Fly Rocket Fly: Design Lab Report

"The Zlatan 10W"

Submitted: December 22nd, 2016

Date submitted:

Maximum launch distance: 210 yds

PURPOSE

<u>Question:</u> What is the best way to make a rocket which is going to break all the records, using only cardboard, duct tape, one soda bottle and one (or two) golfs balls?

LITERATURE REVIEW

Lessons Overview: There was a lot of things I learned from the past-year's students design reports, like most people use two soda bottles to make the rocket but with only one of them can be enough; how much psi we should use to make sure that our rocket won't explode in the launch days; you should know that the nose cone has to be heavier than the rest of the rocket because the rocket will fly better and it won't splint during the fly (for that reason I recommend to use as much tape you have and two golf balls, but if you can only use one, will be okay) and it has to be ready to receive a lot of impacts; you can put fins on the rocket (in our case, we use three: one on top and the two ones on the sides. You can use four fins if you want. My recommendation is that the fins have to be in opposite directions) and you will see that the rockets fly will be better and more impressive in the point of view of the people who will see yours.

First thing you should do is imagine in your head how you want your rocket (making sure that you have the basic things to make your rocket), and then, just do it.

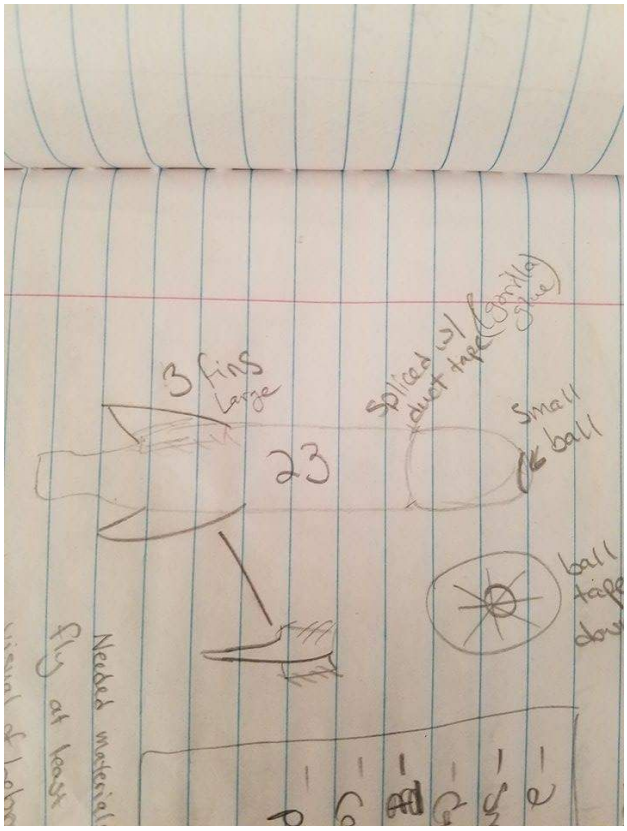
As I said before, my advice is use a lot of tape, as much tape you can, but that's not the same like waste tape, because you are not wasting tape, you are taking advantage of it to make sure everything will be fine.

Also, you should keep in mind the size of the rocket. I said before that you can use two soda bottles but in our case we only used one, and was enough.

About the nose cone, it has to be heavier than the rest of the rocket, and right there is where you should use as much tape you have. My advice is the following: you can cut the bottom from other soda bottle, then, put one golf ball on the bottom of the bottle you are going to use like a rocket. After that, put the bottom you cut from the other bottle and put it on the golf ball and you are ready to use tape. Tape it and put the other golf ball above the tape (right here you can use some clay to make the nose cone form) and tape it. Now your nose cone is done.

Then, your rocket is ready to get painted as you want.

First design



TESTING AND DEVELOPMENT

SEP 30, 2016: MISSION 1

Mission #1: Preparation

We are testing the splicing done on the large tank. We are also testing the mass of the front of the rocket.

Mission #1: Results

The rocket had exploded on the launch pad after being compressed with air.

Launch Failure.

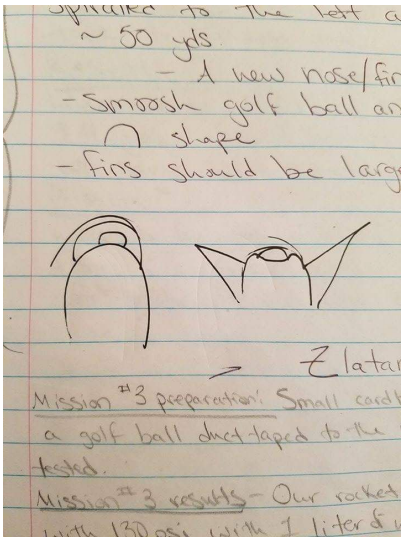
Figure 2: Mission #1 Data

Trial #	PSI	Distance (yards)
1	120	0 (Explosion)

Mission #1: Recommendations

A new design is needed without splicing, the front of the rocket blew off after compression. One tank, 1 liter capacity, with a golf ball for more mass in the nose cone and small fins on the rear made from a sturdy cardboard.

After the explosion, the day after, in class, we design a new nose cone and that's what we got:



OCT 4, 2016: MISSION 2

Mission #2: Preparation

A new rocket has been built with small cardboard fins and a nose with a golf ball secured by duct tape. We are testing its weight distribution and nose cone.

Mission #2: Results

Our rocket wasn't launched due to not having enough time.

Mission #2: Recommendations

The rocket should be in one piece and functional for the next testing day.

OCT 4, 2016: MISSION 3

Mission #3: Preparation

Small cardboard fins have been attached with thinly sliced duct tape. Also a nose cone with a golf ball secured by duct tape has been added. Both are being tested.

Mission #3: Results

Figure 3: Mission #3 Data

Trial #	PSI	Distance (yards)
1	130	50

The rocket rolled in the air and did not travel as we expected.

Mission #3: Recommendations

A new nose cone is needed with the ball dented into the front and larger more stable fins.

OCT 13, 2016: MISSION 4

Mission #4: Preparation

Larger fins made of house siding have been added and tested. The nose cone has been remade with significantly less tape.

Mission #4: Results

Figure 4: Mission #4 Data

Trial #	PSI	Angle (Degrees)	Distance (Yards)
1	120	45	94
2	120	45	54

The rocket was much more successful and flew further than the previous launch date.

Mission #4: Recommendations

The fins need to be adjusted with less tape to reduce wind drag. The nose should be more efficient with less tape as well.

OCT 19, 2016: MISSION 5

Mission #5: Preparation

The fins have been readjusted but the nose cone has been unchanged.

Mission #5: Results

Our rocket exploded for the second time. The O-ring on the launch pad was too loose and caused the mouth of the bottle to break.

Mission #5: Recommendations

A new rocket is needed. New design ideas include: Large sturdy fins from house siding, golf ball in the nose for better weight distribution secured by a small amount of duct tape, and a single unspliced body.

OCT 25, 2016: MISSION 6

Mission #6: Preparation

A new rocket has been made, The "Zlatan 10W" is it's name. Large fins from house siding are attached (idea from The Flying lady), nose cone has a huge amount of tape surrounding a golf ball. We are hoping to achieve 100 yrds.

Mission #6: Results

Figure 5: Mission #6 Data

Trial #	PSI	Angle (Degrees)	Distance (Yards)
1	120	45	185
2	130	45	124

The rocket suffered some damage on the first impact resulting with a lower distance on the second launch.

Mission #6: Recommendations

The fins are finalized and do not need any alterations. The nose should be adjusted to be more efficient possibly a second golf ball is needed.

OCT 27, 2016: MISSION 7

Mission #7: Preparation

The rocket's fins have been left unchanged however the nose cone has been given a second golf ball for better weight distribution.

Mission #7: Results

Figure 6: Mission #7 Data

Trial #	PSI	Angle (Degrees)	Distance (Yards)
1	125	40	109
2	130	40	141

The addition of the second golf ball made the rocket too front heavy and impacted the flight poorly.

Mission #7: Recommendations

The nose cone is too heavy and needs to be lightened by removing one golf ball.

OCT 31, 2016: MISSION 8

Mission #8: Preparation

Some duct tape has been removed however the second golf ball is still in the nose cone.

Mission #8: Results

Figure 7: Mission #8 Data

Trial #	PSI	Angle (Degrees)	Distance (yards)
1	135	45	169
2	135	45	182
3	135	45	122

Mission #8: Recommendations

The second golf ball needs to be removed and the nose cone, instead of being held together with tape, be attached with clay.

NOV 2, 2016: MISSION 9

Mission #9: Preparation

A new nose cone design has been made with clay and one golf ball to replace the tape.

Mission #9: Results

Figure 8: Mission #9 Data

Trial #	PSI	Angle (Degrees)	Distance (yards)
1	135	45	160
2	135	45	182
3	135	45	168
4	135	45	170

The clay design proved to be much better and the rocket flew much straighter than it ever has.

Mission #9: Recommendations

The clay is too fragile and cannot withstand the impact. Some tape over the clay is needed.

NOV 4, 2016: MISSION 10

Mission #10: Preparation

A new nose sone is being tested with clay and one golf ball.

Mission #10: Results

Figure 9: Mission #10 Data

Trial #	PSI	Angle (Degrees)	Distance (yards)
1	135	45	168
2	135	45	177
3	135	45	170

The rocket is flying much more consistently but the distance should be further,

Mission #10: Recommendations

With Rocket Day being tomorrow not any drastic changes should be made to avoid a poor distance. That being said, the rocket should be restored to the ideal conditions to ensure a good launch for tomorrow, i.e. taking out dents, adjusting tape and making sure fins aren't moved.

ROCKET DAY CONCLUSION

We managed to make a rocket design simpler but more effective. We also fixed the fins problems, because at the beginning they were too small and we thought that the fins had to be bigger, and we weren't wrong.
Other problem was the nose cone. We didn't use much tape so at the first attempt, it explode, so we should make another one, beut with heavier materials, and that's what we did, using golf balls, clay and the most important thing of the rocket, THE TAPE. We realized that these materials do not cause the nose cone to suffer so much damage when impacting with the ground. You should also be very open to changing everything to produce better results, because be focus on details makes perfection. You also have to make sure that you are using the right pressure in your rocket, do not use more because you rocket will EXPLODE.

Figure 10: Final "Zlatan 10W" Design

LAUNCH TEAM

My title during both experimentation and rocket day was RUNNER. I was in charge of picking up the rockets and returning them so they can be launched again.

It is funny because you can do sport at the same time you are learning how to launch rockets.