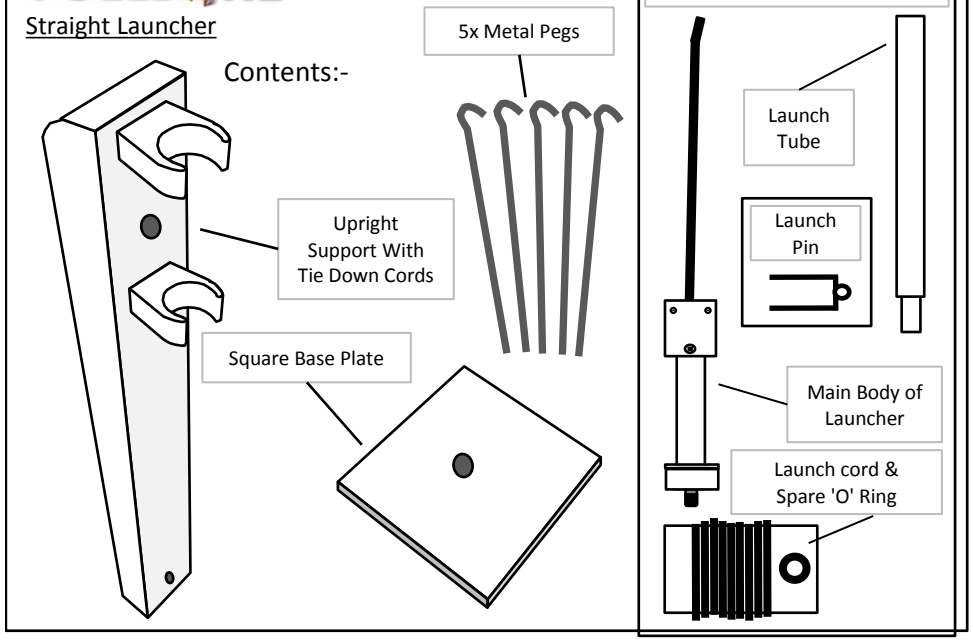
FULLBORE WATER ROCKET LAUNCHER

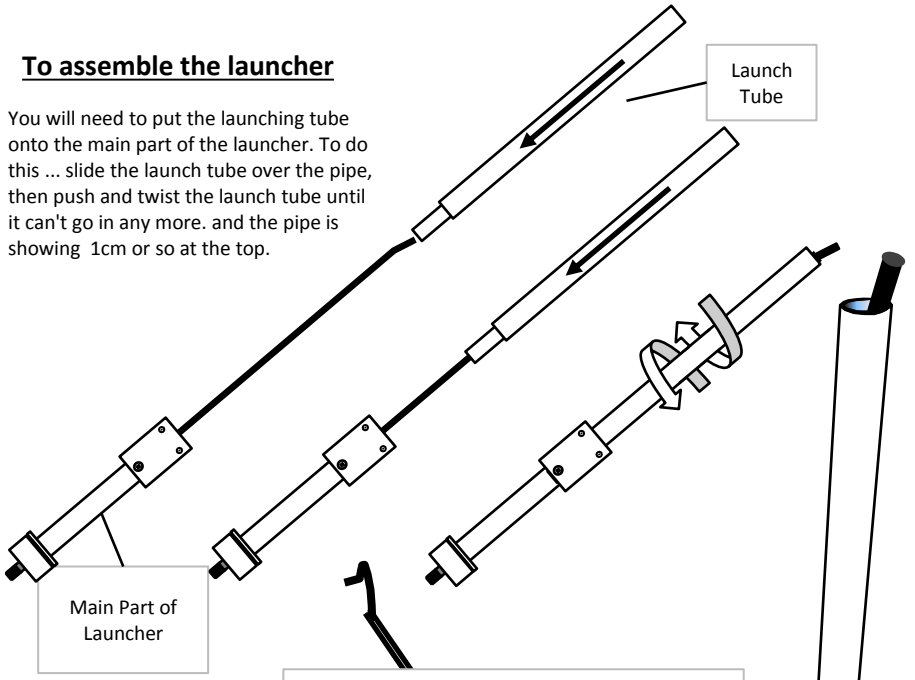
Straight Launcher

Contents:-



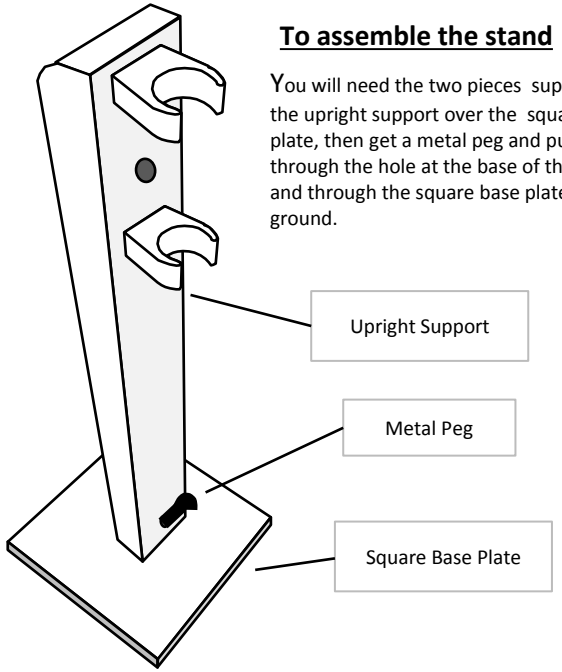
To assemble the launcher

You will need to put the launching tube onto the main part of the launcher. To do this ... slide the launch tube over the pipe, then push and twist the launch tube until it can't go in any more. and the pipe is showing 1cm or so at the top.



To assemble the stand

You will need the two pieces suppied, place the upright support over the square bottom plate, then get a metal peg and push it through the hole at the base of the upright and through the square base plate into the ground.



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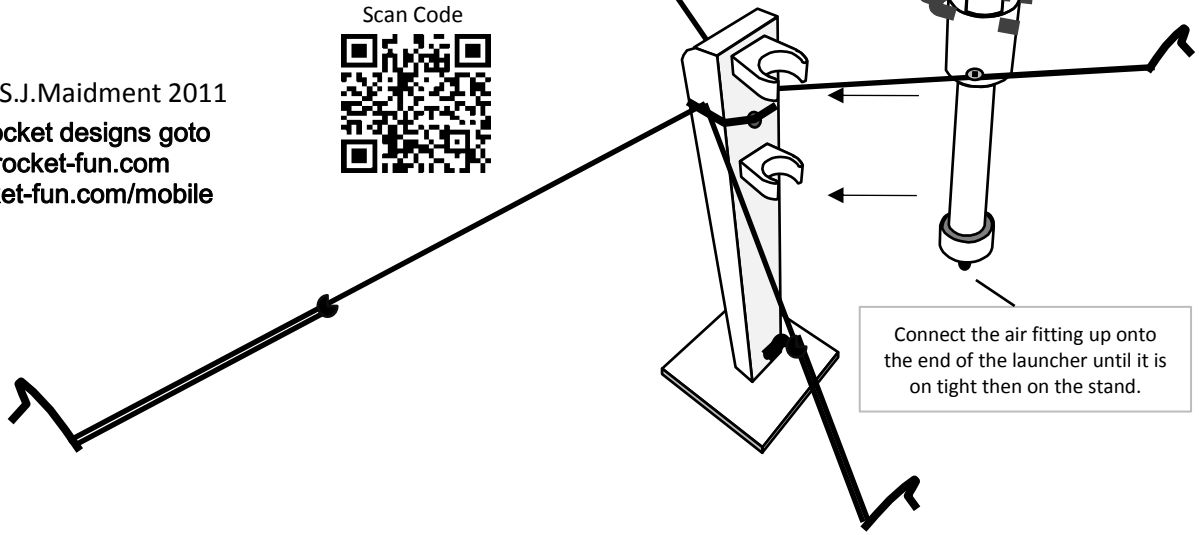

Rocket Safety

Safety is very important with any rocket. Water Rockets in particular are not toys. A pressurized water rocket can store huge amounts of energy and fly hundreds of miles per hour. They can suddenly burst, or injure bystanders by landing hundreds of feet away. Because of this, children should never be allowed to launch water rockets without constant adult supervision. Rockets can be safe but only when everyone understands and abides by safe behaviour. Please note that local laws and regulations may apply. It is the responsibility of all participants to be familiar with and follow all appropriate regulations related to rocketry in their respective countries. Failure to comply with these rules is grounds for disqualification in any world record contests. A 'Water Rocket' is defined as any rocket whose thrust is generated from low temperature compressed gas (air) acting on an inert reaction mass (water).

I. Construction Materials:

Only lightweight, non-metallic external parts for the nose, body, payload container and fins should be used so that the rocket does not conduct electricity. Never use "glass" or other breakable containers at any time. Use only carbonated beverage bottles or pressure chambers that are designed to handle the envisioned flight pressures.
Rocket can be any shape or size but cannot exceed 1,500 grams. This is the total dry weight of all flying components in a flight ready condition including the pressure vessel, fins, nosecone, payload bay, camera, altimeter, flight computer, deployment system, batteries, and nozzle.(no reaction mass) A heavy mass falling from high altitude can be very harmful to persons or property.

II. Payload Materials:

The payload container has to be constructed from strong non-metallic materials to completely enclose any metallic parts carried inside (batteries, electronics, and mechanical components).
The payload section is to be attached above all pressurized parts of the rocket and cannot contain any exposed metal parts.
The payload section must be separate from any pressurized portions of the rocket.
Payloads should never include any flammable, explosive, bio-hazardous materials or live animals.

III. Recovery System:

All launched parts of rocket which travel over 6 meters (20 feet) in altitude must have a recovery system which limits their descent rate at time of touchdown at ground level to a maximum velocity of 10 meters/second (33 feet/second). This includes all pieces which separate or are shed off in flight. Fast falling rockets, debris, or rocket parts can be very dangerous. Recovery system malfunctions will disallow any record flights.
Recovery system cannot contain black powder, fireworks, or pyrotechnic "squibs".

IV. Pressure Vessel:

The pressure vessel shall be made of thin, ductile plastic capable of withstanding the intended launch pressure.
The pressure Vessel cannot be constructed using any portion of an existing high pressure enclosure. (i.e. no Paintball tanks, CO2 tanks, SCUBA tanks, Propane Tanks, etc.)
The pressure Vessel and all external parts of the rocket may not be fabricated from metal. In addition to being heavy and dangerous if falling because of failed deployment, metal can also cause major problems if landing on power lines.
Metallic components should never be in contact with the outside of the pressure vessel as they could become dangerous projectiles should the rocket explode.
Pressure testing of all rocket pressure vessels should be preformed by filling the vessel completely with water before pressurizing the system. It is also recommended that a protection barrier be deployed to minimize projectiles being ejected from the testing area if a burst of the vessel occurs.
Rocket must be pressurized with atmospheric air. No exotic gasses, cryogenics or combustibles allowed.

V. Reaction Mass Rules:

Reaction Mass must be primarily ordinary tap water. Do not use substances that are harmful to the environment.

VI. Launcher:

Rockets should be launched from a stable launch device that is pointed to within 30 degrees of the vertical to ensure that the rocket flies nearly straight up.
Launcher should be constructed using components which are rated for the planned launch pressure.
Rocket must be completely remotely launched. Operators/Spectators are to stand back a minimum of 15 meters (50 feet) while rocket is pressurized and remote launched. Persons may be closer than this if they are behind an adequate shield, but touching or handling of the rocket is forbidden. (Activating cameras and deployment systems must be done prior to pressurization, launch triggered, or done remotely). A high pressure rocket can rupture and explode violently and cause severe injury.

VII. Pressure Source:

All valves, hoses, pipes and fittings from the pressure source to the launch pad shall be rated for the planned launch pressure.
Rocket must be pressurized using atmospheric air only. Other Gasses, "Phase change" (steam rockets) and pyrotechnic pressurizations systems are not allowed.
Use, storage, and transportation of compressed air tanks should be according to all applicable safety codes. The system in use should allow the rocket to be pressurized, depressurized (if necessary) and launched from the minimum safe distance as described above. If the rocket does not launch when triggered, DO NOT allow anyone to approach it until the rocket has been depressurized.
Bottled air pressure source must be located at the minimum safe distance of 50 Feet (15 meters) from the launcher (this allows the bottle air pressure source to be safely controlled in the event of an emergency).

VIII. Flight Safety:

Rockets should only be launched outdoors, in a clear open area with no obstacles such as trees or power lines.
An audible countdown should be used before each launch.
Rockets should be launched in safe weather conditions with wind speeds no greater than 15 miles per hour.
Do not attempt to recover any rocket from power lines, tall trees, rooftops or other dangerous places.
Do not launch rockets over or near roadways or into the path of a vehicle.

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Disclaimer:

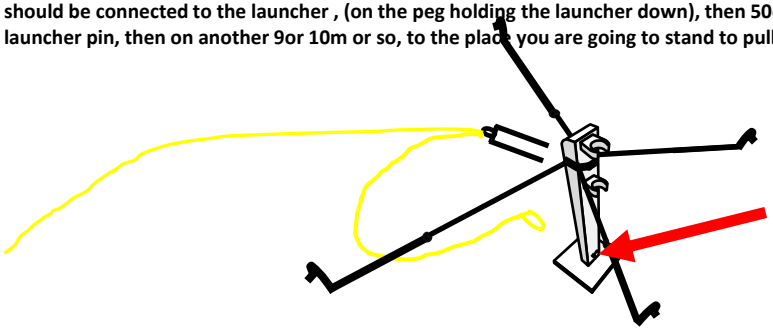
Fullbore Water Rocket Launcher and its members are NOT RESPONSIBLE for any injury or loss of property to any person suffered while operating this water rocket launcher.

How to use the launcher

1. Placing the Launcher

When placing the launcher make sure you peg the launcher down so that it can't be knocked or pulled over! See ROCKET SAFETY. Remember to remove pegs before picking up the stand at the end of the day or you will damage the stand!

Make sure the release line is not twisted, knotted or over the air-line. The release cord should be connected to the launcher , (on the peg holding the launcher down), then 50cm of cord to the launcher pin, then on another 9or 10m or so, to the place you are going to stand to pull the cord to launch.



The launch cord should be connected to the launcher stand.

The reason for pegging the line down is to stop the launch pin from flying through the air and hitting you in the face! (Don't say it won't happen!!!)

2. Water Fill

Turn your water rocket upside-down, then fill to the required amount (about a third of the total capacity).

3. The Rocket

Holding the water in the rocket, turn the rocket the right way up and sliding the neck of the bottle down over the launch tube then twist and gently push until the rocket will not go down any more. (Should be tight fit). Get the launch pin and put the prongs through the holes which are just below the rocket, the prongs should go straight through to the other side. If they don't then give it a little wriggle until they do pop through. Check the release cord is not been stood on or pulled before your ready to launch your rocket.

4. Pressurising

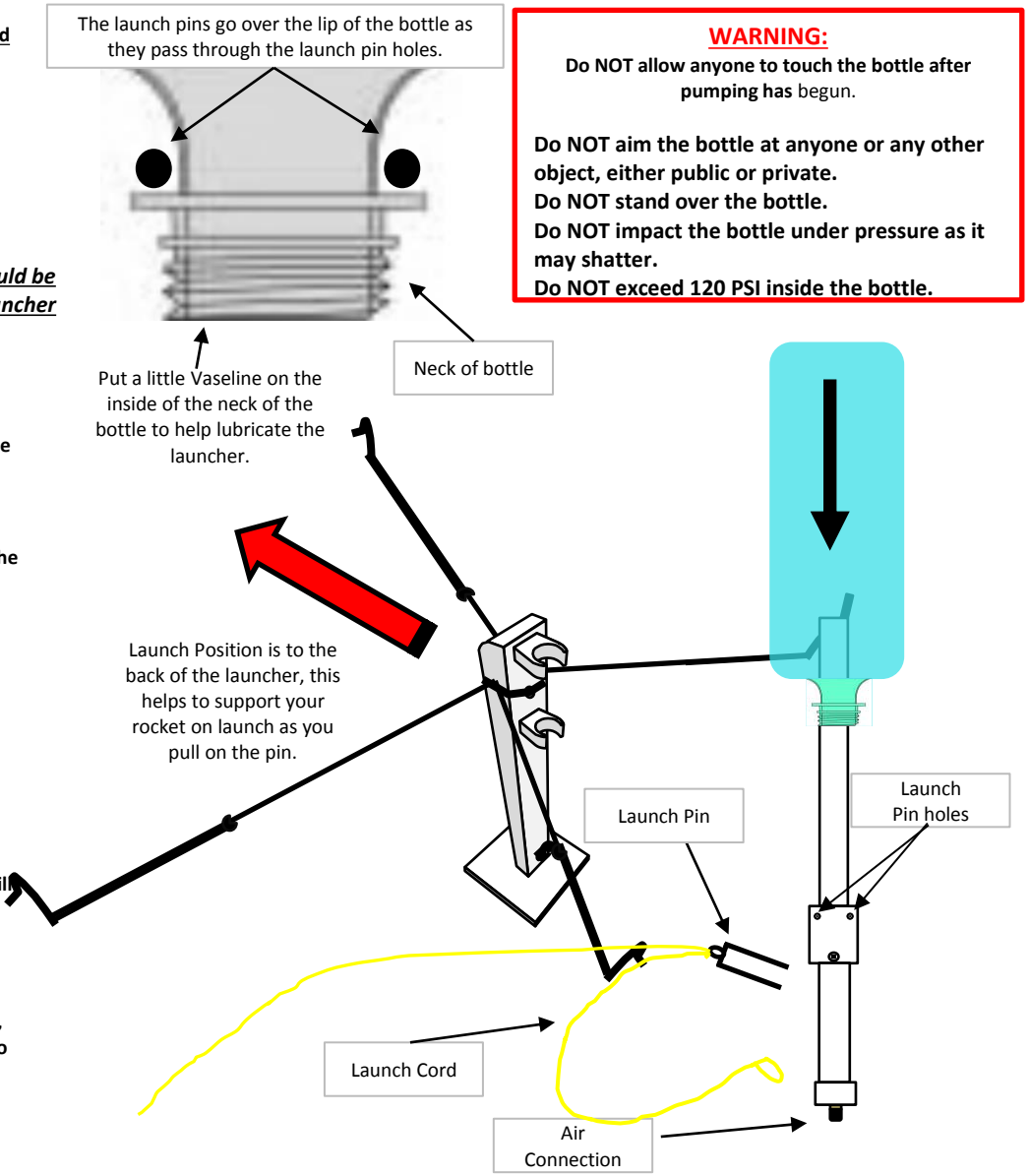
Connect the pump to the air connector or air line (it is recommended that you use an extension air line as you put pressure in to your rocket). Check the launch pin is still in place and the cord is still loose and not pulled before you wish to launch. Slowly pump until you reach the required pressure, do not exceed 120psi.

5. Launching the Rocket

Don't leave the rocket pressurised too long, do a check around the area for dogs, people, children etc. Stand well back and get the release cord, slowly take up the slack until a little resistance is felt. Do a count down from 5 ... 4 ... 3... 2... 1 ... PULL BACK sharply to pull the launch pin out of the launcher! Then .... WOOOOOOOOOOSSSSSSSSSSSSSSSSSSSSSSSSHHHHHHHHHHHHHHHHH!

6. Aborting the Launch.

If you need to abort the launch, you can release the air from inside the rocket by **slowly** removing the connection to the air line / air connect from the pump! Please be careful when doing this as it can be very high pressure!!!!



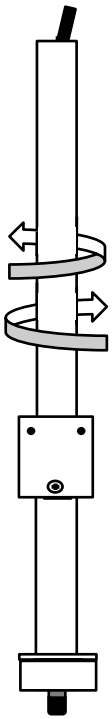
WARNING:

Do NOT allow anyone to touch the bottle after pumping has begun.

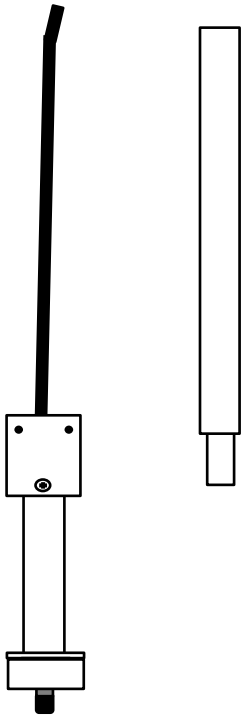
Do NOT aim the bottle at anyone or any other object, either public or private.
Do NOT stand over the bottle.
Do NOT impact the bottle under pressure as it may shatter.
Do NOT exceed 120 PSI inside the bottle.

Replacing the 'O' Ring

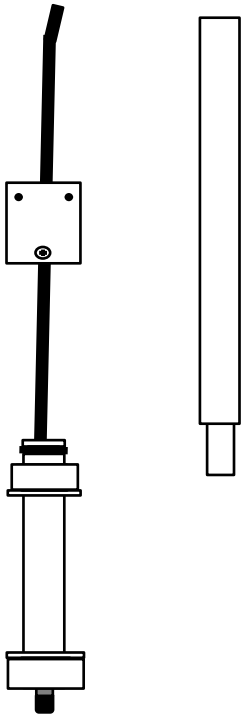
First try and unscrew all three screws approx 4mm out then unscrew the whole upper section and slide off.
Replace 'O'ring then screw section back on and tighten the screws. If this didn't work then try information below.



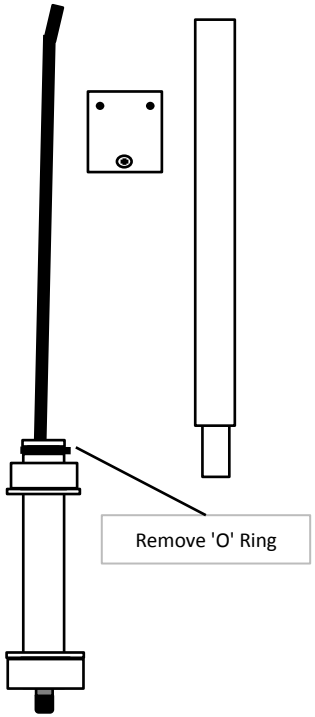
Hold the area with the launch pin holes, then grip the launch tube, then twist and pull. The launch tube should come slide apart from the main body of the launcher.



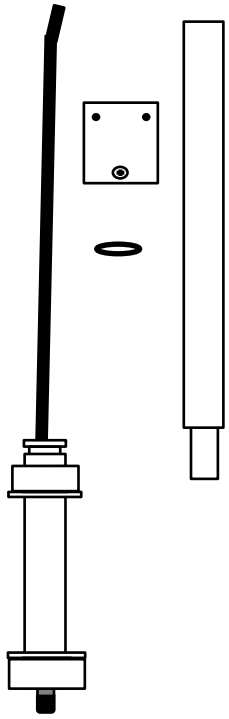
Un-screw the three retaining screws on the tube with the launch pin holes.



Slide it off the main body of the launcher and put too one side. The black 'O' ring is now exposed

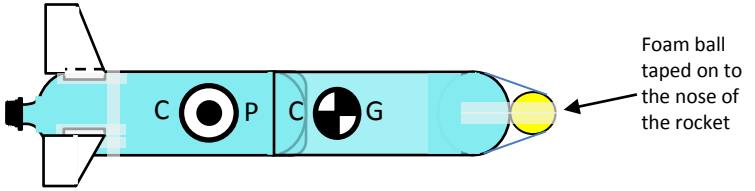


Remove the black 'O' ring. Get the replacement 'O' ring and slide it over the pipe and onto the end of the tube where you found the original 'O' ring. Apply a little Vaseline around the 'O' ring to help with the rocket loading.



Now slide the tube with the launch pine holes back over the pipe and on to the end of the main body of the launcher and line up the holes for the screws. Get the three retaining screws and put them back in to the launcher and gently tighten. Replace the launch tube.

- The Center of Gravity (CG) can be found by locating the balancing point of the rocket.
- The Center of Pressure (CP) can be found by tying a string around the rocket body so that it does not slip. Stand in a wide open area and swing your rocket in a circle. If the rocket points in the direction you are swinging, it is stable. If not, add more clay to the nose cone or replace your fins with larger ones. This test should be repeated until the rocket points in the direction you are swinging.
- The CG should be closer to the nose cone than the CP.

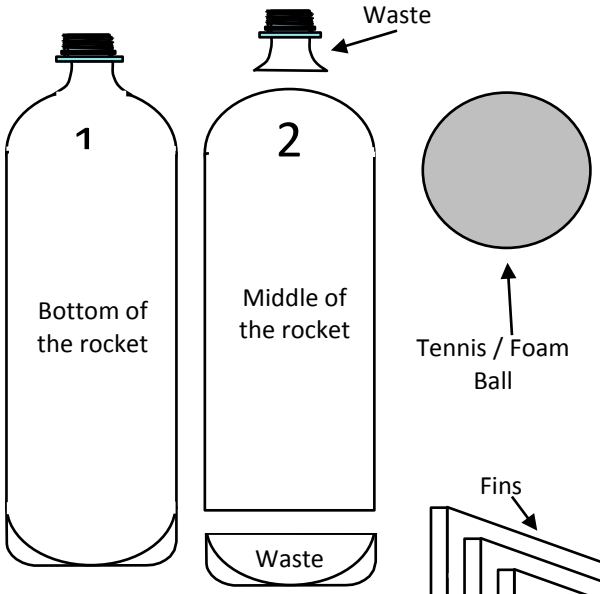


Building a Basic Rocket

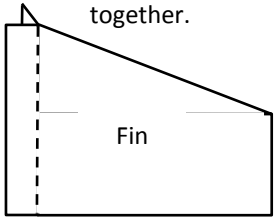
Before you build a rocket try the bottle on the launcher to test if it holds pressure and fits correctly.

You Will Need
2 X 2ltr Bottles
1 X Glue/Double Sided Tape
1 X Cardboard
1 X Roll of Sellotape
Sheets of Paper

Tools
1X Hot Glue Gun
1X Pair of Scissors
1X Fine Marker Pen



- The 1st bottle is kept the same, just remove any bits of plastic from the top, which are the same colour as the screw cap.
- The 2nd bottle is cut in to three pieces, remove the top and the base of the bottle to help reduce weight of the rocket.
- The tennis ball needs to be cut in half and taped or glued on to of the 2nd bottle.



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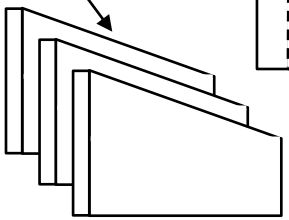

Rocket Fins

Fin Template

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WATER ROCKET LAUNCHER

The fins are made out of cardboard from a cereal packet. The fin is in two parts that are stuck or double sided sticky taped together. The two tabs are bent out along the dotted line after scoring with the back of a knife, the tabs are used to tape the fin to the rocket.

To make the fin water-proof use package tape on both sides, folding over the edges. The fins are then hot glue guned in the corners of the tab and fin on each side(fig 5), this gives the fin more support.

Finally the fins are taped to the rocket using sellotape on each tab and then around the rocket to stop the tape pealing off. They should arranged symmetrically around the rocket (every 120° if you have three fins or every 90° if you have four).

Use a some paper to help mark the correct location for the fins. (fig 6).Wrap the paper around the rocket base and mark where the paper overlaps (Fig 6),then divide the paper (Fig 7) into three (or four if making four fins for your rocket). Put the paper back round the base of the rocket and mark where the fins are to go.

Take the paper off the rocket and put the marks up against a door frame (Fig 8) and draw a line down your rocket for the fin locations, you should get a straight line along the bottle (you don't want fins going in the wrong direction).

Put the fins where you have marked the base of the rocket, making sure you follow the lines you have drawn on the rocket body .

Fin Cross Section

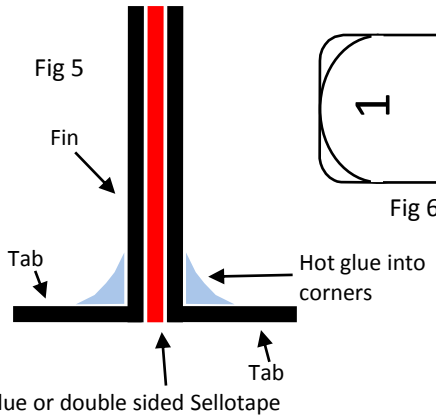


Fig 5

Marking the Fin Locations on a 2ltr Bottle

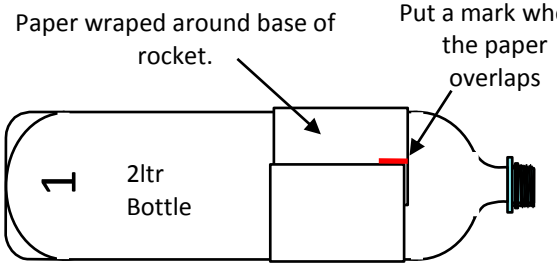


Fig 6

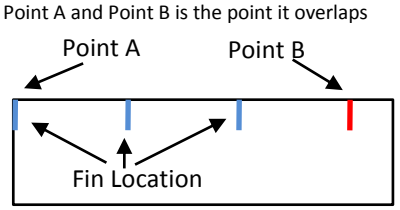


Fig 7

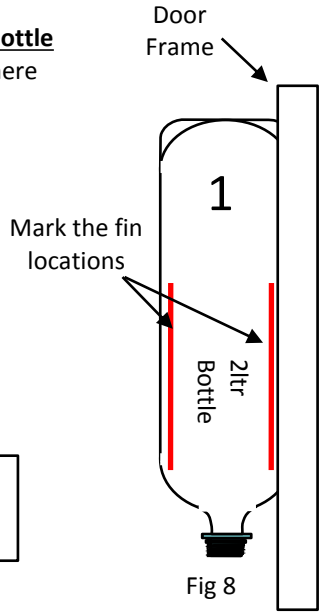
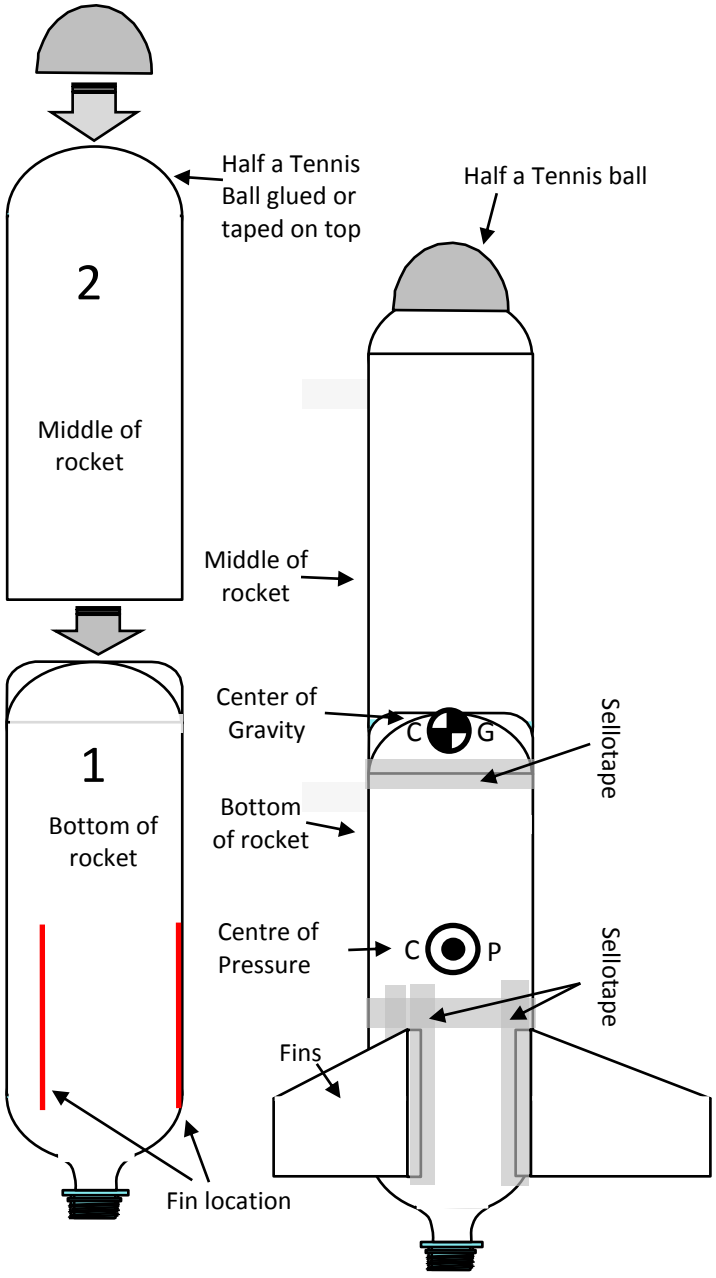
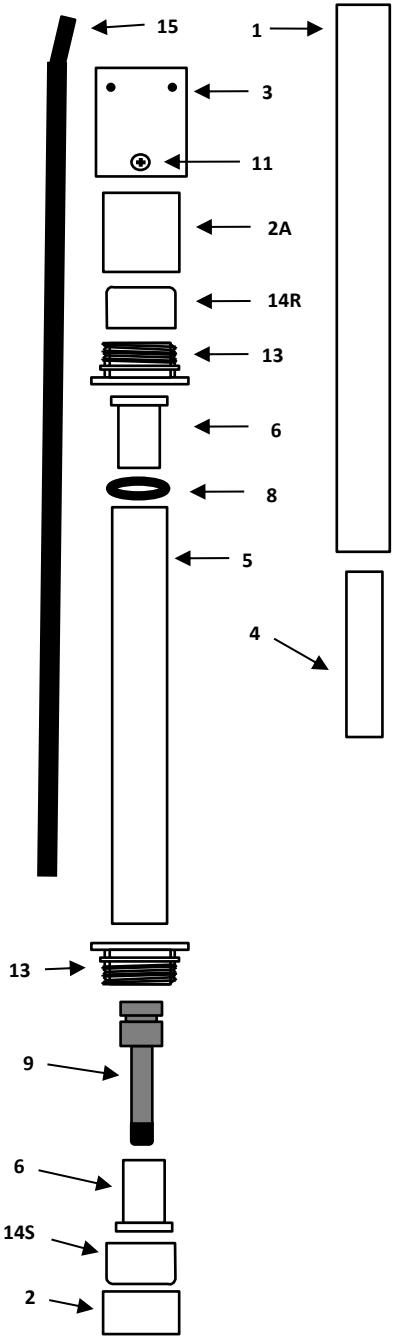


Fig 8



Components List



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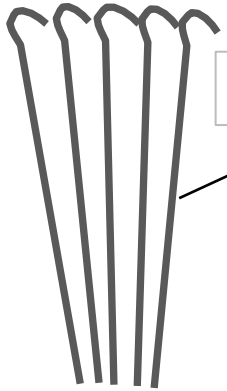

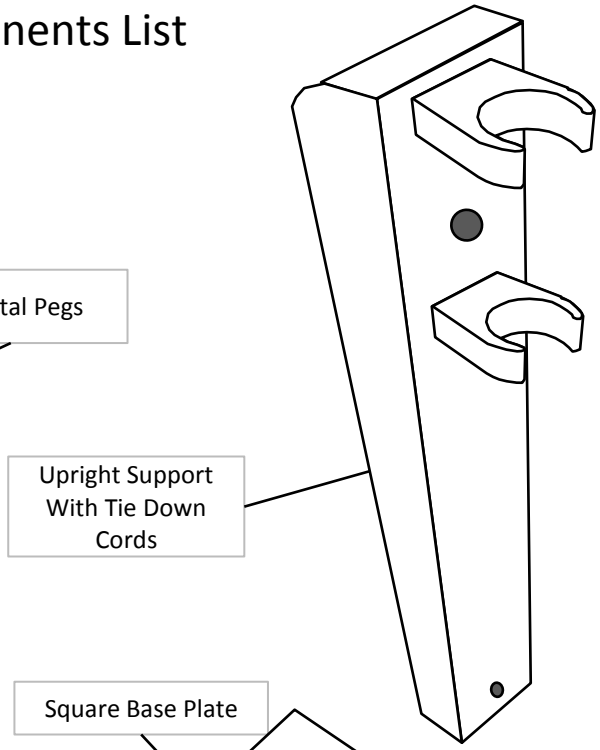

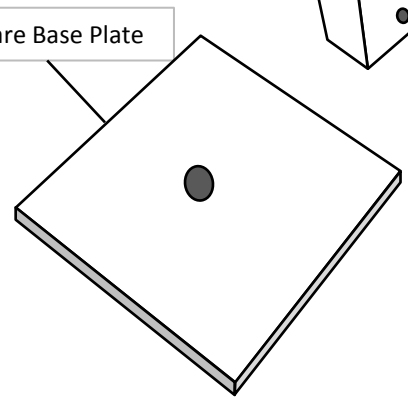

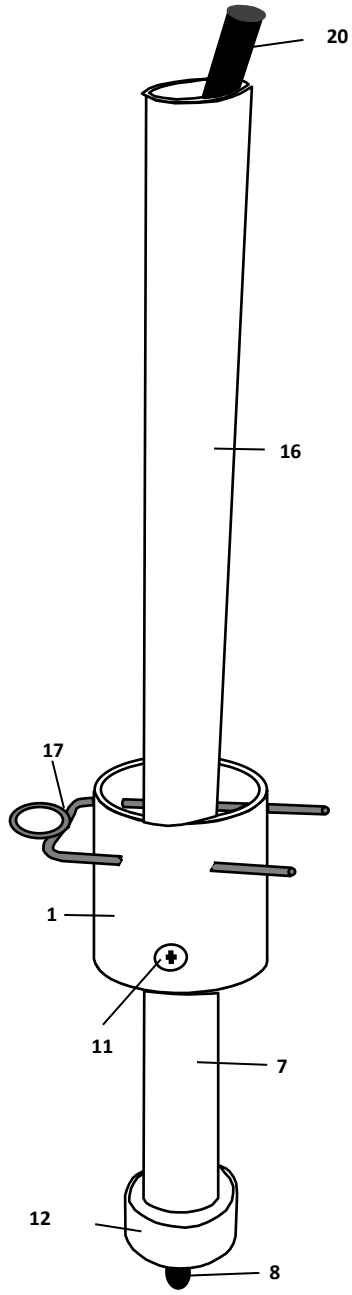

1 Launch Tube
2 Outer Cover Ring
2A Inner Launch Pin Ring
3 Outer Launch Pin Tube
4 Launch Tube Joiner
5 Central Tube (Long)
6 Central Tube Support Insert
8 Rubber 'O' Ring 14mm ID X 2.5mm
9 Air Valve Port
11 Screws
13 Plastic Joiner
14R End Cap (Ring)
14S End Cap (Small Hole)
15 Air Pipe
17 Launch Pin

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