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DISCLAIMERS

AntiGravity explicitly states that this product is not meant for use by unsupervised children and is not meant for use with any air pump other than a standard low pressure hand-powered bicycle air pump, nor is it meant for use with any bottle other than a plastic bottle that previously contained fizzy pop. Using any air pump capable of applying more than 80 pounds per square inch of pressure or using anything other than a pop bottle is strongly DISCOURAGED.

JURISDICTION

AntiGravity is located in and operates from Chilliwack in the province of British Columbia, Canada and no other location. The laws of the province of British Columbia shall govern these terms and conditions and any dispute related thereto without regard to choice of law rules. Consumer hereby consents and agrees to exclusive jurisdiction and venue of courts in New Westminster, British Columbia, Canada. Use of this product is unauthorized in any jurisdiction that does not give effect to all of these terms including, without limitation, this paragraph.

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If any part of this agreement is deemed to be invalid or unenforceable for any reason, then such invalid or unenforceable provision shall be deemed superceded by a valid and enforceable provision that most closely matches the intent of the original provision and the remainder of the agreement shall remain in effect.

www.antigravityresearch.com email: sales@antigravityresearch.com toll-free: 1-866-546-8633
phone 604-824-9021 fax 604-648-8192



Also included with your Ozone Probe 2-Stage Rocket kit:

Filling Hose / Launcher

Lets you pump up the rocket from a safe distance away. Releases automatically when you stop pumping.



Guide Rod

Keeps your rocket pointed up until it's going fast enough to continue on straight up.



Safety Marker

Ensures that the launch site is clearly visible to all.



Clear pictorial instructions

Makes the rocket easy to assemble, a breeze to launch.



Requirements:

- 1 - Bicycle air pump
- 1 - 2-liter plastic pop bottle
- 200 ml water
- 1 - 1000' wide open field

Ozone Probe 2-Stage

Water Rocket Kit To 500 feet

Closed-cell foam bumper pad for a safe, soft touch-down every time.

Designed to fit on any plastic pop bottle you choose.

Upper-stage nozzle specially designed for controlled, long-term energy release.

Super-light expanded polymer strut supports instantly fold out and click into place.

Fluted tubular polypropylene struts lock ring fin in position for aerodynamically superior performance.

Low-friction guide tube keeps the rocket pointed up during liftoff.

Shock-absorbing mounting system for maximum reusability.

Tough expanded-polymer booster fins stabilize entire rocket during liftoff.

Upper Stage weighs only 60 grams, maximizing both altitude and safety.

One-piece expanding bulb interstage release mechanism for high reliability, split-second timing.

Stage Separation at +30 ft



Booster stage drops away while 2nd stage settles into lengthy climb phase



High power reduction-type nozzle for high acceleration during boost phase.



Reasonably priced spacecraft for the home, school or office.

Preparing the Rocket Bottle

Unless you bought one of our brand new bottles or stretched bottles for your rocket, you'll need to find an empty, used pop bottle. Make sure to only use a plastic bottle that used to hold fizzy pop. Don't use a water bottle, as it is not strong enough to hold the required pressure. Never use a bottle that has been damaged in any way, or that has any visible flaws.

1

Use a pair of snippers or a nail clipper to remove the retaining ring from the mouth of the bottle. If you don't remove it, the retaining ring can interfere with the positioning of the fins.

2

Remove the label from the bottle by gently heating the glue with a hair dryer. The label should then peel off easily. The rocket will fly higher without the extra unnecessary weight of the label.

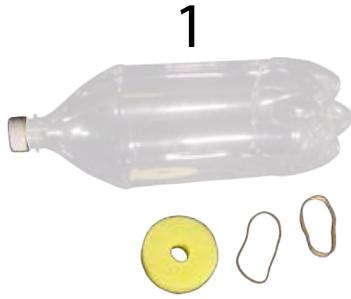
**3**

This is what the finished bottle should look like. Now you are ready to begin assembling the rocket.

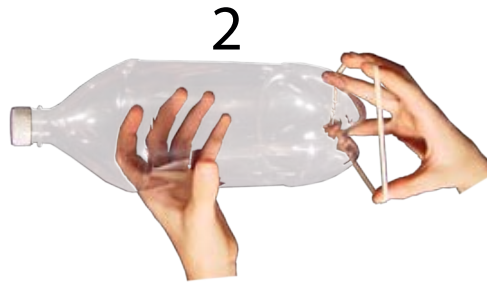


Bumper Installation

The bumper is important because it softens the impact when the rocket lands. Always make sure the bumper is properly attached and centered on top of your rocket before launching. It not only protects what (or who) it hits, it makes the rocket last longer.



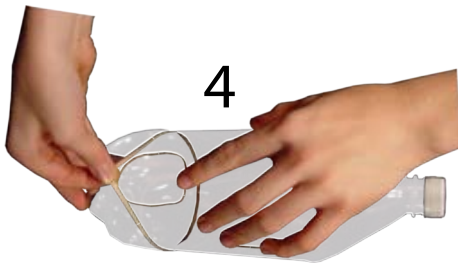
Start with a bottle, a bumper pad, a fat elastic band and a long elastic band.



Stretch the fat elastic band and put it over the bottom of the bottle.



This is what it looks like with the fat elastic band in place.



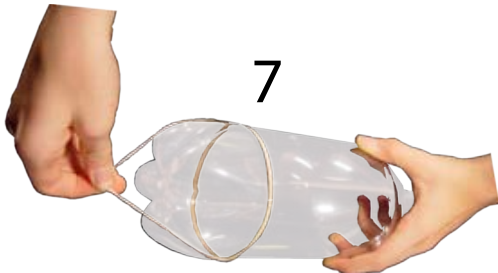
Lift the fat elastic and slide the long elastic underneath it.



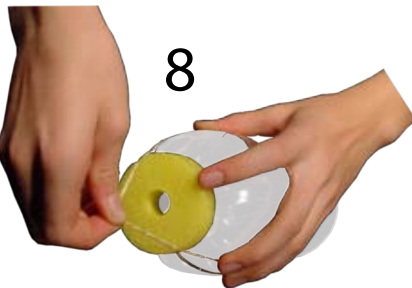
The long elastic now passes beneath the fat elastic, making two loops.



Pass both thumbs through both loops in the long elastic and slide your thumbs to opposite sides of the bottle.



Pull the long elastic's loops up over the end of the bottle, high enough to slide the bumper under.



Slide the bumper pad under the long elastic and let go of the elastic.

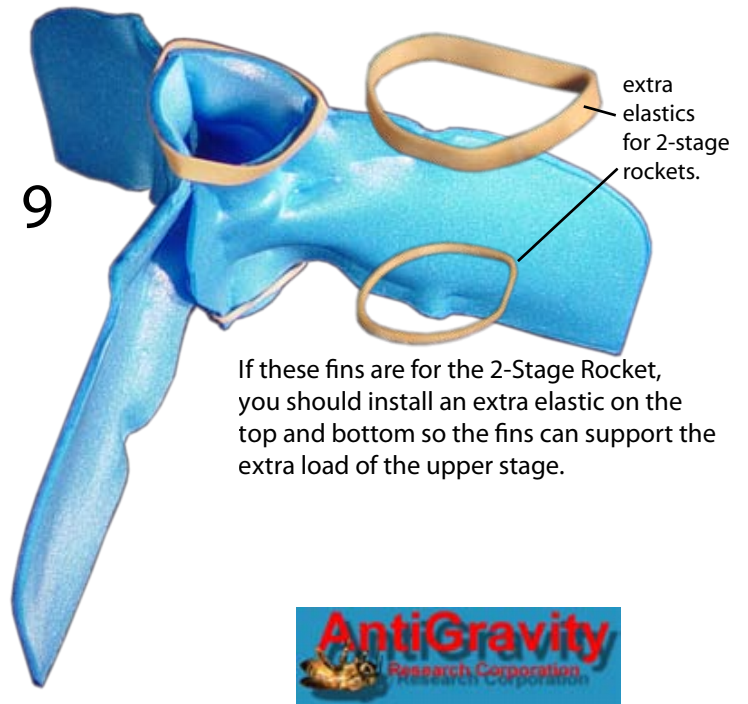
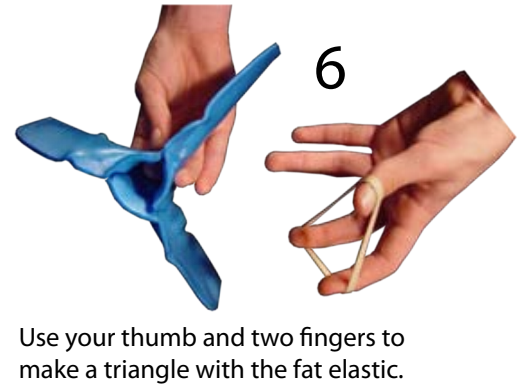
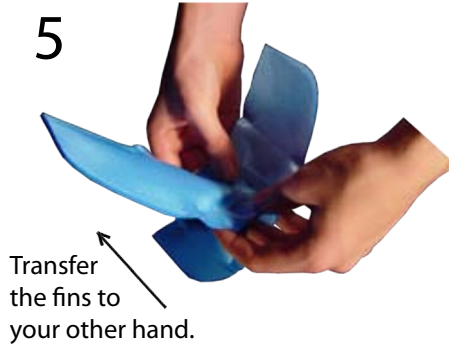
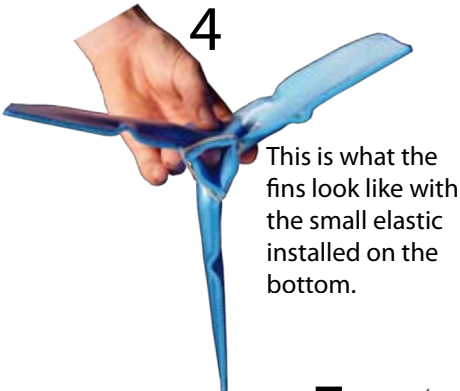
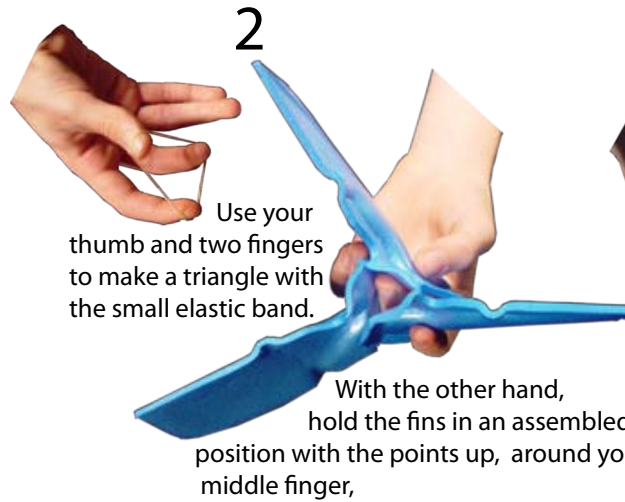
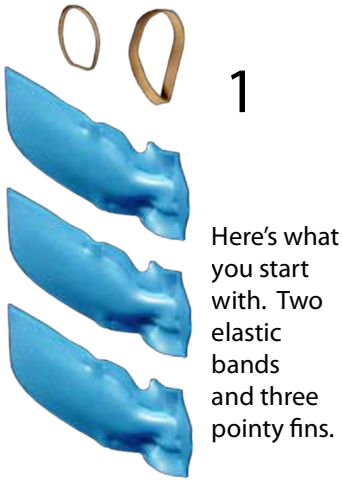


This is exactly what the bumper pad should look like on your rocket.



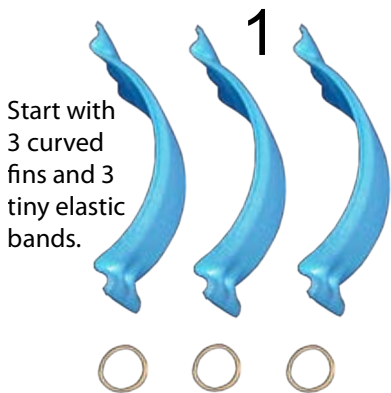
The Tripod Fins

These fins are tough to assemble because the elastics seem to want to keep popping off. Once you've got them in place though, they're there to stay! The elastics hold on tightly when the rocket is flying, but they let go easily during impact so the fins don't break.

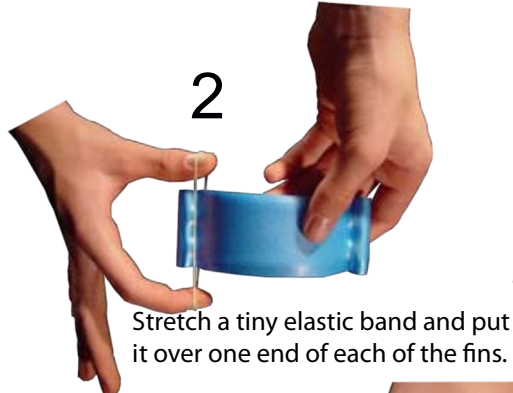


Assembling the Ring Fin

The ring fin is a very light, low friction system for keeping your rocket stable. It is useful for two-stage rockets, high altitude single-stage rockets, double fin rockets and just about any type of rocket your imagination can create.



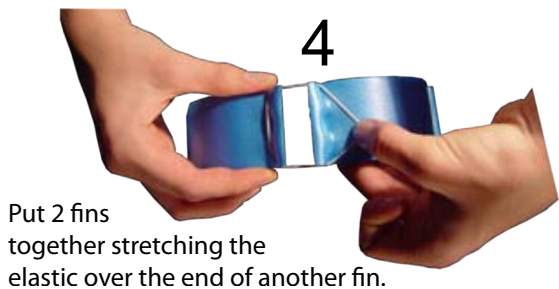
Start with 3 curved fins and 3 tiny elastic bands.



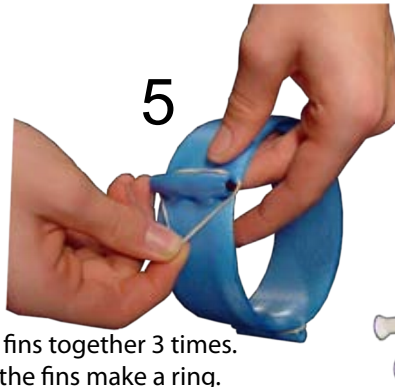
Stretch a tiny elastic band and put it over one end of each of the fins.



See how all 3 fins have an elastic on one end?

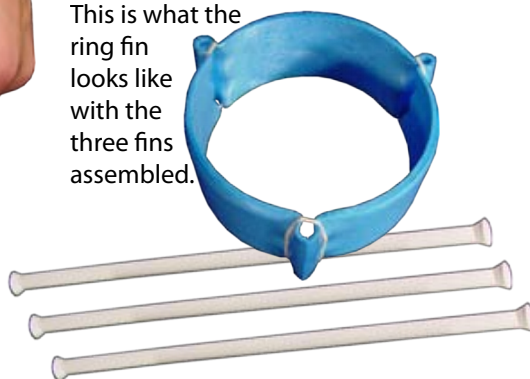


Put 2 fins together stretching the elastic over the end of another fin.



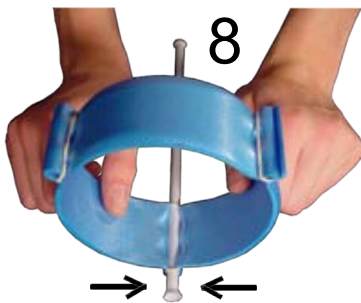
Put 2 fins together 3 times. Now the fins make a ring.

This is what the ring fin looks like with the three fins assembled.



Now you will need three white flared posts. Don't kink or bend them or they get weaker.

Now, let's install the posts. The ring fin will hold onto the posts like a clamp.

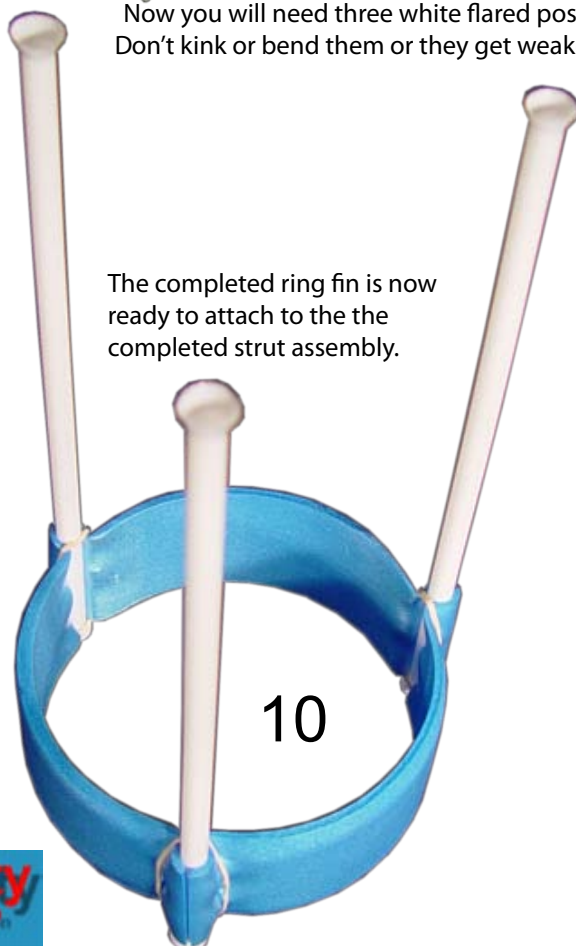


With the post resting on a table, pull apart 2 of the fins and allow them to close around the post. Repeat this for all 3 posts.

The completed ring fin is now ready to attach to the the completed strut assembly.

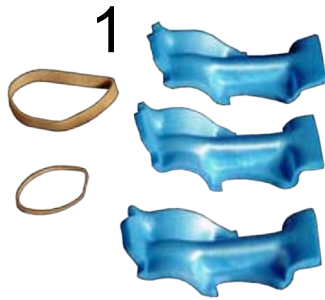


Push each post in until it stops at the flared end.



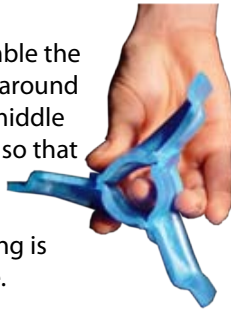
Assembling the Struts

The struts are used to hold the ring fin assembly onto the bottle. They are part of the 2-stage rockets or the High Altitude Pro rocket.

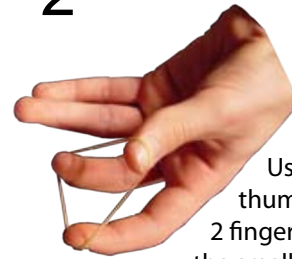


Start with 3 struts and 2 elastic bands.

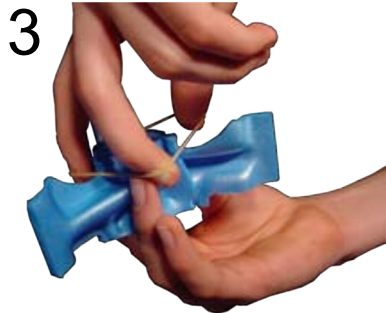
Assemble the struts around your middle finger so that the small opening is visible.



2



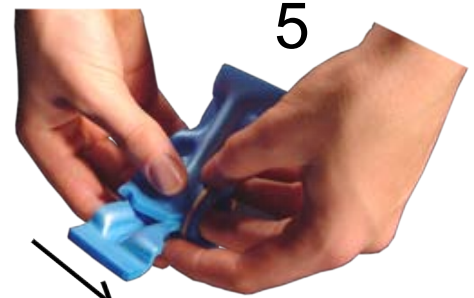
Use your thumb and 2 fingers to stretch the small elastic into a triangle shape.



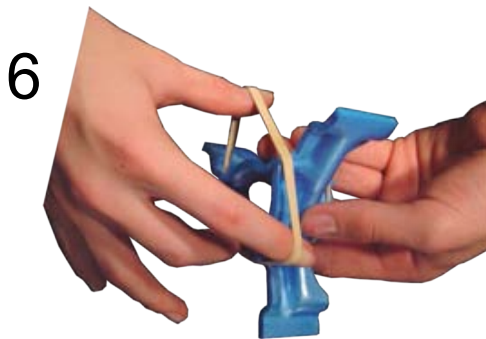
Install the small elastic on the small opening.



This is what the properly installed small elastic looks like.



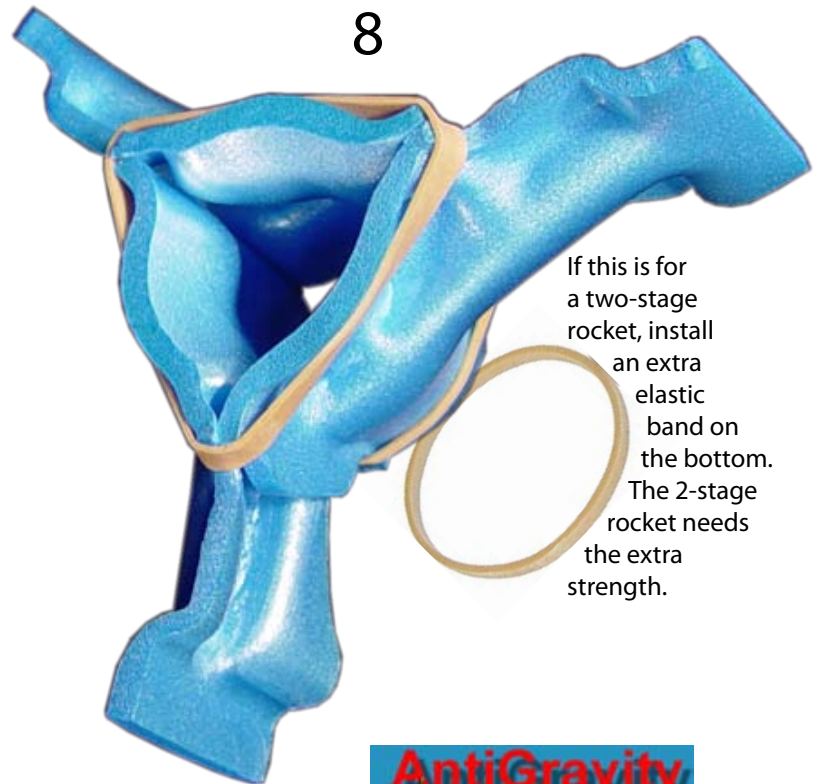
Transfer the assembly to your other hand.



Use your thumb and 2 fingers to make a triangle of the fat elastic band and place it over the large opening.



This is what the properly installed fat elastic band looks like.

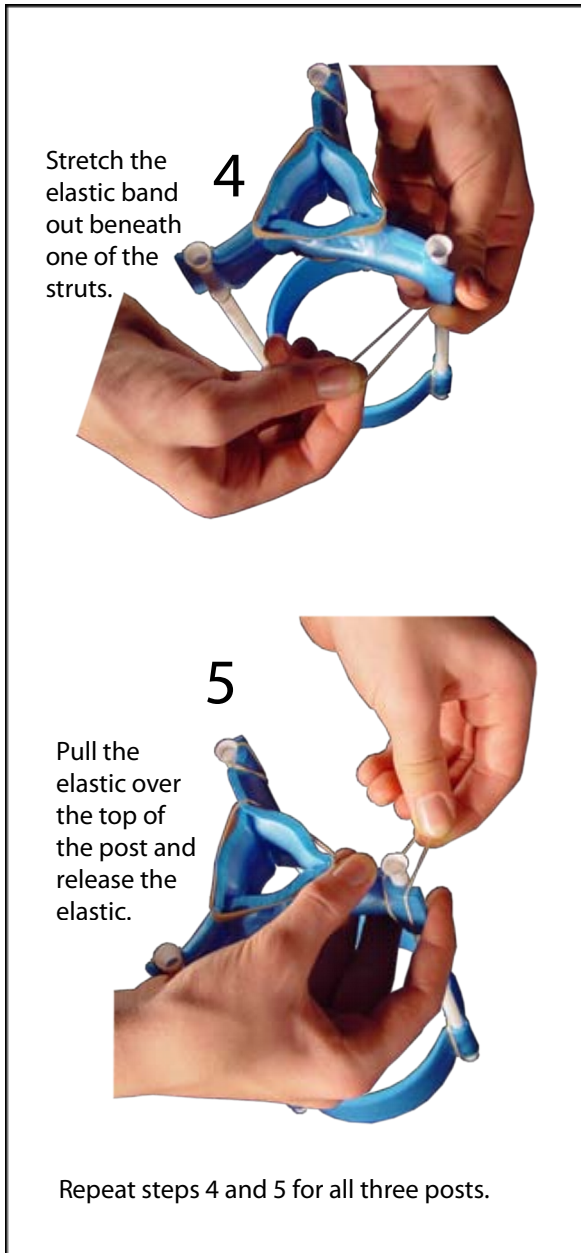
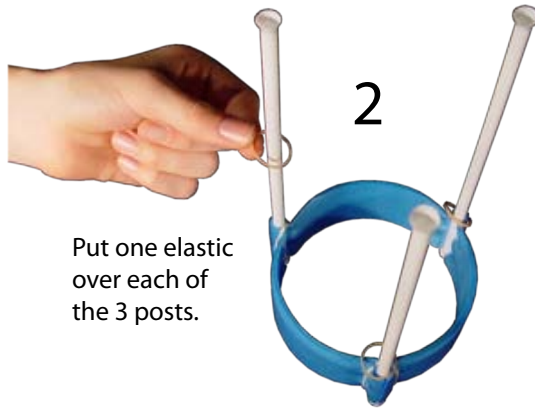
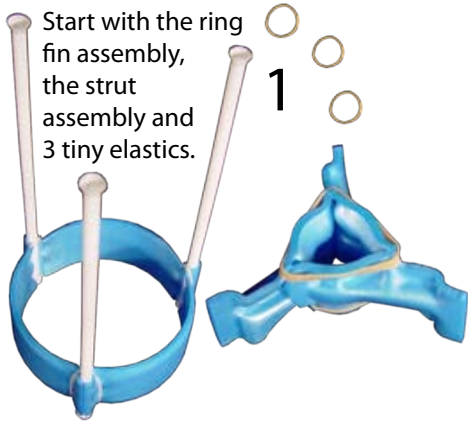


If this is for a two-stage rocket, install an extra elastic band on the bottom. The 2-stage rocket needs the extra strength.



Combining the Upper Struts with the Ring Fin

These are the fins that are usually used on the upper stage of the 2-stage rockets, or on the Pro Edition.



Rocket Fuel

When you head out to the field with your water rocket, it is important that you bring a supply of water with you. A 2-liter pop bottle works well as a container for that supply. Two liters should give you about twenty single-stage rocket flights, or ten 2-stage rocket flights. If the weather is below the freezing point of water, add some salt to the fuel to keep it from freezing.

For extra altitude and an impressive vapor trail, add about 10% to 25% non-toxic hand-wash dish soap to your water. The soapy exhaust will leave a brown spot on the lawn where the rocket lifts off, so make sure this is okay before using soap. You can run the rockets without any water, but they won't fly as high.



Plain ordinary water works very well as a rocket fuel. Don't forget to put the cap back on after each use, or your supply of water will all spill out.

Or



For a soap mixture, first add 200 ml to 500 ml of non-toxic hand-wash dish soap into a 2-liter bottle.



Then fill the rest of the bottle with water, put the cap on and gently shake until mixed.



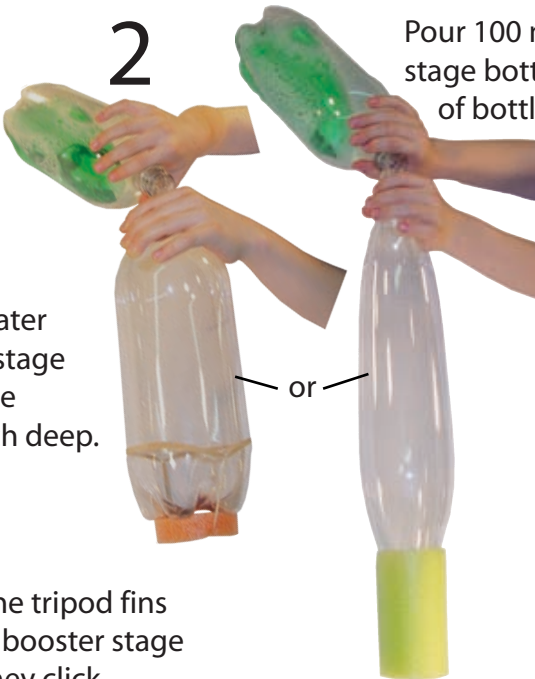
2-Stage: Adding Water and Connecting the Launcher

Once you add the water, the bottles should be kept on their sides until step 7 is done, to avoid spilling.



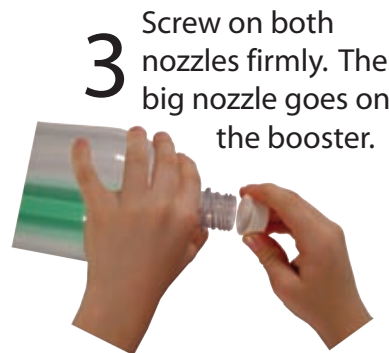
1

Pour 100 ml of water into the booster stage bottle. This will be about half-an-inch deep.



2

Pour 100 ml of water into the upper stage bottle. You can use either type of bottle.



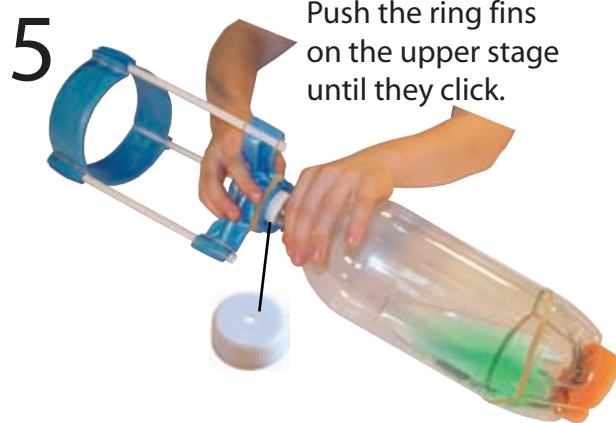
3

Screw on both nozzles firmly. The big nozzle goes on the booster.



4

Push the tripod fins on the booster stage until they click.



5

Push the ring fins on the upper stage until they click.



6

Connect the two halves of the rocket. The yellow tube on the booster should go into the upper stage nozzle.

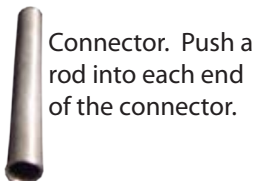
7

Insert the booster launcher's yellow bulb into the booster nozzle. Push it in as far as it will easily go. Now the rocket is ready to mount on the guide rod.



The Guide Rod

The guide rod keeps the rocket pointed straight up until it is going fast enough to be stable. The longer the guide rod, the more vertical the flight. The rocket should have water in it and be connected to the filling hose already. If your guide rod is a 12-inch single stick, go directly to step 4. For a 3-foot rod or 6-foot rod, start at step 1.



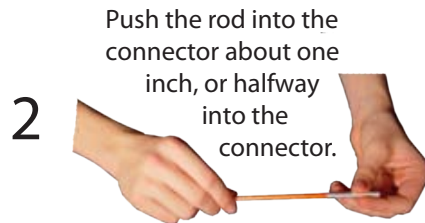
Connector. Push a rod into each end of the connector.



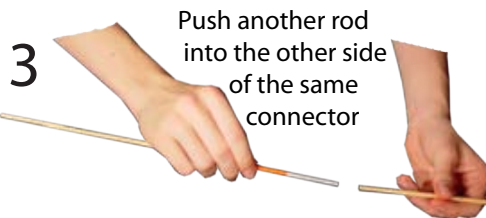
The safety marker prevents you from tripping over the guide rod by making it easy to see.



1 Push a metal connector onto a rod.



2 Push the rod into the connector about one inch, or halfway into the connector.



3 Push another rod into the other side of the same connector

Repeat steps 1, 2 and 3 until the rod is as long as you need. Don't make it longer than 6 sections or it's too high to reach over the rocket.



4 Making sure the rod points straight up, push it through the red safety marker into the ground about 2 inches, or until it is firmly planted.

3-foot rod

6-foot rod

5 Lift the rocket to the top of the rod and slide the guide tube over the rod. Slide the rocket down until it rests firmly on its fins on the ground.

6

Ready to fill with air! The rocket's fins rest firmly on the ground and the guide tube is ready to slide up the rod when the rocket takes off.



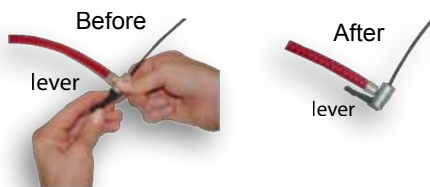
Launching your Rocket

Though you can use any similar air pump, AntiGravity's Rocket Pump is specially designed to easily handle the rigorous conditions involved in water rocket launching. The secret is the pressure reservoir canister, which dissipates heat and absorbs pressure peaks. Always use a hand powered pump to pressurize your rockets, never a compressed air tank or electric or automatic pump. With a hand-powered pump, you stop pumping when the rocket launches, so the little yellow bulb at the end of the launcher doesn't stretch and burst. You also stop pumping if your cell phone rings or if someone interrupts you but an automatic pump keeps on pumping. Plus it's great exercise to pump up a rocket! Always stay at least 20 feet away from the pressurized rocket, and keep everyone else 20 feet away from it, just in case it explodes.

- 1** Push the launcher hose connector into the rocket pump connector.



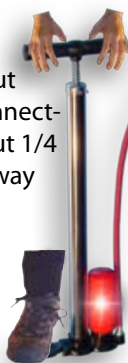
- 2** Push the lever down by holding the metal rocket pump connector, not the hose.



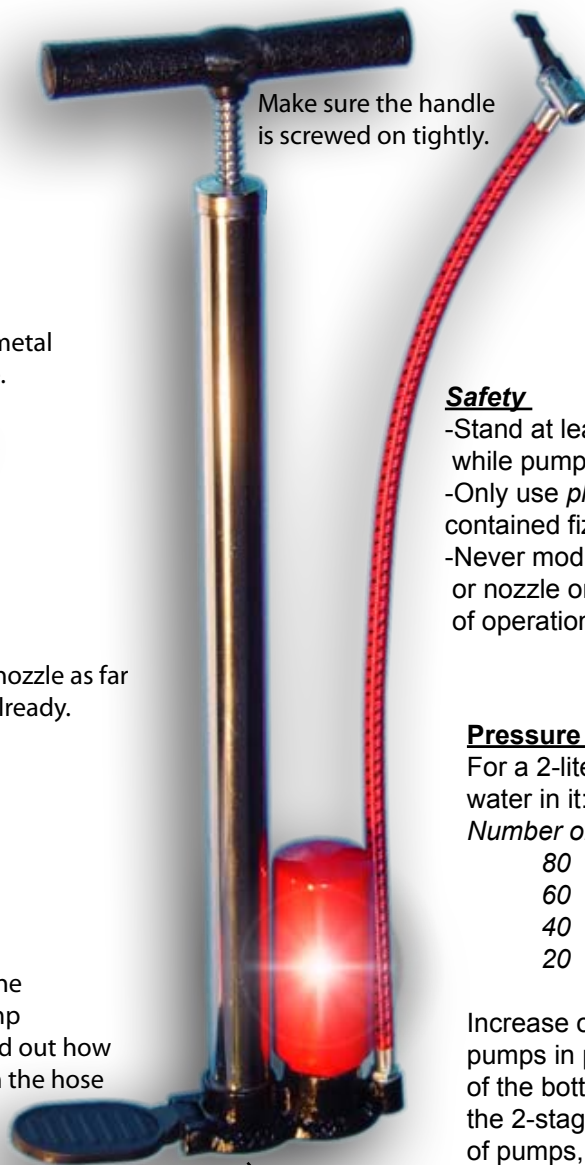
- 3** Push the yellow bulb into the rocket nozzle as far as it will go, if you haven't done this already.



- 4** Place both hands on the handle and one foot on the foot rest, and begin to pump (See pressure guide on this page to find out how much to pump). If no air goes through the hose to the rocket, back out the connector about 1/4 of the way and try again.



- 5** If rocket doesn't launch on it's own, just stop pumping. If it still doesn't launch (usually at lower pressure) disconnect the pump from the launcher hose.



When not in use, keep the pump indoors, away from sunshine and water.

Safety

- Stand at least 20 feet away from the rocket while pumping.
- Only use *plastic* bottles that previously contained fizzy pop.
- Never modify an AntiGravity launcher hose or nozzle or it may adversely affect safety of operation.

Pressure Guide

For a 2-liter plastic bottle with 100 ml water in it:

| Number of Pumps | Air Pressure (psi) |
|-----------------|--------------------|
| 80 | 80 |
| 60 | 60 |
| 40 | 40 |
| 20 | 20 |

Increase or decrease the number of pumps in proportion to the volume of the bottle you are pressurizing. For the 2-stage rocket, double the number of pumps, because it has 2 bottles to fill.

If you add more water, use fewer pumps.

Pumping faster allows the rocket to hold on longer and fill to a higher pressure.



Two-Stage Water Rocket Troubleshooting Ideas

1. For best rocket performance, use a hand powered air pump that has a 20 inch stroke and a 1.25 inch diameter barrel. Using a pump of these dimensions, the 2-stage rocket requires 100 pumps. Always count your pumps in case the top stage takes off by itself. Remember the number of pumps when it took off.
2. If the upper stage lifts off without the booster stage, try again with more water in the upper stage. More water will make the upper stage heavier so that it will not take off so quickly. Usually you start by putting 100 ml in the bottom stage and 100 ml in the top stage, but you can put up to 300 ml in the top stage if necessary for extra weight. If you pump faster it will also tend to hold down the top stage longer. If the top stage still takes off by itself, try launching by flipping the pump-connector lever open before the number of pumps that the upper stage usually takes off at.
3. Weak rocket performance is usually caused by too low pressure. A properly working 2-stage rocket should quickly fly straight up, with the booster dropping out at about 25 feet off the ground and the upper stage traveling almost straight up for hundreds of feet. The 2-stage requires about 100 pumps to make it fly properly. This will put about 80 psi of air pressure in the rocket. The line will have about 100 to 120 psi in it while you are nearing 100 pumps.
4. If the rocket tips over and flies sideways, it most likely has too much water in it. Try it again with less water in both stages. Ideally, you should start with 100 ml of water in each stage.
5. For highest altitude, mix 10% to 25% non-toxic handwash dish soap into the rocket water. The mixture foams when you pump up the rocket, raising the center of gravity which makes the rocket more stable. It also allows the rocket to carry up much more water, to have smoother thrust and to make more efficient use of the energy of the compressed air. Note: the soap will turn the lawn brown at the lift-off site.
6. To keep from breaking, the rocket comes apart when it hits the ground. Be prepared to reassemble much of the rocket after each flight. Try to find all the parts and elastic bands each time so that you can fly your rocket again and again.
7. If the rocket wobbles or loses its fins in flight it may have loose or poorly placed elastic bands holding the fins on. Make sure the elastics are all seated properly before launch. If the elastics are too loose, use new elastics from the package provided with your kit. Elastic bands gradually lengthen when used over and over in a wet environment. If all the elastics are too loose, try using two elastics in each position.
8. If the fins or strut supports break you can fix them with low-temperature hot melt glue. Switch your glue gun to its low temperature setting so that the fin material doesn't melt. Make sure to wash any soap off and dry the rocket parts or the glue won't stick.
9. If the upper stage won't separate from the booster, try launching with higher pressure or put soapy water on the interstage tube to lubricate it. If the problem persists, try enlarging the hole in the upper stage nozzle by 1 or 2 thousandths of an inch. This will grip the interstage tube less tightly and allow easier release.

