**December 4, 2020**

I decided to not do my original idea for the science fair and am trying to find one.

**December 5, 2020**

I figured out what I’m going to do. I’m going to build a bottle rocket. I am very interested in space and have read up on space and rockets. I wonder if I make a rocket using different size pop bottles which one will go higher.

**December 12, 2020**

We have launched all the different size bottle rockets and have launched each one six times. We have launched a 250 ml bottle, 500 ml bottle, 1l bottle, 2l bottle. We had to measure the distance from where we launched the bottle to where I was measuring the height. We had to build a base from which to launch the bottle from so that our launching is consistent. We are using a modified bicycle pump that can measure the psi. We are pumping it to 40 psi before launching it. The 2l bottle went the highest by far. I wonder if I change the size of the nozzle if it would change the height, we can reach with a 2l bottle, because if I can make air come from the bottle faster then maybe the bottle will go higher. I am not sure how to adjust the size of the nozzle yet.

Material list:

1. 250 ml bottle
2. 500 ml bottle
3. 1 litre bottle
4. 2 litre bottle
5. Wooden plank
6. Metal rod
7. Duct tape
8. Bicycle pump that measures psi
9. Straw
10. Altimeter
11. Measuring tape – up to 60 meter

Procedure

1. Attach a straw to each of the different size bottles.
2. Cut a metal or wooden piece to measure 13cm x 25cm.
3. Cut rectangles of 3.5 x 4.5 cm from plywood. Glue the blocks together and further enforce it using duct tape.
4. Cut 10cm x 3.5 cm wooden rectangles from plywood and glue it together. Drill a 3mm whole in the larger plywood blocks to insert metal rod.
5. Use a metal rod to string in the straw that is attached to the bottle.
6. Put a nozzle of bottle in between plywood blocks.
7. Insert end of bicycle pump into bottle nozzle.
8. Pump bicycle pump to 40 psi.
9. Release bottle at 40 psi.
10. Measure height of bottle using the altimeter

Results

250 ml bottle - 10.5, 12, 12, 12, 13.5, 12

500 ml bottle - 10.5, 15, 15, 12, 12, 13.5

1l bottle - 17, 16, 15, 16.5, 17, 17

2l bottle - 19, 22, 20.5, 20.5, 20, 22

**December 19, 2020**

We are going to launch more 2-liter bottle rockets except with different size nozzles. We have drilled different size holes in cork screws. It was tricky to get the whole in the middle and the size we wanted them to be. I think that the biggest nozzle will make the bottle go the highest because there is more area for the air to leave the bottle making the thrust more.

**December 28, 2020**

We have launched 3 out of 5 different size nozzle bottle rockets six times each. I am using an altimeter altitude tracker made by Esti to measure how high the bottles go. We have run into some problems getting an accurate height measurement since we had a few days of mild to strong winds that made it impossible to get accurate and repeatable measurements. Today the wind was not very strong right before the sun set and we managed to get repetitive results. Even though we are getting consistent results using the Esti tool, we are starting to wonder about the accuracy of the Esti tool since only a few millimeters in height can make a drastic effect on the height measured and we did not get the same measurements as a few days ago when the wind was about the same as today.

**January 3, 2021**

We have finished launching all the bottle rockets 6 times. We used the same material and procedure as described above. Although the measurements seem consistent, we are starting to wonder if the height is actually accurate.

**January 9, 2021**

I have started my PowerPoint slide presentation and it is going well. Since this experiment seems to have gone in phases I have to think about how I am going to present this. We have also started to design different ideas to launch the rocket from indoors and on a string in our basement. The basement is about 22m long and launching it indoors might give us more accurate results than launching it outside. Also, I can test the bottles any day because we are not dependent on the weather. We want to spin a string across the basement and then launch the bottles with the different size nozzles on the string measuring the distance they travelled. Our basement is not long enough to launch the 2l bottle. It goes all the way and then hits the wall at the other end of the basement. We are going to add a c size battery to the bottom of the bottle to make it go slower so that it does not hit the wall from the far end but stops before it reaches the other side. Throughout all our launches we have used the same bicycle pump, pumping it up to 40 PSI.

**January 10, 2021**

The experiment seems to work. We used fishing string (nylon string) and a straw, and the straw cracked on the first launch. Then we used a plastic tube from a pen and that also cracked. Now we are hoping a metallic tube is stronger. We have bought the new stuff and tested it and it doesn't work that well so now we’re not using a metal tube because it cuts the string no matter how strong. But now we're using a pretty strong string and were looking for a tube that won’t cut the string. We found a piece of metal that is smooth and does not cut the string and it seems to be working.

Material

1. Four 2 litre pop bottles
2. At least 4 corks
3. A step drill bit
4. Glue
5. Duct tape
6. Nylon rope
7. Weights
8. At least four AA batteries
9. At least four 3/8” compression sleeves
10. A bicycle air pump that has a dial that shows the air pressure
11. Gloves
12. Ear protection

Procedure

1. Drill 3 different size holes into 3 corks with a step drill bit
2. Glue the corks to the inside of each bottle and wait for it to dry
3. Attach 4 compression sleeves symmetrically to a 2 litre plastic pop bottle
4. Attach 4 AA batteries symmetrically to the bottle
5. Measure the distance between each compression sleeve to determine the width at which the rope will be strung
6. String the rope using weights on both sides to keep the rope tight; at least 18 meter distance

Results

Bottle A - 13.2, 12.67, 14.35, 11.67, 13.4, 12.57, 15, 11.96, 12.38, 14.68

Bottle B - 10.85, 12.43, 11.73, 11.87, 10.22, 10.28, 13.88, 11.37, 10.69, 10.53

Bottle C - 12.43, 13.35, 12.14, 10.79, 12.37, 11.48, 13, 12.37, 13.57, 13.47

Bottle D - 10.7, 11.72, 11.68, 11.2, 10.25, 13.32, 11.25, 12.82, 11.88, 13.04

**January 14, 2021**

We have decided to more accurately measure and more efficiently launch by launching it indoors in a different way because it’s too unbalanced and wiggles a lot on the one string and we need it to be more balanced. Now we're using 2 strings and distributing the weight a little more evenly by adding 2 AA batteries on the top and 2 more on the bottom.

**January 16, 2021**

We have finished launching 2 out of 4 of the rockets and have gotten a lot of work done on the slide show and I will hopefully be done by the end of the week.

**January 24, 2021**

We have finished launching all the rockets and I have finished my slide show and I am ready to present to the class on Tuesday.