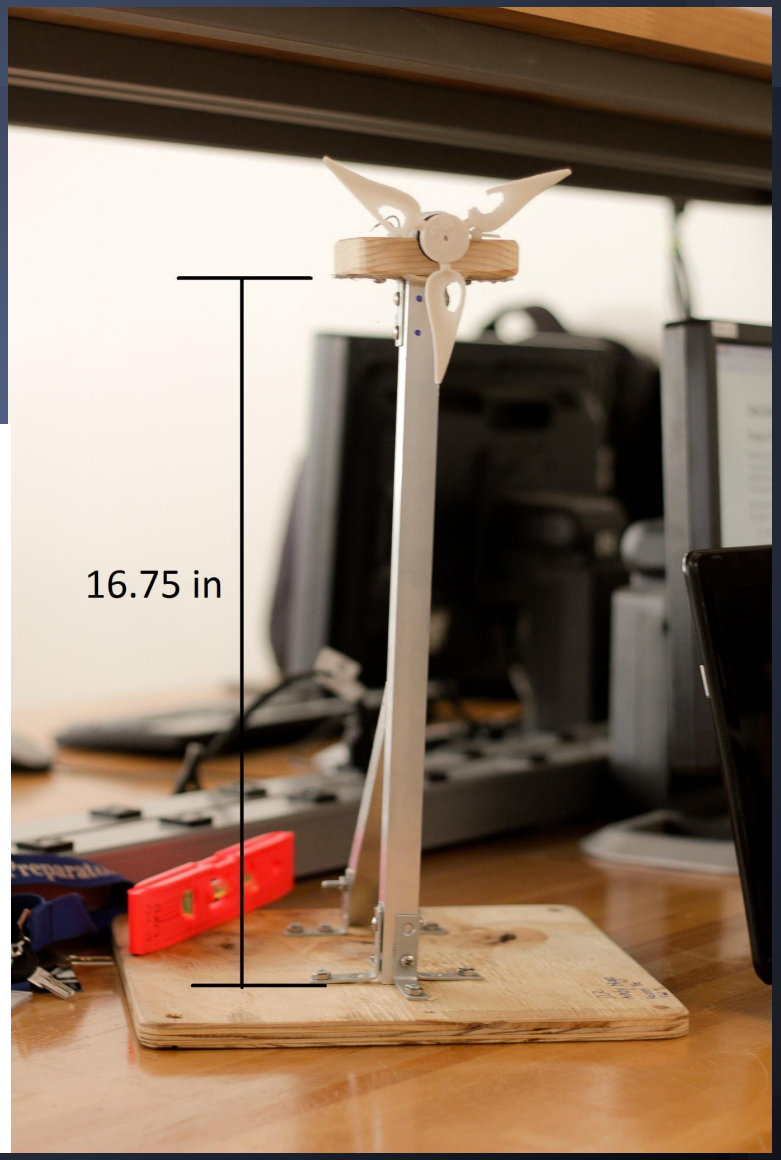
Design of Turbine Blade



Structure Specifications

- Material: Aluminum
- Height: 16 3/4 inches
- Weight:1205 g = 1.205kg



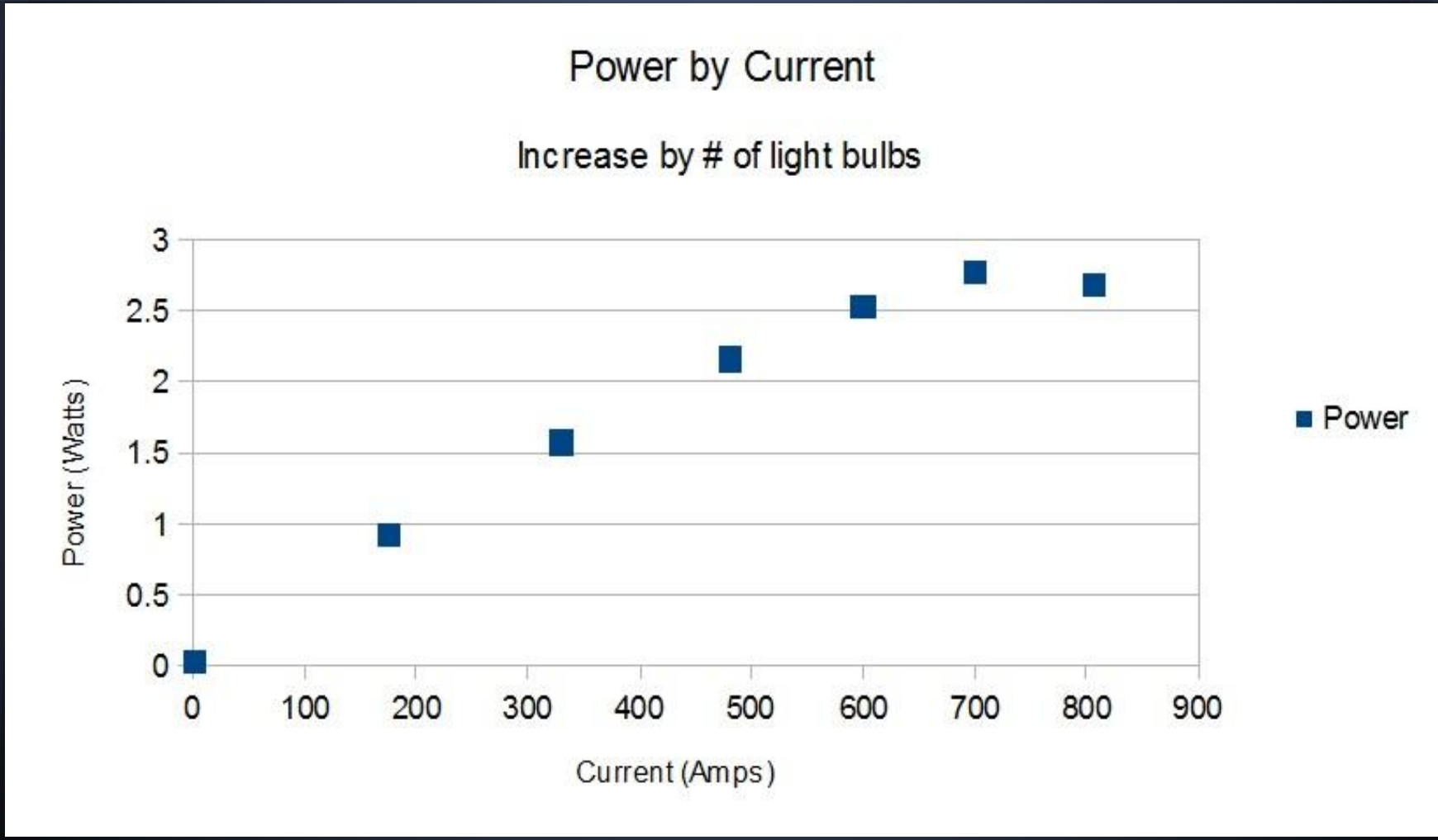


Testing the Turbine Blade

To properly test the efficiency of the turbine, our project underwent wind testing from an industrial-like fan at 29 mph top speed.

Included with the wind speed, we add 6 lightbulbs to test Voltage, Power, and Current from the turbine. The number of lightbulbs are increased over a course of time for proper analyzation.

Performance of the Wind Turbine Statistics



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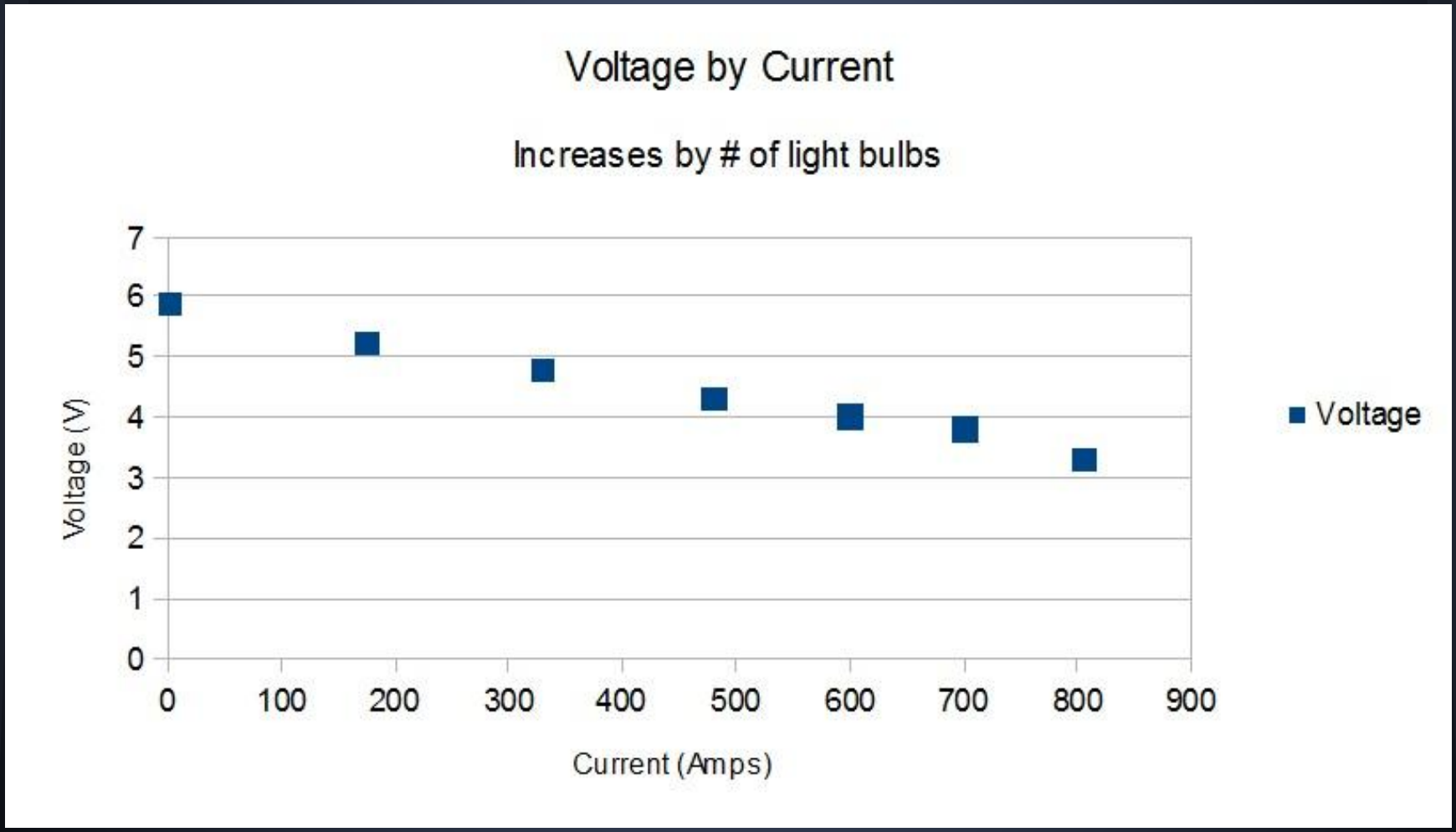

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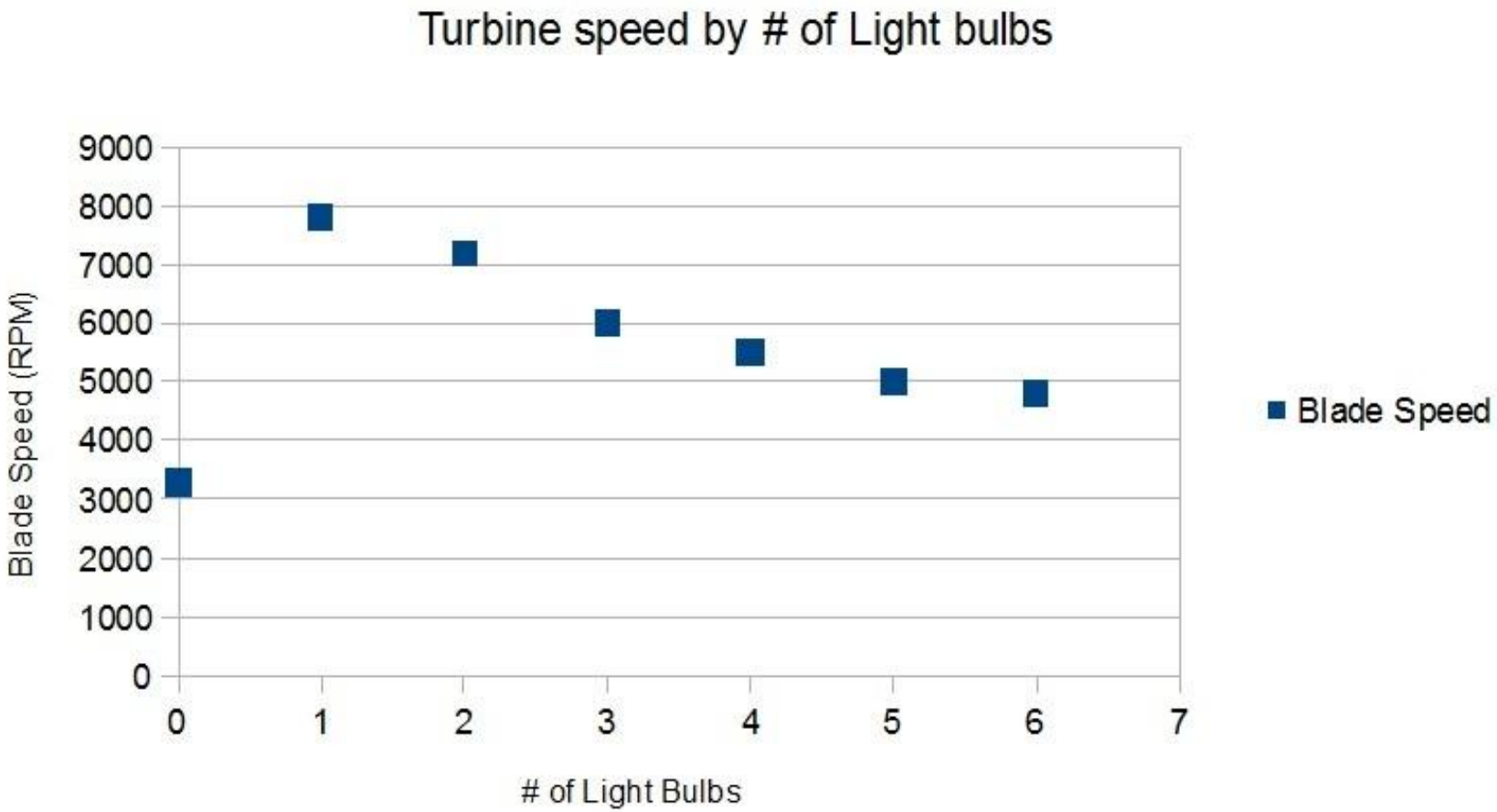

Performance Results

Overall our 3-bladed design was well built to undertake the power of the high-speed fan during experimentation.

During testing we observe that as the number of light bulbs increase the Power increases as well. In vice versa Voltage is decreased, while both displayed the same level of Currents.

The Speed of the blade however, decreased as we increased the number of light bulbs present.

Conclusion

Project Summary

- Everyone did their part on time
- Materials and tools were easily available
- Original Design blade broke
- Non-contact Tachometer ran out of batteries
- Disagreements on designs of the tower

Recommendations for future work:

- Create a thicker, more durable blade
- Designing Single Blade? Whale-fin type blade?
- Structure integrity & design with Cables