

# How to Build a Rocket: Calumet Style

The following should have all the information you need to build and launch your own bottle rocket. We've also produced an instructional video which may prove helpful in building your own rocket.

Thanks go out to Mary Peterson, the Science Lady, who first brought this project to camp, and who taught me everything I know about building bottle rockets.

Have fun, and don't forget to share your rocket launches with us!



## Materials List

Qty	Description	Notes
1	20 oz Soda Bottle	<i>Pepsi products work really well, but as long as it isn't a water bottle, it'll work. (Water bottles have thinner walls &amp; won't take as much pressure)</i>
1 roll	Electrical Tape	<i>Regular old black electrical tape will work fine, but you can get various colors, too. Duct tape, or even masking tape will work in a pinch, but the flexibility of elec tape makes it ideal.</i>
1	Pair of Scissors	<i>You'll not only need them for cutting tape, but also the fins and nose cone</i>
1	Washer, rock, or what-have-you	<i>This is a counter weight to help the rocket return cone-down. It shouldn't weigh more than 1 ounce (28 grams)</i>
3	Rocket Fins	<i>The templates for the fins are below. Corrugated Cardboard is a great material for this.</i>
1	Nose Cone	<i>Cardstock would work well for this. A Cereal box is a little stiff, but workable</i>
<i>For the Launcher</i>		
1	Ball Inflation Needle	
1	#3 Rubber Stopper	<i>#3 is a standardized size, but some places don't label them that way. The stopper should be: 5/16" top diameter, 11/16" bottom dia, 1" height</i>
1	Air Pump	<i>A standard bike pump will work beautifully.</i>
1	Small Nail	<i>This is for making a hole through the stopper for the ball needle. Pushing the needle through without making a hole first will likely end in either a split stopper or a bent/broken needle.</i>
	Hammer and/or Pliers	<i>A way to drive the nail through the stopper. I used a pair of pliers, you might be able to hammer it through, but you'll need pliers to pull it back out anyway.</i>

## Building your Rocket!

1. Take the label off your bottle. The tape will stick better directly to the bottle.

Throughout the assembly, it is helpful to remember that the ***Top of the bottle*** is the ***Bottom of the rocket***.

2. Measure a piece of tape the length of the bottle.

I've found I can do this easily by laying it down on the bottle, sticky side up and then cutting it.



3. Fold the piece of tape you just cut in half along the length of it, STICKY SIDE OUT.

This might be the thing people have the hardest time with, don't get frustrated. Here's what works for me:

A. Stick your thumbs to the lower corners of the piece of tape.



B. Stick your index fingers to the upper corners of the piece of tape.



C. Pinch your index fingers together with their thumbs, folding the tape in half. Pulling gently on the tape will help make the fold more defined.



If you are having a hard time following this, but have access to the video that this accompanies, it might be easier to see how I did it.

4. Stick your folded piece of tape to the side of the bottle, where you want your first fin to go. It should, mostly, stay folded once it is stuck on the bottle.

***Be sure each piece of tape is clear of the opening of the bottle, tape cannot be in or over the mouth of the bottle!!***



5. Place your first fin on the bottle, snug against the folded side of the tape.

The curved side of the fin should fit nicely against your bottle. The fin should be pointed in the same direction as the mouth of the bottle.



6. Unfold your piece of tape, smoothing it up against the fin and flat onto the bottle above the fin.



7. Cut & fold a second piece of tape, as you did in the steps above. Lay this piece of tape on the bottle along the opposite side of the fin, fold facing the fin.



8. Unfold your piece of tape, smoothing it up against the fin and flat onto the bottle above the fin.



9. Repeat Steps 2-8 for each of your remaining 2 fins.

When laying your remaining fins, I've found that, in letting the bottle rest with the fin(s) supporting it on the table, laying the first piece of tape along the top side of the bottle does a pretty good job of spacing them properly around the bottle.

You also want your fins to be somewhat in the same orientation on the rocket, at least close enough that your rocket will stand on its own when it comes time to launch.

10. Stand your rocket up. Congratulations! Take a moment, shake yourself out, and admire your work so far!

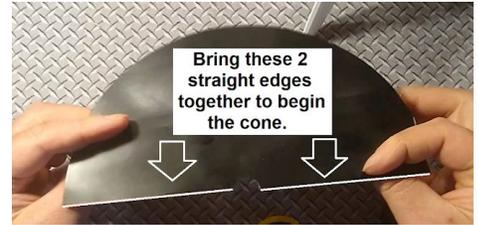


11. Place your weight (Washer, rock, or what-have-you) on the top of the rocket (that is, the bottom of the bottle).

Cut 2 pieces of tape long enough to hold your weight in place, and tape the weight in place.



12. After you've cut out your nose cone from the template, Roll it into a cone shape. Start by bringing the two halves of the straight side together. If it doesn't look like an Ice Cream Cone, you did it backwards. It isn't uncommon.



13. Stick the opening of your cone over the top of the rocket to assure a good fit, then tape along the seam of the cone to hold it at that size.



14. Once the cone is taped together, place it back on top of the rocket. Cut a length of tape long enough to go around the rocket, and tape the cone onto the rocket.



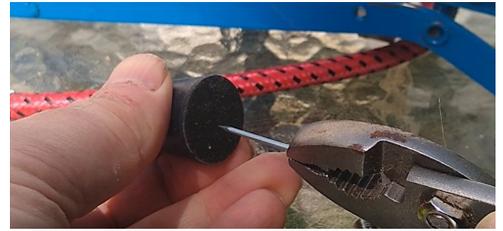
15. **THAT'S IT!** Your rocket is complete!

Now, on to the next portion: The Launcher!



## The Launcher

1. Push the small nail through the rubber stopper so there is a hole going through the middle from top to bottom. Pull the nail back out. *Pushing the needle through without making a hole first will likely end in either a split stopper or a bent/broken needle.*



2. Push the inflation needle through the hole you just made.



3. Attach the needle to the Pump.

Your Launcher is complete!

**WE'RE ALMOST THERE!!**



## THE LAUNCH!!!!

1. Fill your bottle about halfway with our rocket fuel, Dihydrogen Monoxide<sup>††</sup>.

<sup>††</sup> Use tap water, but pour it into a bottle labeled DHMO.



2. Insert the rubber stopper snugly into the bottom of the rocket.



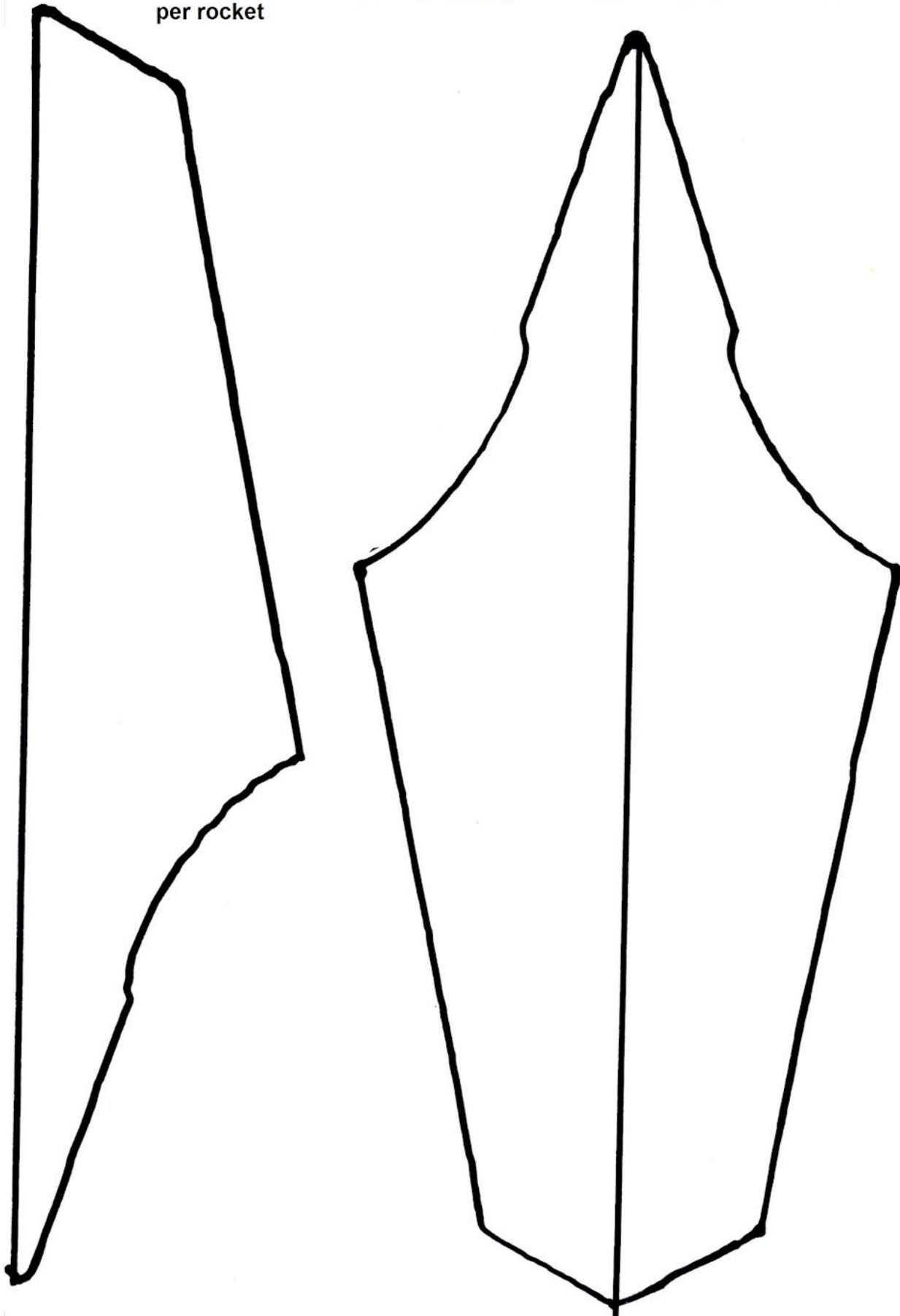
3. Stand your rocket up in a wide open space, be sure it isn't pointing at anyone, and start pumping! Be sure to have someone recording the launch!





## Rocket Fins

Corrugated Cardboard will work great for this. You'll need 3 fins per rocket



## Rocket Nose Cone

Cardstock or a Cereal Box would work fine for this.  
Construction paper is ok, but I wouldn't go any lighter  
than that.

