## Team Info and Research Statement

Team Name: Carolina Bruin Bears

Team Members: Ryan, Pierce, and Alex

### Team Info

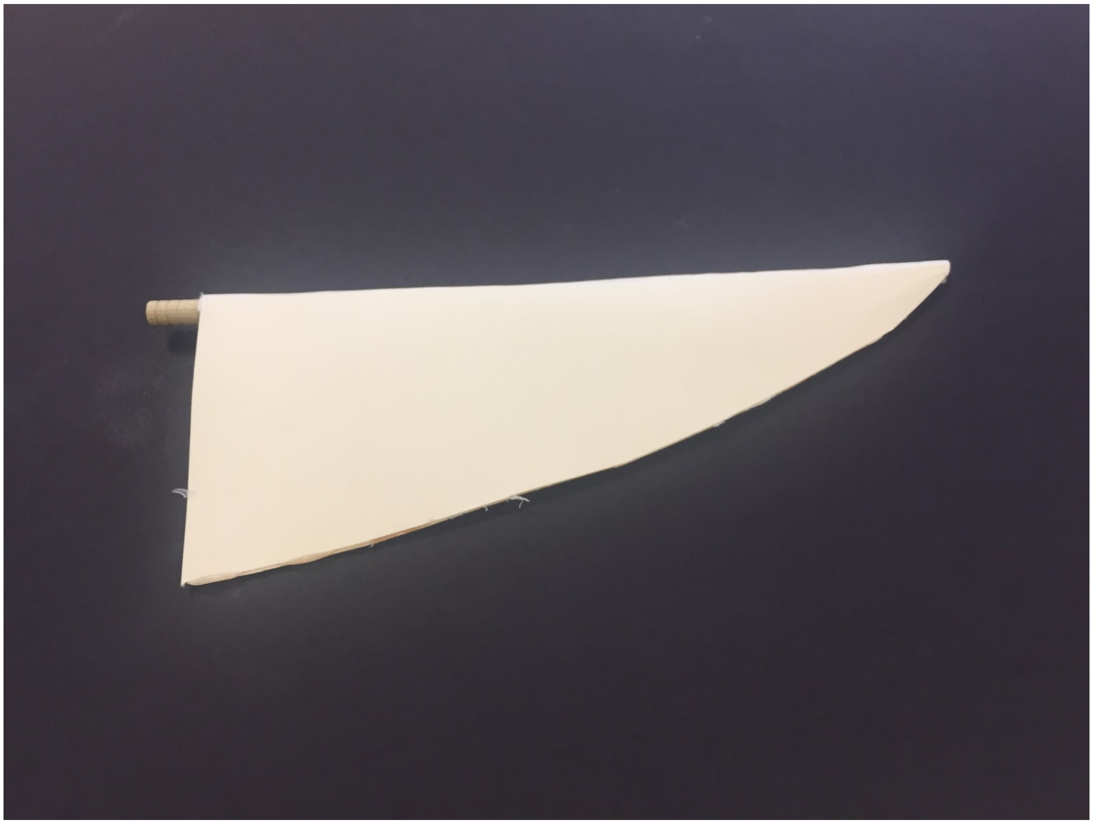
Our names are Ryan, Pierce, and Alex. We go to Ravenscroft School in North Carolina, and we are in 7th grade. We are taking the Engineering 1 class and taking on the KidWind Challenge. We used the engineering design process to create, build, and test our turbines. At first we asked about the problem, then imagined possible solutions, then planned how we were going to create the solution, then created and brought our plan to life, next we improved our creation, and finally we communicated and received feedback from others. Designing wind turbines is important because in the near future, all of the fossil fuels and oils we use to power cars, engines, electricity, and just about everything else will run out. Using renewable, efficient, and cheap energy will allow for a cleaner way of producing electricity. With cleaner energy comes a cleaner and healthier environment.

### Research Statement

We used the engineering design process when designing and testing our turbines. What we did in the ask part of the process was we asked about the best design for a blade, what were the best pitches to use, how long should the blades be, and how many blades to use on the turbine. We then thought about how airfoil blades would do using blade pitches that were from -25 to 20, then we thought about smaller blades in fours. We thought "outside the box" to make the best turbine. Then we planned it out, we sketched the idea, and then cut it out and tried out the design. We made 3 different blade designs, a curved triangle file folder airfoil, a curved triangle cereal box, and a paper towel roll half cylinder. With all of these design came flaws and needing improvement, but we put our heads together and made our turbines better. We changed the angle, material, number of blades, resistance, and even the shape of the blades. We recorded data for every single test we did, and found our best power and efficiency. We then talked to others and communicated our ideas to find better, more efficient, more creative, and more powerful blades.  The variables we kept constant while testing were the distance from fan (15cm) for the most wind catching and the fan setting (3) for the most wind. The variables we changed during the testing were resistance, number of blades to catch the most wind, blade pitch to find the best angle, blade material to find light but sturdy material, and the length and width of the blades to catch the most air.

**File Folder Flyer**

Our first blade was an airfoil; it had a tiny curve where the dowel was. The inspiration was a regular turbine it has a little curve at a point. The materials were file folder and a dowel. The length of the blade was 22.5 cm. We had some ups and downs; we had a mean power of 629.9 mW and one was 21.80 mW. Our resistance was always around 100 (Ω). Lastly, the negative angle was always the best.



Data:

| Trial | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Number of blades | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| Blade pitch (°) | 10° | 10 ° | -10° | 20° | -20° | -10 | -15 | -5 |
| Resistance (Ω) | 100 | 100 | 100 | 100 | 96 | 97 | 100 | 100 |
| Mean power (mW) | 523.8 | 21.80 | 161.2 | 231.2 | 629.9 | 610.9 | 625.4 | 503.4 |
| Mean potential (V) | 7.184 | 1.468 | -3.970 | 4.817 | 7.789 | 7.669 | 7.776 | 7.242 |

**The Cereal Spinner**

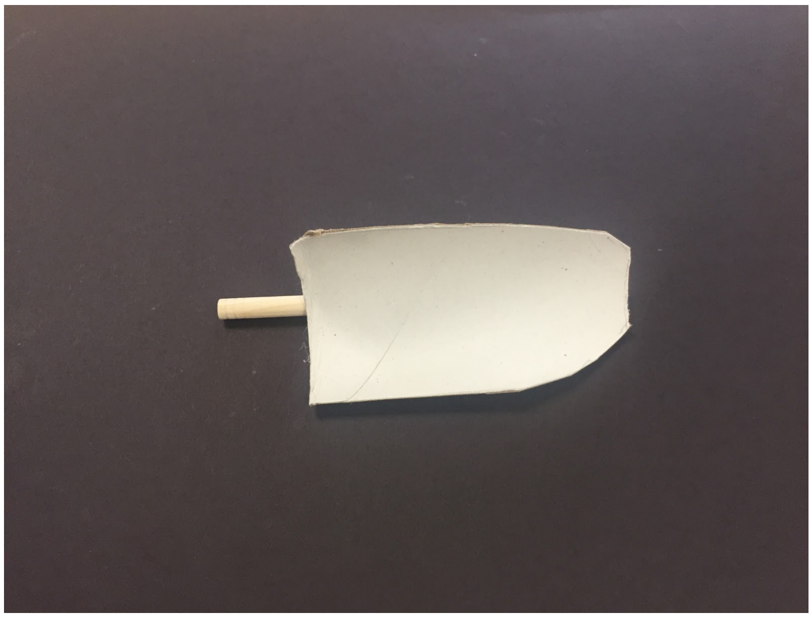
Our second blade the blade was a rectangle with a triangle at the end, it was made out of cardboard cereal box and a dowel. The inspiration for this blade was a bird's wings. The materials were cardboard and a dowel. The length of the blade was 19.5 cm. The results were very good at the beginning of the test but slowly got worse. At the end we had a mean power high of 1050 (mW).


Data:

| Trial | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Number of blades | 3 | 3 | 3 | 3 | 2 | 4 | 4 | 4 |
| Blade pitch (°) | -20 | -10 | -15 | -25 | -15 | -15 | -20 | -10 |
| Resistance (Ω) | 100 | 98 | 100 | 99.5 | 99.5 | 99.5 | 100 | 102 |
| Mean power (mW) | 679.2 | 66.97 | 734.4 | 684 | 132.8 | 1050 | 1014 | 848.1 |
| Mean potential (V) | 8.239 | 2.562 | 8.537 | 8.257 | 3.657 | 10.15 | 9.975 | 9.328 |

**The Half Egg**

The Half Egg was a half cylinder made out of paper towel roll. The inspiration was that we wanted a creative but completely curved blade, because some turbines have twisted/curved blades. We used only paper towel roll, and used our first cut out to trace the rest. The blades length was 16 cm from the center of the hub, which was the radius of the turbine. The results were anywhere from 200 - 350 mW. We changed the number of blades and the blade pitch in our 3 tests. The Half Egg was definitely not our best design, but it sure was a cool concept of a half egg out of paper towel rolls.



Data:

| Trial | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Number of blades | 4 | 6 | 6 | 3 |
| Blade pitch (°) | -10° | -20° | -5° | -15° |
| Resistance (Ω) | 99 Ω | 96 Ω | 96 Ω | 100 Ω |
| Mean power (mW) | 320.8 mW | 211.4 mW | 306.5 mW | 246.0 mW |
| Mean potential (V) | 5.613 V | 4.500 V | 5.509 V | 4.984 V |