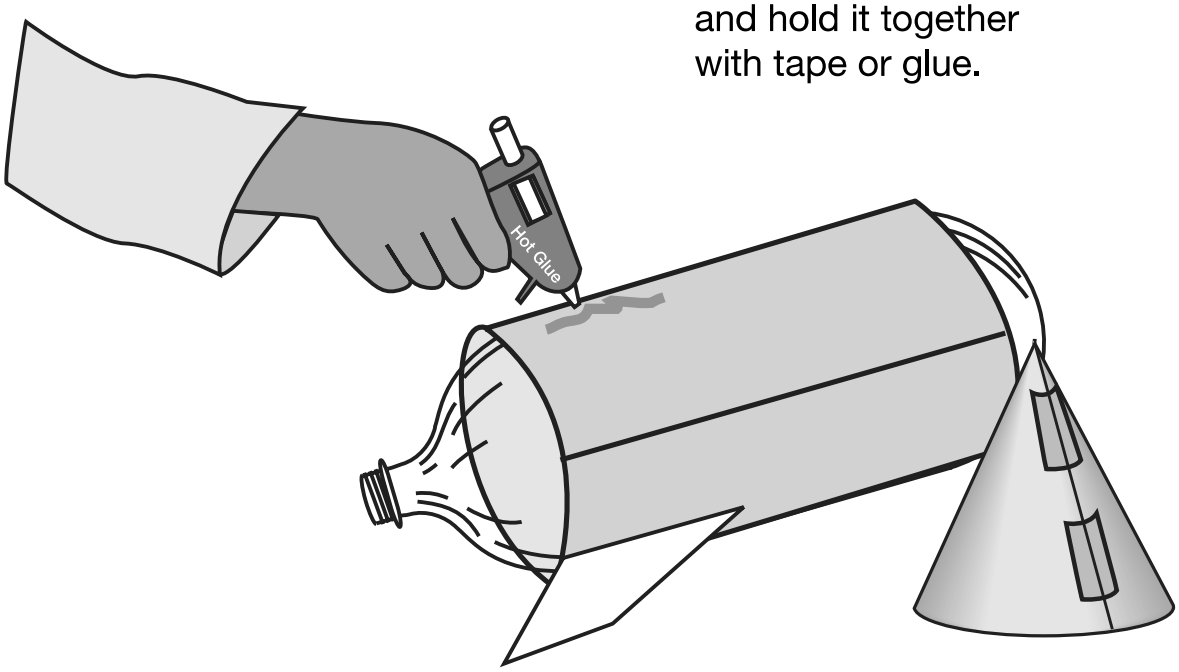
Building A Bottle Rocket

1. Wrap and glue or tape or a tube of posterboard aroun the bottle.

2. Cut out several fins of any shape and glue them to the tube.

3. Form a nose cone and hold it together with tape or glue.



4. Press a ball or modeling clay into the top of the nose cone.

5. Glue or tape nose cone to upper end of bottle.

6. Decorate your rocket.

Launching Water Bottle Rockets

Objective

To show the connection of propulsion and force, pushing the rocket by accelerating water out of a bottle. Expand on the straw rocket exercise by building a water rocket that will fly powered by pressurized water.

- Target word: Acceleration
- Preparation time: 1 hour
- Activity time: 1 hour
- Students involved: 3–12 per adult

Preparation

Refer to the Safety Code in Appendix B. Build the water bottle rockets in three or more teams of three students each. Materials and assembly instructions are given in a previous section on page 85. Perform the string-swing test given in the section on Rocket Stability Determination page 138 on these rockets. You will also need to build the water bottle launcher (see Appendix A).

Procedure

Students will explore what relative amounts of air and water propel the rocket better, or make any design adjustments to the fins or nose. Observing the flight of various lengths and weights of rockets will add to the inquiry experience.

1. Begin by having some bottles filled one-fourth, one-third and one-half full of water.
2. Set them on the launcher, and pump these rockets each with the same amount of air (same number of pumps). Then, launch them to see which ones go the highest or furthest.
3. Note the results on a data sheet.
4. Then, select a set water amount and change the number of pumps to increase or decrease the air pressure for the next launch round.
5. Note the results on a data sheet.
6. Determine the best combination of the water fill level and air pressure, and fly all rockets with that formula.

Sample Data Sheet

Rocket	Flight	Water Fill	Air Pump Strokes	Height
1	1	1/2	4	low
2	1	1/3	4	low
3	1	1/3	6	high
1	2	1/4	8	highest

Questions

1. How is the air and water pressure operation better than just the air pressure with the straw rocket?
2. What if you just put air in the bottle? Just air pressure drove the straw rocket in a pulse. The bottle has the pressure expelling water. Ask them to explain the difference. The action of expelling the water mass causes the reaction of the bottle motion (Newton's Third Law).
3. How would a 2-liter bottle fly differently from a half-liter bottle? Hypothesize what would happen and then build and launch a rocket made from a small bottle.

4. How would you relate pressure, volume and bottle mouth size against rate of water expulsion for effective propulsion?
5. How do you relate the operation of this water-propelled rocket to a liquid fuel combustion propelled rocket?