Blast Off for the Stars

Water Rockets really are rocket science!!

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What are water rockets?

Water rockets are the ultimate recycle project for scouts.

At the minimum:

- Rubber Stopper
- 2 Liter soda bottle
- Hand Tire Pump
- 3 playing cards
- Roll of clear packaging tape
- Some small rubber hose
- Some water

At the other extreme:

- Compressed gas or air tank and regulators
- Seamed Multi-stage bottles
- Big Foot launcher
- Inclinometers for gauging height

Safety Concerns

- Bottles are proof tested to 180 psi (pounds per square inch) by DOT regulations
- A water rocket at launch leaves the launcher at 100 miles per hour and weights 1 ½ pounds.

Launch area safety

Keep everyone except the "Launch Boss" a minimum of 15 feet back.

The "Launch Boss" should at a minimum be wearing safety goggles, preferable a face shield, ear plugs, and gloves.

DO NOT STAND OVER THE ROCKET WHILE PRESSURIZED!!

If any adjustments are required, depressurize the rocket.

Range Safety

The range should be clear fully down range.

Scouts should not be allowed to try and catch the rocket.

Be aware of obstructions in the area.

Be aware of other individuals in the area. The rockets can go 700 feet in altitude and over 100 yards down range.

Pay attention to wind drift and compensate with launch attitude.

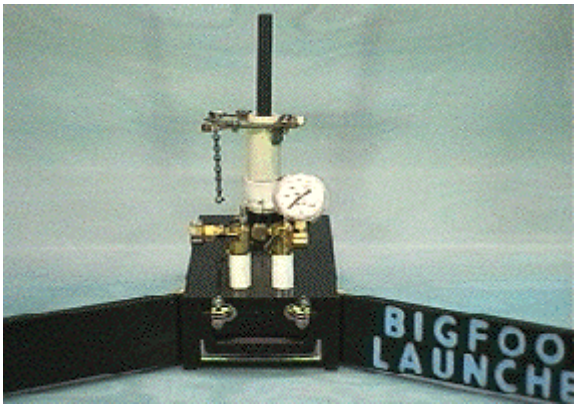
Reuse of bottles

It is not recommended to reuse bottles if white stress marks can be seen. Bottles in this condition have been known to rupture at much lower pressures.

Consider the actual life of a bottle to be 4 – 6 launches.

Launchers

Big Foot



This is launcher purchased over the Internet for approx. $180.00

Cable Tie Launcher

Home-made for a cost of about $15.00

Building a rocket

"Camaro Design"

- 2 – 2 liter bottles
- Cut the first bottle just below the shoulder on the screw top end.
- Turn the cut bottle around and place the open cut end over the bottom (opposite the screw end) and tape.
- Place the cutoff top over the bottom of the cut off bottle and tape.
- Cut the fin designs from the playing card.
- Tape a minimum of three fins just above the shoulder of the screw top end.
- Place the rocket on the launcher, fill the nose with water for balance weight.
- Fill the main chamber ½ full with water, pressurize, range check, launch check, and FIRE!
- This rocket can be made in five minutes by cub scouts.

What can they learn?

Basic Rocket Dynamics

Center of Balance vs. Center of Thrust

The center of balance needs to remain ahead of the center of thrust for duration the flight.

The effects of mass (water) and energy (air pressure) on flight performance

Basic aerodynamics

Angle the fins to see the effect

Use different Nose Cones

Geometry

Using Inclinometers to measure the height of the launch

Further information

Web Links
http://www.h2orocket.com/ Big Foot Launcher
http://teacherlink.ed.usu.edu/nasa/rockets/activities/bottle/bottle.html
http://www.geocities.com/CapeCanaveral/Lab/5402/
http://www.osa.com.au/~cjh/rockets/
http://www.netspace.net.au/~bradcalv/myrocket.html
http://www.axsnet.com/~jcaclown/rocket.html
http://www.geocities.com/CapeCanaveral/Lab/3810/jelly.htm

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