- First, when you say self deploy I assume you mean a parachute that will activate without an action by another force. And we are talking about personnel parachutes, though the discussion could apply to material delivery systems.First, there is a static line. The parachute, and pack has an attachment to the airplane, the static line, and when the jumper leaves the airplane, the static line stretches out to max extension. At that point the static line opens or causes the pack to open, and the parachute deploys.The next method is an electronic or mechanical system that uses barometric pressure to determine altitude. The system has a preset altitude that will initiate pack opening, and the pack opening releases a spring loaded pilot chute that catches air and extracts the parachute. Modern electronic systems, used as back ups for reserve deployment, not only use barometric pressure but also use an estimate of vertical velocity to determine when to activate.

Materials

➔ Plastic soda bottle (2-liter or similar size)
➔ Water (for propellant-”fuel”)
➔ Air pump (with needle valve or foot pump)
➔ Cork (to seal the bottle opening and pump air into rocket)
➔ Duct Tape (for securing fins and rocket components)
➔ Foam Board (for the fins of the rocket)
➔ Scissors or Utility Knife (for cutting fins and nose cone)
➔ Ruler (for measuring dimensions)
➔ Marker/pencil (for marking lines and measurements)
➔ Glue (hot glue or strong adhesive)
➔ Cardstock paper (for a base to attach fins and make a cone/nose)
➔ Safety goggles (recommended)
➔ Waterproof material (used to make a waterproof surface in of water spills or splashes)

Step-by-Step Instructions:

1. Prepare the Bottle:

➔ Clean and dry the bottle.
➔ Make sure the bottle has a tight-fitting cap or cork (for pressurization).

2. Make Fins:

➔ Cut out 4 fins from cardboard or foam.
➔ Ensure fins are evenly spaced and angled correctly for stability.
➔ Attach fins to the lower half of the bottle using tape or glue.

3. Make the Nose Cone:

➔ Cut a cone shape from cardstock paper
➔ The base of the cone should match the diameter of the bottle's top.
➔ Glue or tape the nose cone securely to the top of the bottle.

4. Prepare the Rocket's Propellant:

➔ Fill the bottle about one-third full with water. (The more water, the greater the thrust, but it can reduce the height of the rocket.)
➔ The water acts as the mass that will be forced out when pressurized air is released.

5. Seal the Bottle:

➔ Insert a cork or stopper into the bottle's opening.
➔ Ensure the cork is snug, but leave a small hole for the air pump nozzle.

6. Add the Launching System:

➔ Attach the pump's nozzle to the hole in the cork. Ensure a secure fit so no air escapes during pressurization.
➔ Or, if using a launch pad, make sure the bottle is firmly placed.

7. Prepare for Launch:

➔ Ensure the rocket is placed on a flat, stable surface for launching.
➔ Safety first: wear goggles and ensure the area is clear of obstacles.

8. Launch the Rocket:

➔ Begin pumping air into the bottle slowly and steadily. As pressure builds, water will be forced out, propelling the rocket upward.
➔ Once the pressure reaches a certain point, the cork will pop off, and the rocket will launch.

Tips & Safety:

➔ **Safety Gear:** Always wear safety goggles during testing and launches.
➔ **Testing Pressure:** Test with lower pressures first before increasing for maximum height.
➔ **Launcher Position:** Never point the rocket at people or animals.
➔ **Water to Air Ratio:** Experiment with the water level to optimize height and stability.
➔ **Rocket Stabilization:** Ensure fins are placed symmetrically to maintain flight stability.

A **bottle rocket** is a type of small, homemade rocket typically made using a plastic bottle as the rocket body. It is designed to be propelled by the force of water or air pressure. When air or water is forced into the bottle and then released, it pushes the bottle upward, creating a thrust that propels the rocket into the air. Bottle rockets are often used in science experiments, educational demonstrations, and as a fun activity for children.

Components of a Bottle Rocket:

- **Plastic Bottle**: The main body of the rocket.
- **Water or Air**: The propellant used to create pressure inside the bottle.
- **Nozzle**: The opening where the water or air exits.
- **Stabilizers**: Fins or tail pieces at the bottom that help stabilize the flight and keep the rocket flying in a straight line.

How It Works:

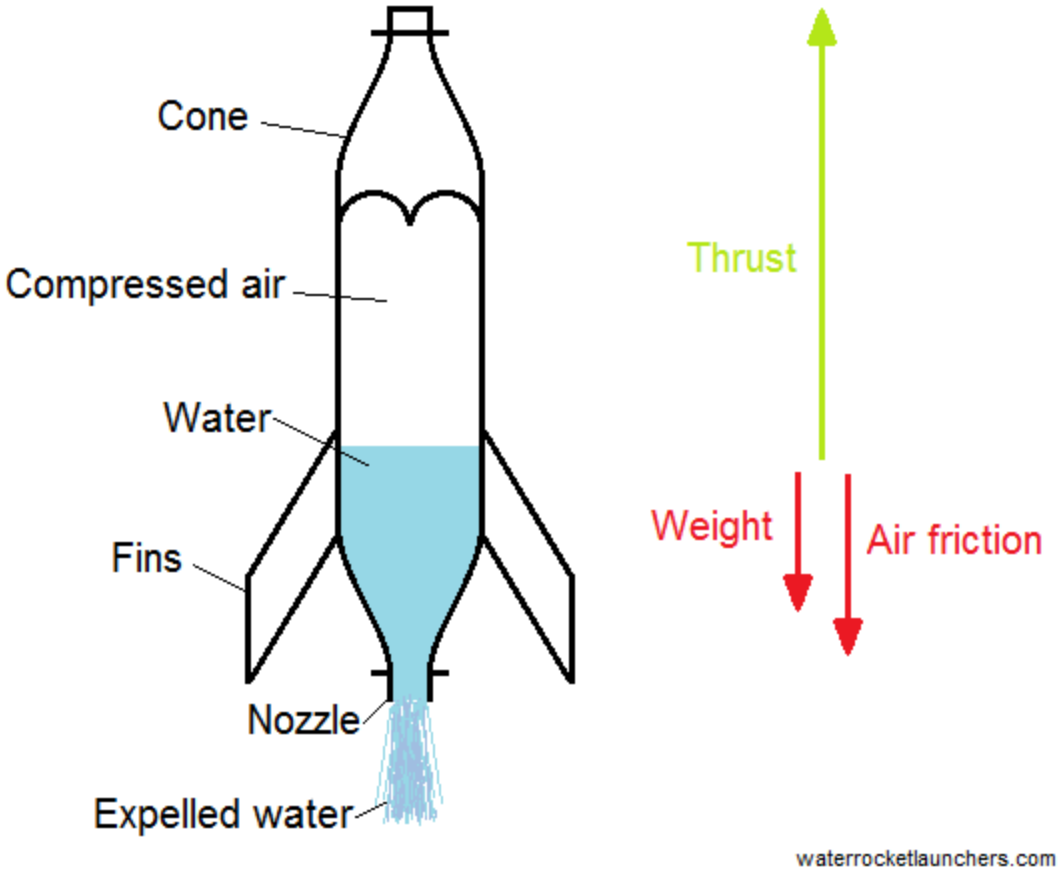
1. The bottle is partially filled with water.
2. A pump is used to pressurize the bottle (typically air is pumped in using a bike pump).
3. Once enough pressure is built up, a release mechanism is activated (such as removing a cork or cap).
4. The water shoots out of the nozzle, and the rocket is propelled upward due to Newton's Third Law of Motion (for every action, there's an equal and opposite reaction).

Visualizing the Image for Your Presentation:

If you're creating an image or illustration for this concept, here's an idea:

- ➔ **Background**: A clear sky or a grassy field, emphasizing that the rocket is being launched outdoors.
- ➔ **The Bottle Rocket**: A plastic bottle with some water visible inside. It could be upright, with water shooting out of the nozzle, surrounded by spray or vapor to indicate pressure release.
- ➔ **Flight Path**: A curved line or dashed line showing the rocket's trajectory as it launches into the sky.
- ➔ **Details**: Fins on the base for stability, and maybe some motion lines around the rocket to show speed and thrust. Optionally, a pump attached to the bottle showing how air is being pumped into the bottle

Models


Cone
Compressed air
Water
Fins
Nozzle
Expelled water
Thrust
Weight
Air friction
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