## A Little Astronaut's Manual to Building a Bottle Rocket



#### To the space explorers of tomorrow,

The future belongs to you. It is our duty to teach you all that we have learned, for it is you who will solve the problems of tomorrow. Be confident and learn from your mistakes when you make them, because we learn how to be successful from studying our failures.

With love from the 49er Rocketry Team,





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Thrust: the force of a jet or rocket engine

• The force of the fuel being ejected from the

bottom of the rocket creates a force pushing the rocket up

- The **thrust** in the bottle rocket comes from the gas created in the reaction between the baking soda and the vinegar
- A large amount of pressure is built inside the rocket and when this pressure is released from the bottom of the rocket **thrust** is achieved.







01 Nose cone

**Nose cone:** a protective cone on the front of a rocket

Air Resistance: the force of the air that pushes against the rocket as it flies.

• The Nose Cone allows the rocket to "cut through"

the air and reach a higher altitude

• The Nose Cone in the bottle rocket is made as pointed as possible to decrease **air resistance** 







**Fins:** a thin piece of material which provide aerodynamic stabilization when the rocket is in flight.

- Fins are used to stabilize the rocket during flight
- Without the fins, the bottle rocket would fly off in unpredictably
- If the fins are too big the rocket will tilt into the wind and could fly sideways













1x 20oz. Soda Bottle



1x Bottle of Vinegar



#### 1x Box of Baking Soda





1x medium size Cardboard





1x Tape

1x Scissors





1x Cork



1x Thin Cardboard



1x Paper Towels









1. Cut the thin cardboard into a 7" x 9" rectangle

2. Fold the rectangle from the top right towards the top left making a tight cone shape with your hands.

3. Cut the excess material so the cone fits around the soda bottle







1. Make sure your nose cone is the right size for your soda bottle 2. Place the nose cone on the bottom of the bottle. This will now be the top of your rocket.

3. Tape the bottom side of the nose cone around the soda bottle





Tape

Tape



1. Pick the 3 best looking fins that you cut in section 2

2. Place a piece of tape on the middle of each side of the fin

3. Place the three fins an equal distance apart around the soda bottle

• Make sure you are under the close supervision of an adult before moving on to the next section.











- Have an adult with you at all times
- Make sure you launch the rocket in an

open field

• Confirm that there is no one within 5

feet of the launch radius

(including yourself)





1. Fill <sup>1</sup>/<sub>4</sub> of the soda bottle with vinegar

2. Pour a tablespoon of baking soda inside the soda bottle and place the cork inside the bottle neck

3. Quickly flip the soda bottle upside down, place it on the ground, and move 5 feet away



## **Blast Off!**











# Thank you for your participation brave space explorer





1. Pour 1 tablespoon of baking soda into a paper towel

2. Shape the paper towel into a baggie that will fit into the soda bottle

3. Place the baggie into the bottle and ensure that the cork can hold it just below the neck.