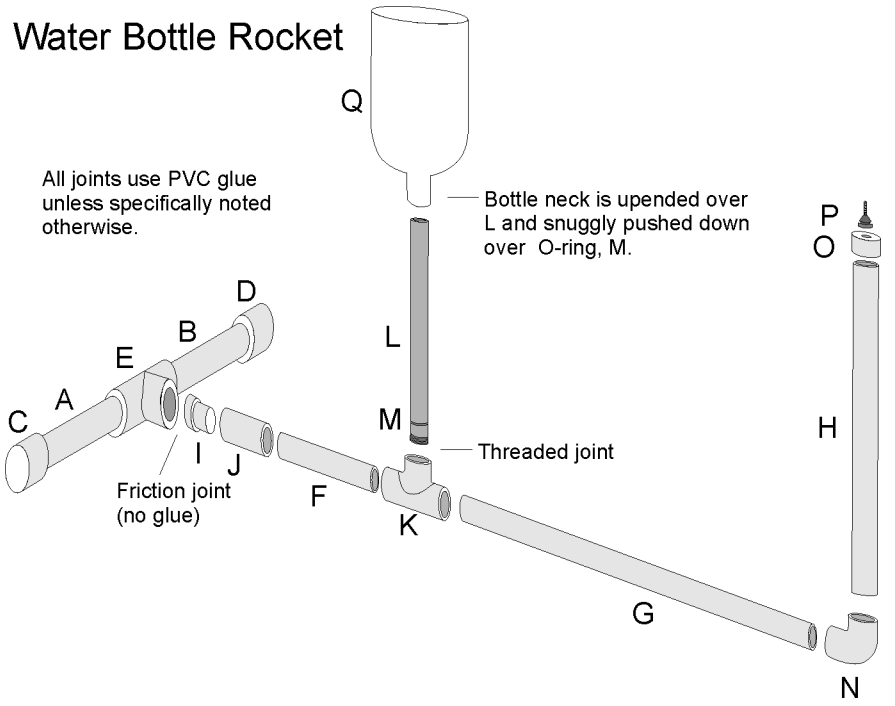
# Water Bottle Rocket Launcher

An inexpensive water bottle rocket launcher for children >7 years age supervised by an adult. Features easy PVC pipe construction, a durable O-ring seal, and disassembly for flat storage.

| Diagram ID | Quantity | Materials Description |
|---|---|---|
| A, B | 1 ft (for all) | PVC Pipe 1” Sch 40 (A and B = 6”) |
| C, D | 2 | PVC End Cap 1" Sch 40 |
| E | 1 | PVC Tee 1” x 1" x 1" Sch 40 |
| F, G, H | 3 ft (for all) | PVC Pipe ¾" Sch 40 (F=6”, G=18”, H = 12”) |
| I | 1 | PVC End Plug ¾" Sch 40 (sometimes called ¾"x½“) |
| J | 1 | PVC Joint ¾" Sch 40 |
| K | 1 | PVC Tee ¾" x ¾" to threaded ½” Sch 80 Riser |
| L | 9” | PVC Riser ½” Sch 80 (¾" OD, one end threaded)<br>Make 2 by cutting an 18” riser threaded at both ends. |
| M | 1 | Rubber O-ring: (13/16” OD, 5/8” ID, 3/32” Wall) |
| N | 1 | PVC Elbow ¾” Sch 40 |
| O | 1 | PVC End Cap ¾” Sch 40 |
| P | 1 | Passenger Car Tubeless Snap-In Valve<br>(1 ¼” length to fit .453” hole) |
| Q | several | 2-Liter plastic beverage bottles |




**Water Bottle Rocket Launcher**
**Bill Cumming, Oct 24, 2000**
**BSA Troop 135, Cub Pack 127, Santa Rosa CA**
**wcumming@sonic.net**

# Water Bottle Rocket Launcher

**Assembly of Water Bottle Rocket Launcher**

Drill a 1/2" hole in the center of one end cap (O), smooth any burrs that may allow air to leak, insert the valve stem (P) from the inside of the cap, and pull it firmly with pliers to seat in the hole. Most children need adult help with this.

Use general purpose PVC cement to glue joints according to the diagram. Note that I is glued to J but the E to I-J joint is NOT glued. This is a friction joint that allows for the base to be disassembled for storage. Do not thread the riser (L) to the tee (K) until after the O-ring (M) is installed as follows.

To seat the O-ring, cut a groove at M around the riser L so that it will be about 1/2 to 3/4” above the tee when L is attached to K. The groove should be about 1/16” deep and 1/8” wide. With adult supervision, older children can use a hacksaw and file to cut this groove. Alternatively, adults could use a table saw with a simple jig or a lathe. The fit of a 2-liter bottle neck Q (0.84" ID) to M must be snug enough for pressure to build without being too tight for children to seat the bottle. The depth of the groove holding M controls this. Check the groove depth by temporarily installing the O-ring and testing it with a bottle.

**Launching the Rocket**

Attach a bicycle pump to the valve (P). Fill a 2 liter plastic bottle with 1 to 3” of water. Quickly tip the mouth of the bottle over the launch tube L and push it down until it is firmly seated over the O-ring. Keeping the launch tube vertical, pressurize the launcher with the pump. The launch pressure depends on the O-ring seal. If the bottle fails to launch at a safe pressure, release the air pressure through the valve and increase the depth of the O-ring groove slightly using a file. If the seal is poor and the rocket launches prematurely, cut a shallower groove just below the existing one and install an extra O-ring.

**Rules for Safe Use**

- The launchers can only be used under adult supervision.
- Launch the rockets in an open space where this activity is permitted. Because the bottles are light, trying to catch falling bottles is safe providing that it is done in a place where the boys can safely run while looking up.
- Launch in low wind in an area where recovery of the bottles is highly likely so that trees, rain gutters and so on will not be littered by snagged bottles.
- No more than four boys may use one launcher at the same time.
- No one should be closer than 4 feet from the launch tube when pumping.
- The safety of the bottle rockets depends on their very light weight. Use only light weight 1 or 2 liter plastic beverage bottles. Do not attach anything to the bottles that would increase their weight or could detach and cause injury.
- Use less than 3” of water and launch within 15 degrees of vertical. When launched in a near vertical orientation, 3” of water would be expelled within a few inches of the launch tube, keeping the bottle light. Nevertheless, the bottle does take off with a high velocity and could injure an eye.

**Water Bottle Rocket Launcher**
**Bill Cumming, Oct 24, 2000**
**BSA Troop 135, Cub Pack 127, Santa Rosa CA**
**wcumming@sonic.net**