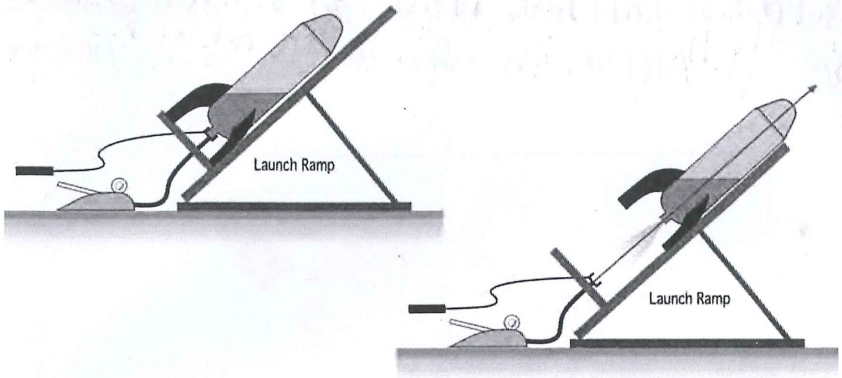
Introduction

At its simplest, a water rocket is an upside down fizzy drink bottle, which has had a nose cone and some fins added. The bottle has some water which will provide the thrust to push the rocket along. The actual fuel of the rocket is provided by compressed air which is inserted into the bottle by a bike pump.



PLANNING AND DESIGNING — 24 MARKS

1. ~~Name~~ Name three features that impact the launch distance of rockets, and explain how they impact the launch distance. *(3 marks)*

- propellant - the fuel is what creates the thrust force of the rocket so that it can launch.

- fins - the fins keeps the stability and control of the rocket inabling it to reach its destination

- nose cone - the nose cone acts as a punch so it goes through the the air, it also stops the air from slowing it down.

3

Decide which feature you think is the most important in making the rocket fly the best. This is the feature you are going to change and then test to find the optimum design for a water bottle rocket.

2. State the:

   a. independent variable *(1 mark)*

   (change the amount of fuel (water)

   b. dependent variable *(1 mark)*

   (the distance the rocket goes

3. Create a hypothesis for your experiment *(2 marks)*

if the amount of fuel is increased then the distance of that the rocket goes will increase.

ree controlled variables, and explain why they must be controlled. *(4 marks)*

the controlled variables that will be kept the same for this experiment will be the Nose cone shape, fins and body shape. These are kept controlled so that the independ variable of water increase is the only thing that will affect the dependent variable.

4

5. The design of your rockets.

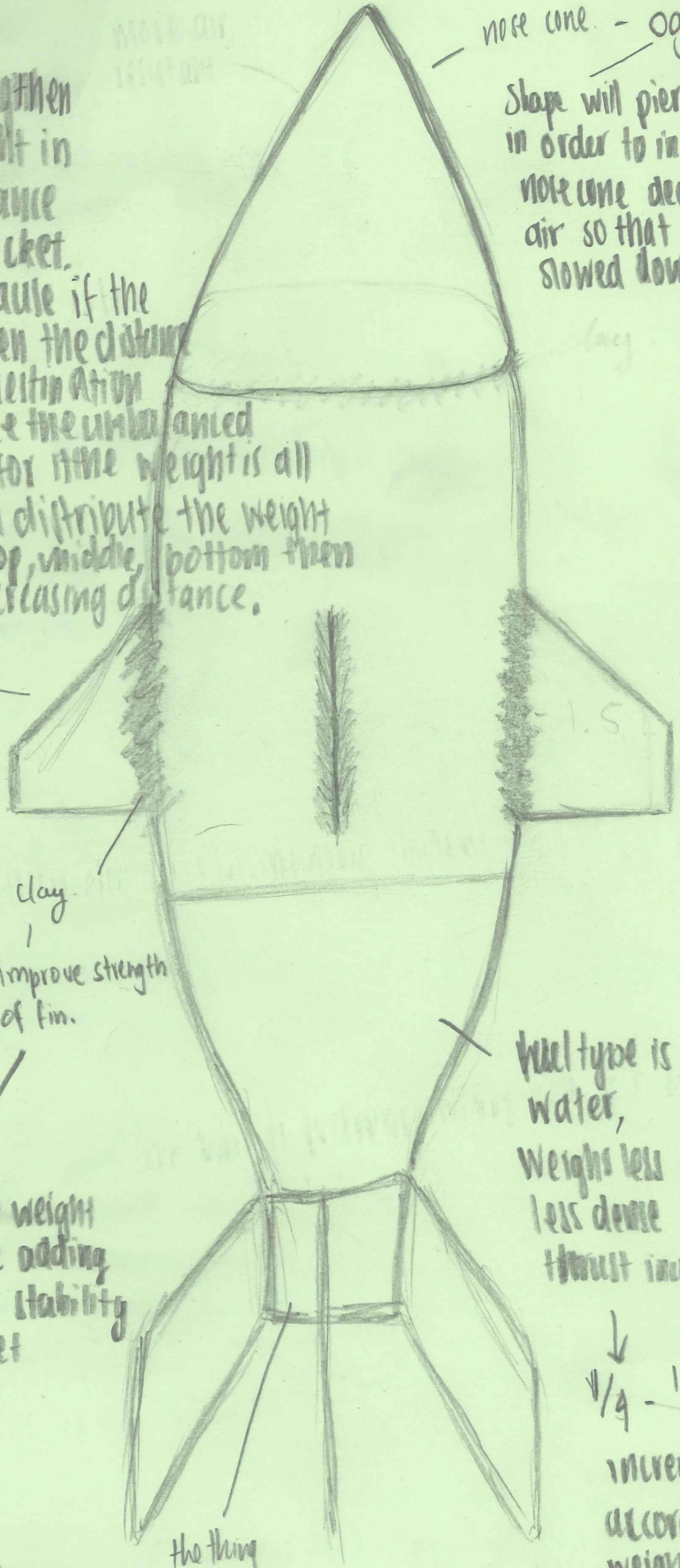
   a. You need to design two rockets which will be exactly the same except for the one feature you've decided to change. Draw a sketch of your two designs on the A3 sheet of paper; include the measurements and design features that are unique to your rocket *(5 marks)*

   b. Next to each feature of your rocket design – the features that are the same between your two rockets - include why you have chosen that particular weight/shape (refer to Newton's laws and other scientific concepts) *(5 marks)*

6. Write a step by step method of how you are going to measure the launch distance of your rockets and record your data. *(3 marks)*

1) build rocket then place on launching system
2) Launch rocket #1
3) Using a measuring wheel walk out to where rocket landed
4) Record the distance in meters
5) Launch rocket again but this time increase the amount of water.
6) Again using a measuring wheel walk out to where rocket landed
7) Record the distance in meters (on a table)
8) repeat step 1 - 6 2 more times. (trialing 3 times increase reliability).

would say this rocket is middle heavy due to the fins weight to strengthen its stability. The weight in the middle helps the balance of the travel of the rocket. the reason why is because if the weight is at the top then the distance will be short since the destination is to hit the ground since the unbalanced weight, this also goes for if the weight is all at the bottom. But if I distribute the weight by adding more to the top, middle, bottom then it will be to heavy, decreasing distance.



nose cone - ogive shape

Shape will pierce through the air in order to increase distance. nose cone decreases the effect of air so that the rocket isn't slowed down by it.

28 cm cylinder bottle this shape reduces the amount of surface area that is in contact with air thus increasing the distance that it travels. this shape also stops the air in slowing it down.

Bottle (1.5 L).

Fins - tapperd swept

help stability / control while in flight to increase distant

3x fins on the bottle any less will decrease the balance of the rocket / stability.

clay / improve strength of fin.

also affects the weight of the bottle adding more to the stability of the rocket balancing it.

fuel type is water, Weighs less less dense thrust increase

1/4 - 1/3 increase according to weight.

the thing that connects with the tube.

Note

if the weight increase of the rocket then the amount of fuel most increase so that there is enough thrust force for rocket.

BUILD AND TEST YOUR ROCKET **9 M**

8. You must now build the rocket(s) that you have designed. You will be marked on whether your rocket(s) match your design and the effort put into their assembly. *(2 marks)*

9. Rocket launches and data collection. *(2 marks)*

10. In the space below create a table for your results. *(5 marks)*

	Distance (M)			
Water Amount	Test 1	Test 2	Test 3	Avg
240 mL	19m	17m	14m	16.7m
300 mL	14 mL	16 m	13 m	14.3 m

YSIS **16 MARKS**

Describe the trend shown by your results. *(2 marks)*

With 240mL of water the rockets distance would go further where as with 300mL of water the rockets decreased by 2.9m. In summary more water less distance and less water more distance.

12. Explain your results using your scientific knowledge of rocket design. In other words – explain why the rockets flew the way they did. *(3 marks)*

the rockets flew the way they did because of the amount of fuel that was in the bottle but the stability of the rocket was good in the air due to the strength of the wings and how the weight was all in the middle causing it to go a further distance.

13. Use Newton's first law of motion to explain why the rocket did not continue to rise into the sky. *(2 marks)*

Using Newton first law of motion the reason why the rocket did not continue to rise in the sky was because of the air force was applied causing it to go to back down.

14. Using Newton's Third Law of motion, explain why the rocket took off from the ground. *(2 marks)*

Every action has an opposite and equal reaction in other words the rocket took off from the ground due to the air pushing forward in the bottle where as the water (propellant pushed the opposite way creating thrust so that the rocket could take off.

15. Describe two limitations in your experiment, and explain how they could be altered to improve the reliability of your data. *(4 marks)*

two limitations that had affected the results was the direction of change in the wind and when we had launch the rockets (at the bottom of a little valley hill. to improve the reliability we could check the weather for instance the wind and pick a day where its not to windy and launch rockets on a flatter surface.

16. Write a scientific conclusion for this experiment. *(3 marks)*

the test results of the rockets distance did not support the hypothesis through increasing amount of water would increase the distance. The results had shown that increasing the amount of fuel level decreased the amount of distance of 300ml avg distance was 14.3m where as the less amount 240ml had the avg distance of 16.7m with the difference of 2.9m.

The End ☺