Fly Rocket Fly

PPAP (Pink Purple and Pink)

Maximum Distance: 210 yd

Date:

Purpose

What is the best way to take 2 liter bottles and other material to create a bottle rocket that not just can fly but can go the maximum distance?

Literature Review

When doing studies on rockets you will read other people's rocket design reports. Learning ways to make the best rocket and the best ways to launch them. After the studies and also lots of our own experiments, I learned of the pros and cons of fin shapes, ideal mass, nose cone, how the secure the rocket, and other general things about making the best rocket you can.

When designing the fins of your rocket the first choice you should make is what material will you be using. For example; cardboard , sheet metal, plastic and even wood are materials that people will use for their fins. My partner and I used to different fin materials cardboard and plastic. We chose to use cardboard and plastic because unlike sheet metal they are easy to use and more accessible, and unlike wood they are easy to form into fin shapes. When it came to fin shape we chose two different designs the basic right triangle and the parallelogram after launching rocket we can conclude that both are fins did not make a difference when it came to increasing distance. Also you should make sure that the fins are never more than half the size of your bottle rocket and they are placed on the end of your rocket.

When designing a nose cone for your rocket what you are looking for is something that is aerodynamic. Now there are lots of different shapes you can make you nose cone and lots of different ways you secure them on and keep them sturdy. There are two different simple designs there's a cone shaped nose cone, and a rounded one. When using a cone shaped cone on your rocket you will experience what I want to call speed wobbles, there not exactly the same as speed wobble you

have on a skateboard but when you rocket flies the back end of you rocket will do circles in flight. When using a rounded nose cone you will get less of the speed wobbles.

When securing pieces to you rocket there are two main material people use, duct tape and superglue. Now both of these adhesive are both very good for securing pieces onto your rocket. When you need to attach your fins to your rocket I think if you want to do the best you can use both duct tape and superglue. I learned that when you use super glue to attach the fins there is a better chance they will stay attached after impact. When using duct tape don't use a lot. Only use duct tape in places that really need it if you use too much duct tape it ruins the aerodynamics of your rocket. Use the tape to secure the fins and the two separate piece of bottle together. I say use less because you can add more mass later in the process of making your rocket and the more duct tape the more unnecessary mass you have.

Ideal mass is very important when create a great rocket. The majority of the mass in you rocket should be located in the nose cone. When you do your research you will find lots of different answers for ideal mass. My ideal mass would be around 200 grams. From experience I've learned is the lighter it is the farther it will go. A rocket with a very simple design and with one golf ball and hot glue glue as a weight is a great rocket, When you measure ideal mass it does not include the water ideal mass should be measured without water. Make sure you have a nice balanced rocket most of the weight should be in the nose cone.

Building your rocket should be stressful. You will have to buy a lot of things to make a bottle rocket. And the material you will need are easy to get. You can easily find cardboard in your house to make the fins of your rockets use cereal boxes or pizza boxes because they are easy get and you probably won't have to pay for them. Glue and duct tape is not hard to get. The only difficult to do is that it not easy get super glue you may to use super glue and you may have to get some at a hardware store for around 5 dollars, but if you're lucky you could just ask you parent if they have any and they most like will. Getting bottles also isn't hard to get but if you don't have any you can got to stewarts and buy some soda there for cheap. These are some things I learn about making rocket. Also when you doing this it's important to stay ahead because you next launch day is closer than you think and you will always have repairs to do.

Testing and Development

Mission #1

2016, Sep 20

Mission #1 Preparation: To prepare for my Lit Review I got a pencil and my lab notebook

Mission #1 Results: Things I learned from Lit Review are that the ideal mass is 350-400. Its best to face the rocket toward the wind. Place fins securely on the back of the rocket. Recommended pressure is around 120 Psi. Structural integrity is important because you want a racket that can take an impact.

Mission #1 Recommendations: I need to learn more about angle of launch, fin size and shape.

Mission #2

2016, Sep 22

Mission #2 Preparation: Our whole class got ready to go outside to learn how to launch.

Mission #2 Results: We learned the basic about how to setup and use the launcher we also got to launch a rocket a two for example. We made sure everything works and this are set for rocket launches.

Mission #2 Recommendations: We need to learn how to be efficient and how to to assign people to certain jobs.

Mission #3

2016, Sep 26

Mission #3 Preparation: To prepare for my Lit Review I got a pencil and my lab notebook

Mission #3 Results: I learned that 45 degrees will not be the optimal angle for a launch but 60 degrees will be. I learned also ideal mass is 120 psi and that less than 350 gram of weight should be added to the nose cone of your rocket to have a nice ideal mass.

Use triangle fins and use super glue to secure parts of the rocket together.

Mission #3 Recommendations: does the 350 ideal mass also include water? Some more studying should be done but most importantly i need to make my own rocket.

Mission #4

2016, Sep 28

Mission #4 Preparation: We had basic materials. Two 2 liter bottles cardboard glue and duct tape.

Mission #4 Results: I used the scissors to cut the bottles in half then i use the two have and glued them together. I the used a golf ball as a weight in the nose cone and after all that i cut out a basic triangle and tape them to the rocket.

Mission #4 Recommendations: I had to have made a different rocket because the one made on construction day was a pretty bad prototype that probably would fly well.

Mission #5

2016, Sep 30

Mission #5 Preparations: As a class we took everything we needed over to the practice field near the bus garage.

Mission #5 Results: On launch day one, I learned that Nate Shader, Jacob Thompson and I will probably end up doing launch crew. Others may want to do launch crew but they would need to learn how to use ratchet straps first.

The Mistake: Results

Distance	Angle	PSI
175	32	110

Mission #5 Recommendations: Or rocket nose cone had to be improved and so did our fins.Our class needs better teamwork when it come to collecting rockets. Our first rocket flew really well at least that what we thought, but since it was only our first launch we wouldn't now.

Mission #6

2016, Oct 4

Mission #6 Preparations: We used the same rocket but with multiple improvement to the nose cone and fins.

Mission #6 Results: When observing our rocket that day we realized it was not going as far as we hoped and would descend quickly. The Mistake flew well but took a lot of damage in the nosecone and the fins. We only got one launch of and it wasn't a very far launch at 120 yards.

The Mistake: Results

Distance	Angle	PSI
120	32	110

Mission #6 Recommendations: We learned that our rocket was to heavy, weighing in at 350 grams. We decided The Mistake had taken too much damage and decide to use a new rocket and retired The Mistake.

Mission #7

2016, Oct 6

Mission #7 Preparations: Our new rocket we used a golf ball as our weight and as a support in the nose cone, we used two bottle ends and a golf ball in between as a nose cone. Our new rocket fins are made from cardboard and we cut out in the shape of triangles. Our rocket weighted 153.

Mission #7 Results: For its first flight our new Cheetah rocket worked decently. Our nose cone held up really well, like it was supposed to.

Cheetah: Results

Distance	Angle	PSI
115	32	115

Mission #7 Recommendations: At the time we thought we should test out different rocket designs so that we can figure out what the optimal design for a rocket is.

Mission #8

2016, Oct 12

Mission #8 Preparations: We had two rockets Cheetah and a new rocket Blue. Our new rocket had only one big difference and that was that it had four fins instead of three.

Mission #8 Results: Both Rockets flew well, but after the launch day Blue was in bad condition and did not fly as well as our other rocket, blue did not have good nose cone.

Blue: Results

Distance	Angle	PSI
110	45	115

Cheetah: Result

Distance	Angle	PSI
195 185	45 45	120 110

Mission #8 Recommendations: So we decide to scrap Blue and keep on improving on Cheetah. Blue didn't have the structural integrity that we needed so we decide to just keep just keep using Cheetah

Mission #9

2016, Oct 14

Mission #9 Preparation: To improve on Cheetah we decided it needed more weight because last launch our rocket would have the speed wobbles when it flew, causing the rocket to fly straight up or backwards. To fix this problem we used another golf ball as a weight.

Mission #9 Results: The extra golf help balance the weight of the rocket. That launch day was probably one of the most successful because we launched the rocket twice and both times going over 150 yards

Cheetah: Results

Distance	Angle	PSI
165 175	41 65	120 130

Mission #9 Recommendations: we have to fix up a few parts of the rocket, a lot of our rocket was damage a little from the last two launches.

Mission #10

2016, Oct 18

Mission #10 Preparation: Our rocket was in good condition from the last launches so we did do a lot of preparations

Mission #10 Results: our rocket didn't not fly good that day, it's a wet day so when that happens or fins get flimsy because they're made out of cardboard.

Cheetah: Results

Distance	Angle	PSI
165 155	40 40	135 135

Mission #10 Recommendations: After that launch we had to completely change the fins with new ones.

Mission #11

2016, Oct 20

Mission #11 Preparation: We changed the fins on Cheetah to parallelogram shaped fins and we cover those fins in duct tape to make sure they don't get wet. We also fixed the structural integrity by adding more duct tape to our rocket

Mission #11 Results: Our rocket did great. We had two launches and exceeded what we expected for the launch that day. But as for every launch day our rocket took a lot of damage.

Cheetah: Results

Distance	Angle	PSI
185 170	40 40	135 135

Mission #11 Recommendations: We could probably make another rocket but the one we have now so we want to just try to repair it and use it again.

Mission #12

2016, Oct 24

Mission #12 Preparation: My partner and I did not have our rocket for this launch day

Mission #12 Results: For this launch day in improved on my marking flag so that wind could not break it when I hold it up for the range finder, I used zipties to secure the sheet to the PVC pipes.

N/A

Distance	Angle	PSI
N/A	N/A	N/A

Mission #12 Recommendations: Improve on Cheetah before next launch day.

Mission #13

2016, Oct 26

Mission #13 Preparation: We fixed our racket the best we can before this launch day. Fixing dents in the nose cone and improving structural integrity with duct tape.

Mission #13 Results: Our rocket does not go as far as it used to. Our rocket was very inconsistent in the way it flew varying in distance after each launch proving itself undependable.

Cheetah: Results

Distance	Angle	PSI
108 78 156	45 45 45	135 135 135

Mission #13 Recommendations: My partener and i are going to build one last final rocket but we will not retire cheetah because it's still usable.

Mission #14

2016, Oct 28

Mission #14 Preparation: Our new Rocket was created with two cap ends but different kinds. We used parallelogram shaped fins because they've worked the best so far for use. And for our final rocket we used rice as a weight.

Mission #14 Results: We launched both PPAP and Cheetah, they both did very well and surprisingly Cheetah had a great launch day

PPAP: Results

Distance	Angle	PSI
183 159	Not Recorded	135 135

Cheetah: Results

Distance	Angle	PSI
183 145	Not Recorded	135 135

Mission #14 Recommendations: The last thing we need to do before actual launch day it take some rice out of rocket because it's a little too heavy.

Mission #15

2016, Nov 1

This launch day I did not have record of.

Mission #16

2016, Nov 3

Mission #16 Preparation: As a class we designated some time to take about who rocket day will be run.

Mission #16 Results: We conclude one who had what job for rocket day and what that job would require that group to do. I was part of the group that help record rocket distances after they were launched

Mission #16 Recommendations: I thought we were going to need more walkie talkies so I got some my own and brought them

Mission #17

2016, Nov 5

Mission # Preparation: We set up everything we were going to need for the day and we made sure we had everything we needed before people started arriving

Mission # Results: Everything was set up and ready to go, people showed up

Mission # Recommendations: We need more people out collecting rockets

Rocket Day Conclusion

At the end this project I learned a lot. First of all do research in the beginning of you rocket making adventures. Take advantage of past student work because they have done the work already and there work is being given to you so you can gather valuable information. You will need to do your research because there's a lot to know about making a good rocket. If you do not know the basics you will not be able to get a rocket to launch past 50 yards. After doing all your research you will will need create your design and your own rockets. Working quickly and making sure to keep up is important. When you start your launch days start they come and go quickly , and in top of that make sure to right in you lab notebook and record everything you do because you will need it when the project is over.

My team final design is the one on the cover. Our design was simple and we use the least amount of duct tape we could, are final design was very different than our designs in the past and that will happen you final design should obviously be you best design. Our final rocket PPAP got a max distance of 210 yards. Our rocket had a lot of the same qualities of our other rockets, parallelogram shaped cardboard fins and little as possible tape. The only major difference is the nose cone which we ended up using a cone shape. The cap end of the bottle was our nose cone, we took advantage of that and use the cap to put our weight in the rocket which also allowed us to add or remove however much we needed easily without having to take our rocket apart. We used spray paint to make it look good instead of colored duct tape because we didn't want to add any unnecessary weight.

Launch Team

My role in for the launch team was to help measure the distance of the rocket after they launch. I made a a flag out of two PVC pipes and a old bed sheet and made it so that the person with the rangefinder had something to aim for so that the rangefinder can accurately tell how far the rocket travels. When a rocket was launched I ran over to where it landed and I held up my flag and then i would pick up rocket and give it to the runners who went back with the rockets to the launching area to be launched again.