

# Cradle of Aviation Museum

## BOTTLE ROCKET COMPETITION

### EVENT SUMMARY:

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The Cradle of Aviation Museum is joining in the growing tradition of soda-bottle rockets. The concept is simple—put some water into an empty soda bottle, pressurize the remaining air and LAUNCH! It works great even if you haven't done anything to the bottle. But adding fins, nose cones, parachutes, etc. only enhances your flight. It's great for beginners who are not looking to spend a lot of time but also for veteran rocket engineers who would like to tinker with their recovery systems or aerodynamics. It's safe, it's educational and it's fun!

### MATERIALS:

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You will need:

1. **One 2-liter plastic SODA bottle.**  
Bottle must be from a *carbonated* beverage only. **DO NOT USE** water or *Pepsi* plastic bottles. (They are not as strong and will not launch.) Maximum bottle size is 2 liters.
2. **Cardboard or card stock** to make rocket fins.
3. **Scissors**
4. **Glue or Tape.**  
*White glue* or Non-solvent glue only such as *Elmer's* white glue, glue sticks, or tacky white glue. Solvents such as Super glues, crazy glues, and hot glue are **not permitted**. They weaken the bottle and cause it to fail from the stress of the air pressure. Tapes such as scotch / masking/ or duct tape may be used.
5. **Paper**, 8½" X 14" to cover plastic bottle such as construction paper, shiny paper, aluminum foil, or decorated white paper. Remember, you want to keep your rocket lightweight! You can even give your rocket a name!

### RULES OF COMPETITION:

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1. One rocket per person.
2. Total weight of the rocket may not exceed 1 pound.
3. No metal or sharp nose cones are permitted.

4. Fins or other attachments must not extend past the neck of the bottle.
5. No chemicals may be added to the water used.
6. Only water and air pressure propulsion is allowed.
7. The plastic bottle must not be cut, bent, or altered in any way.

### JUDGING:

- **The goal of this contest will be to keep your soda bottle rocket in the air for *as long as possible*.**
- Participants are encouraged to add parachutes, streamers, wings, etc. to keep their rocket aloft.
- Contestants will launch their rockets off the museum's launch pad with the guidance of museum staff.
- The bottle rockets will be filled partially with water, attached to an air compressor, and then launched.
- Judges can refuse to launch any rocket considered unsafe or alter any rule for safety reasons.
- Rockets must remain intact for the duration of the flight.
- Forms of thrust other than the air and water pressure generated by our launch pad are not permitted.

\*Rules are based on the rules used by the Science Olympics

For questions please contact:

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# Building Your Water Rocket

Making your own water rocket is a lot easier than it sounds so don't worry. The museum will supply the launcher, air pressure and water so all you need to do is make the rocket. Follow the steps and suggestions below and you should have an easy time building your rocket. Once you have the materials ready, it should only take you 30-45 minutes to build the rocket. Make sure to read the rules first and then build your rocket accordingly.

If you have any questions about building your rocket, please feel free to email Jennifer Sumner at the Cradle of Aviation Museum at: [jsumner@cradleofaviation.org](mailto:jsumner@cradleofaviation.org) or call at (516) 572-4028.

## Materials:

- One empty and clean 2-liter soda bottle.  
Bottle must be from a *carbonated* beverage only.  
**DO NOT USE** water or *Pepsi* plastic bottles. (They are not as strong and will not launch.)  
Maximum bottle size is 2 liters.
- A piece of construction paper or thick white paper, 8½ x 14 inches
- Pieces of cardboard or cardstock for your fins, about 7 x 7 inch piece for each fin
- A piece of cardstock, thin cardboard, or folder, about 8½ X 14 inches for the nose cone
- Adhesive (non solvent glue or duct tape only)  
**White glue** or Non-solvent glue only such as *Elmer's* white glue, glue sticks, or tacky white glue.  
Solvents such as Super glues, crazy glues, and hot glue are **not permitted**. They weaken the bottle and cause it to fail from the stress of the air pressure.
- Scissors

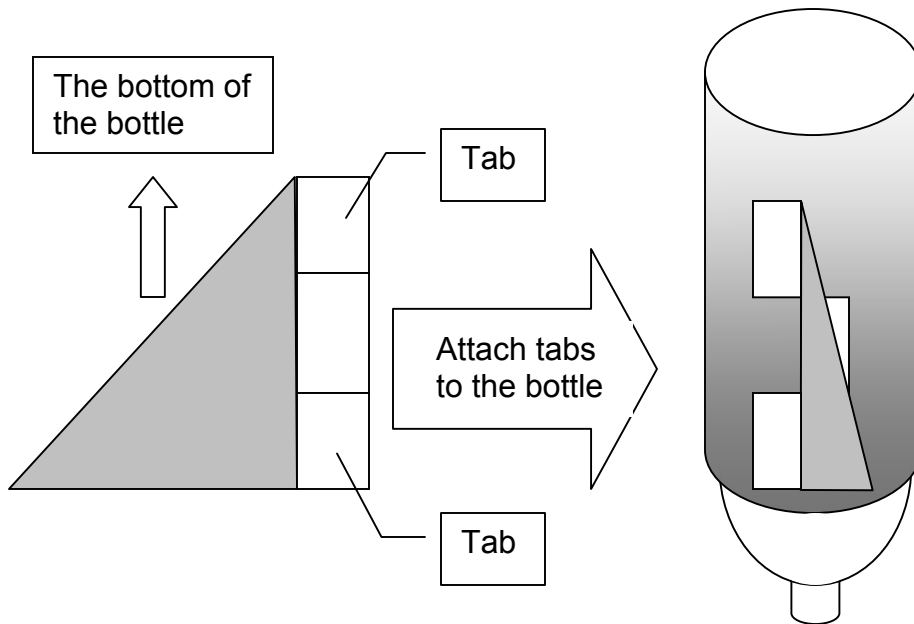
## Directions:

### 1. Wrap the Bottle:

Use the piece of 8½ x 14 inch **construction paper or thick white paper** to cover the outside of the plastic bottle. If you want to design anything on your rocket or give it a name, draw on the paper first before you wrap it around the bottle. Place the bottle upside down so the opening is on the bottom and then wrap the paper around it and tape or glue it securely. Make sure it is not too tight and do not crush or dent the plastic bottle.





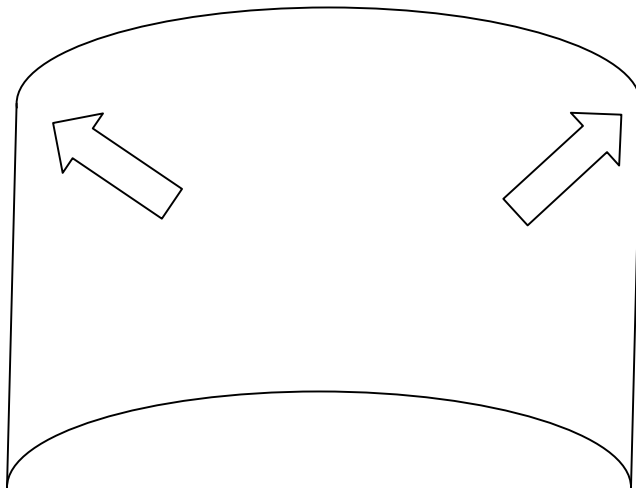


Now put the glue on the tabs and place the fin back up against the side of the bottle. Repeat this step for every fin, spacing them evenly around the bottle.

If you are using tape: Figure out where you would like to put your fin. Spread the extra sections on the fin out so that they are flush against the side of the bottle with the fin sticking out as in the figure above. Now use tape to adhere the tabs to the side of the bottle. Repeat this step for all your fins spacing them out evenly around the bottle.

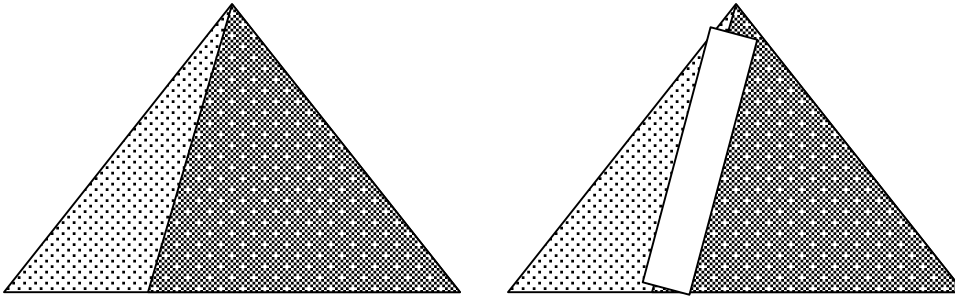
#### 5. Nose cone:

To make the **nose cone**, take the piece of card stock/thin cardboard/or folder and hold it sideways as demonstrated in the picture below:



Now take the top two corners (the corners pointed to in the picture) and bring them together. Overlap them a little bit but be careful because if you overlap too much, the cone may not fit on the top of the rocket. You should now have a cone. (Nose cones

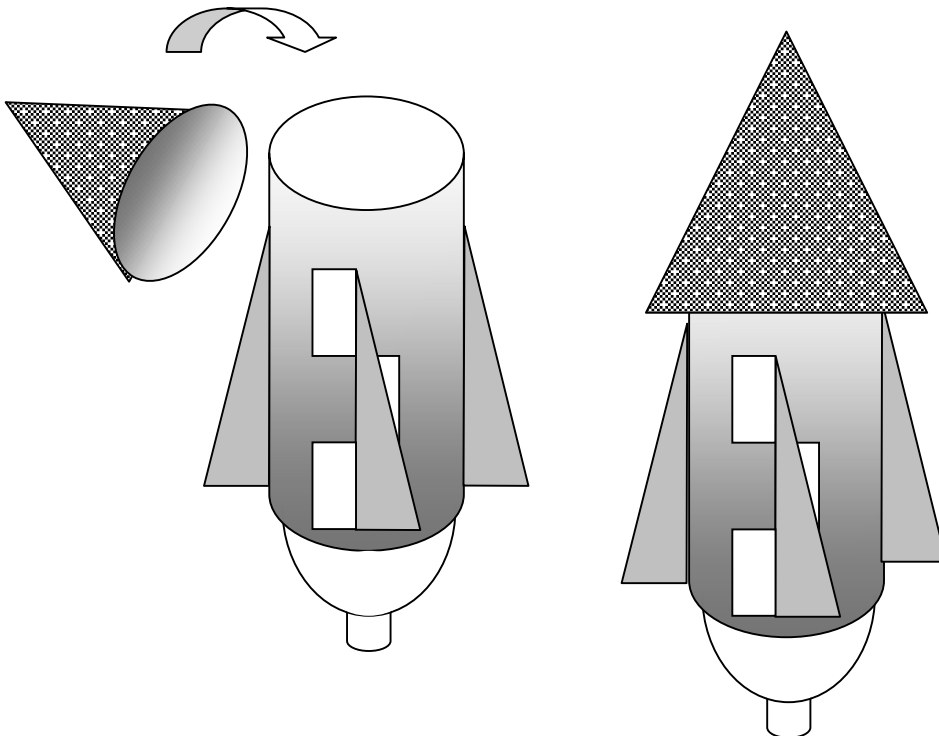
are used to help the rocket's aerodynamics and allow it to move smoothly through the air). Glue or tape the cone from those corners to the peak. Take the scissors and cut around the base of the cone so that it is even.



#### 6. Recovery System:

Now decide if you want to add a **recovery system** such as a **parachute or streamers** to your rocket. Remember that the goal of the contest is to keep your rocket in the air the longest time possible.

If you **DO NOT** want to add a recovery system, glue or tape the nose cone permanently to the top of the bottle.



#### Parachute:

If you **DO** want to add a recovery system, **DO NOT** glue or tape the nose cone on.

You may make a **parachute** out of any material you think will work to keep your rocket airborne the longest. Plastic bags or rip stop nylon are examples of materials that work well.

To make a parachute, simply cut out a circle in the material you are using the size that you want your parachute to be. Note that it must fit folded inside the nose cone of your rocket.

Securely tape pieces of string evenly along the edges of the circle to complete your parachute. The length and number of strings you use depend on your design.

Think about the following:

- Would using only 2 strings be enough to open the parachute?
- How many would be too many that they would get tangled?
- What length is enough to open the chute but not tangle?

After you have decided and taped the strings on the parachute, fold the parachute in half and then in half again and again, until it is folded in a triangle shape and can fit in the nose cone. Gather the remaining **ends** of the strings and tie them together evenly in a knot. Tape this end with the knot securely onto the top of your rocket (the bottom of the bottle). Fold your parachute up and put it in the nose cone.

### **Streamers:**

If you want to add streamers, decide what material you want to use, how many, and tie them together. Securely tape or tie them to the top of your rocket (the bottom of the bottle). Make sure it can fit inside the nose cone. They could be paper, plastic, or whatever else you think might create the DRAG needed to sustain your rocket in the air.

### **To Attach Your Nose Cone using a Parachute or Streamers:**

Place a large rubber band around the plastic bottle, about 3-4 inches from the top of the rocket (the bottom of the bottle). Tie a string to the rubber band. Punch one hole in the bottom of the nose cone, and attach the other end of the string through it. The string must be attached to only one side, so that the nose cone may open in flight and release the recovery system.