

# Advanced Water Rockets



AntiGravity Research Corporation

Bringing rocket science down to Earth

[www.antigravityresearch.com](http://www.antigravityresearch.com)

Version 1.01

# Advanced Water Rockets from AntiGravity Research Corporation

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# IMPORTANT LEGAL AGREEMENT

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The following terms form a legal agreement between you ("Consumer") and AntiGravity Research Corporation ("AntiGravity"). By using this product and/or its documentation (hereinafter referred to as "product") as provided or in any subsequent form, you acknowledge that you have read, understood, and agree, to be bound by these terms and to comply with all applicable laws and regulations. If you do not agree to these terms, do not use this product and return it, for a full refund, to the original place of purchase.

## PRODUCT LIABILITY LIMITATION

AntiGravity shall not be liable for any consequential or incidental damages, injury, loss or expenses arising from the use or inability to use this product for any purposes whatsoever, or for any willful or accidental misuse of the product. By using the product, the consumer acknowledges that the product is intended for specific educational and recreational purposes and that adult supervision, caution and reasonable care should be exercised in its use. Unacceptable uses include but are not limited to, launching the product into the flight path of aircraft, launching the product toward people or vehicles, or using the product to create an explosive device or using the product in any way which may cause injury to self or others. The consumer agrees to release AntiGravity, its owners, employees, heirs, assigns, officers, agents and associates from any and all liability, claims, demands or actions or causes of actions arising from or blame whatever arising out of any damage, injury, loss or death resulting from any cause whatever, whether the result of misuse, the fault of the user, a defect in the product or from any other cause whatever, regardless of intention. No action or representation written or verbal on the part of AntiGravity or any other can amend, make void, or alter this product liability limitation in any way at all. The consumer agrees to all of the terms of this limitation when using the product. If you do not agree to these terms, then do NOT use the product and return it, for a full refund, to the original place of purchase.

## 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.

## SEVERABILITY

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.

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phone 604-824-9021 fax 604-648-8192



# How To Use This Manual

Before going any further in this manual or with your AntiGravity water rocket, make sure that you have read and agree to the Important Legal Agreement on the previous page.

Among other things, this manual contains the instructions you will need to assemble your rocket. To find your way around, you will need to enable the Adobe Acrobat Reader bookmarks tab. Click on the arrow beside the rocket type you need to assemble and it will show you a list of the pertinent pages.

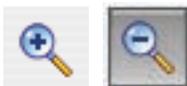


Print out the pages if you think you will need them in the field. If you don't have a printer, assemble your rocket beside your computer while you have these pages on your screen.

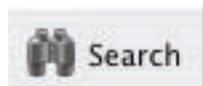
## ***Moving around in the rocket book***



Bookmarks - every page in this book is listed in the Adobe Acrobat Reader bookmark list. If you click on the title of a page, that page will be displayed. If there is an arrow in front of a bookmark it means that it is a section heading. You can click the arrow to display all the pages in that section.



Zoom - Use this Acrobat tool to zoom out to see an overall view of a page, or to zoom in so you can look at the finest details. Whichever zoom level you choose will stay that way from page to page until you change it.



Search for Text - you can instantly go to the next occurrence of a word or phrase using search for text.



Hand Tool - move the page up or down when you press the mouse and move the hand.



Pageup & Pagedown keys - press pageup on your computer keyboard to move to the previous page or pagedown to move to the next page.



Scroll wheel - on your computer mouse, the scrollwheel is very useful to scroll through this book from page to page.

But don't just read about the rocket you have. Take a look at all the rockets. Notice the similarities and differences. Plan to take on a more challenging rocket once you have mastered the one you have. You will probably notice one thing about all of AntiGravity's rockets here in this book: they are all very simple. At AntiGravity, we don't just want to sell you a rocket. We want to teach you how rockets work, and we hope you will use your imagination and inventiveness to start where we left off, and to go far beyond our own limited designs.



# Using your Water Rocket Safely

***Although AntiGravity water rockets are made to be as safe as possible to use, there are some very important rules you will need to follow for the safety of yourself and others. Most of these rules are just common sense, but nonetheless it is important to keep these in mind as you use your rocket, to ensure that you have a safe and enjoyable rocketing experience.***

1. Only launch with adult supervision, in a wide open field, far away from trees, buildings, roads, people and electrical wires.
2. Never put anything in your water rocket but air, water and sometimes non-toxic handwash-type dish soap.
3. Never launch your rocket at or near people, animals, automobiles, aircraft or buildings.
4. Never launch your rocket anywhere near aircraft landing or takeoff locations or into the path of an aircraft.
5. Never launch your rocket under overhead electrical wires or during a lightning storm.
6. Stay at least 20 feet away from the rocket when it is being pressurized, and insist that all other people also stay at least 20 feet away from it, in case the bottle bursts.
7. Don't put any more than the recommended amount of water in any rocket bottle, or the rocket may lift off sideways.
8. Never launch your rocket indoors.
9. Only use a hand-powered pump to pressurize your rocket. Never use an electric or automatic pump or compressor.
10. Only use plastic *pop* bottles that have previously been used to hold fizzy pop. Never use *water* bottles because they are too thin and cannot hold the required pressure. Never use *glass* bottles, because of the danger of heavy impact or sharp broken glass shards.
11. Never climb up in dangerous places or to dangerous altitudes to retrieve a rocket. It is better to lose your rocket than to jeopardize the safety of yourself or others.

***During the course of your rocket experience you will probably run across some situations that don't match any of the above. Always decide in favor of safety for yourself and others. There may be other precautions to keep in mind that apply to specific types of rockets. These precautions will be included in the instructions for each individual type of rocket.***



# Who Uses AntiGravity Rockets?

Not only are AntiGravity rockets an excellent activity for all ages, they have found their way into many specialized markets that we never would have imagined. And even though most of our rockets are enjoyed by individuals and families, our customer list reads like the who's-who of business, entertainment, education, science and national defense. Below is a small sampling of the many interesting and unusual organizations who use AntiGravity rockets.

## Corporate & Defense

American Honda Corporation  
 Deep Space Systems, Inc.  
 NBC Special Effects Department  
 Federal Aviation Administration  
 Whirlpool Corporation  
 US Army  
 US Navy  
 US Naval Academy  
 US Naval Research Laboratory  
 Genesis Innovation  
 Fantastic Machine, Los Angeles, CA  
 Horizon Air Ground Support  
 Waikato Hospital, Department of Pathology, NZ

## Universities & Colleges

Princeton University  
 Princeton University Prep Program  
 Mississippi State University  
 Ohio University, Mechanical Engineering Dept.  
 University of Montana Western  
 Georgia Institute of Technology, Aerospace Engineering Dept.  
 Fresno Pacific University  
 University of Philadelphia, School of Medicine  
 Iowa State University  
 Keele University, School of Chemistry and Physics, UK  
 Jesus College, Cambridge, UK  
 University of Wisconsin, Madison  
 Lee College, Department of Physics  
 Penn State University  
 University of Alaska, Fairbanks, College of Engineering & Mines  
 Yakima Valley Community College

## Science Education Centers

Questacon, National Science & Technology Center, Australia  
 Liminal Labs, Black Rock Space Program  
 NASA & Honeywell's FMA Live show  
 Auckland Observatory, NZ  
 AstroCamp, Guided Discoveries  
 Jack's Mythbusters  
 Young Scientist Camp  
 Interactive Learning Systems  
 Apollo Career Center  
 Future Scientists and Engineers of America  
 Mad Science of Sacramento Valley  
 St. Louis Science Center  
 Orion Science Center  
 Ispace, Inc., Interactive Science, Space & Aeronautics Center for Education  
 Owls Head Transportation Museum

## Schools, Parks & Family Programs

Parks Canada  
 Notre Dame Academy  
 Holy Trinity School  
 Robert Bosch Gymnasium, Germany  
 Summit High School  
 Thomas Jefferson High School  
 Boy Scouts  
 Ranney School, Tinton Falls, NJ  
 Coal Creek Canyon School  
 Our Lady of the Lake CCS  
 York English Primary School and Kindergarten, HK  
 Clark County School District  
 Deep Cove School, Sidney, BC  
 St. John's School  
 Arvida Middle School  
 ENAACT Family Academy  
 Project Lead the Way  
 Fox Meadow Middle School  
 Great River School  
 City of Jacksonville



# How Does A Rocket Work?

**Where does the rocket's power come from?** - When you pump your bicycle air pump fifty times, the work that you do is being stored inside the pop bottle as compressed air. Air is very springy and when it gets a chance, it bounces back to its original volume. The only way it can do that is to come rushing out the nozzle at the bottom of the rocket. You feel tired after doing fifty pumps because you have delivered some of your energy to the rocket. But the rocket now contains the energy that you have lost, in the form of compressed air.

**How a rocket moves** - The rocket moves forward by throwing its exhaust (the air and water) out the nozzle as fast as possible. It does not push on anything, like the ground or atmosphere. Example: if you were sitting in a small boat full of baseballs and one-by-one threw the baseballs out the back of the boat, the boat would move forward on the water. The faster you threw the baseballs out the back of the boat, the more force would be applied to moving the boat forward. This is not a very good way of moving your boat around. And indeed, it is a very inefficient way of moving a rocket around, but what else can you do? There's nothing to push on in outer space.

**How a rocket goes straight** - A rocket is like an archery arrow. As it moves through the air, the heavy front of the arrow falls forward and the wind pushes the fins to the back. To make the rocket go straighter, you can make the front heavier, or make the fins bigger or put the fins farther back. AntiGravity rockets all use bigger fins as far back as possible instead of more weight. That way they don't have to work as hard to travel very high, and they're much safer when they come down because they are so much lighter. Outer space rockets don't have any fins because there is no air out there to push the fins back. They use gyro-sensors to automatically aim the nozzle in different directions to keep the rocket pointed straight.

**What do the guide rod and guide tube do?** In the first fraction of a second when a rocket is lifting off of the ground, it is not going fast enough for the fins to keep it pointed straight up. As soon as it is off of the ground it would tumble in a random direction around it's center of gravity. Then as it picks up speed it would head off in an unpredictable direction. The guide tube keeps the rocket pointed straight up as it slides up the guide rod until the rocket is going fast enough for the fins to keep it stable.

**How does the AntiGravity launcher work?** The yellow bulb at the end of the filling hose is completely closed except for a tiny one-way pinhole valve. When you pump up the rocket with air, the pressure in the hose makes the bulb expand and press on the inside of the rocket nozzle. The air also pushes through the pinhole to fill the rocket. When the pressure in the rocket bottle reaches about 80 pounds per square inch, the bulb cannot hold on to the rocket anymore and it is pushed out of the nozzle by the air in the bottle. Or if you disconnect the pump from the filling hose, the pressure inside the bulb is reduced to zero and the pressure in the bottle shrinks the bulb and pushes it out. The launcher requires no special stand or bulky hardware because the rocket stands on its own fins.



# Why do AntiGravity Water Rockets fly higher?

Most water rockets are made using the open neck of the pop bottle as the exhaust nozzle. Although this is convenient, the large nozzle is grossly mismatched to the job requirements. With most water rocketry, the real job is to lift a pop bottle, which weighs only 50 grams, into the air as high as possible. The open neck nozzle, with its thrust of about 55 pounds (25,000 grams) is about 40 times as much as we really need. And in rocket science, one bad design decision always leads to many more, in order to compensate. At AntiGravity, we take a different approach. Each very simple nozzle is sized exactly to the requirements of the job. In the list below, you can see what advantages come from having a properly sized nozzle.

**1** The open neck of a pop bottle, shown actual size, is a typical of most water rocket nozzles. It has 40 times as much thrust as is required, and expends its energy 40 times faster than required.



Rocket Car or upper stage of 2-stage



Single Stage rocket



Payload rocket



Booster Stage for 2-Stage rocket

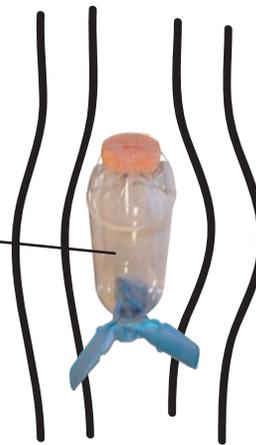


On the right are the four different sizes of AntiGravity nozzles, each precisely cut, centered and sized perfectly for the intended job.

**2** When a rocket travels too fast, it encounters much more air friction than when it travels slowly. The open-neck rocket has about ten times the air friction of the much slower-moving AntiGravity rockets.



Open-neck rocket

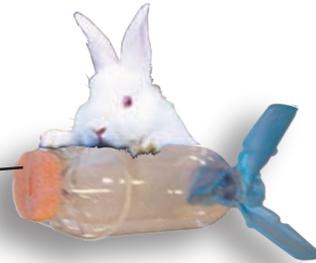


AntiGravity rocket

**3** When there is too much air friction, people try to compensate by adding more weight to the rocket so it will "coast" better. The open-neck rockets often weigh more than one pound (454 grams) empty. The extra weight adds no energy and is much harder to lift. And they have to lift about a kilogram of water.



AntiGravity rockets typically weigh only 60 grams empty and they only need to lift 100 grams of water. There is no energy spent lifting useless weight.



**4** The open-neck rocket has a burst of energy that is spent very quickly, somewhat like a pop gun.

Each AntiGravity rocket is powered almost all the way to the top of its flight, with an impressive vapor trail that makes it look and sound like it's going into orbit.





# AntiGravity's Water Rockets: An Environmentally Friendly Activity

Water rocketry has as its main principle the re-using of an empty beverage container, which is itself easily recycled.



The fuel that it uses consists of the same air that we breathe, and fresh water that we drink.



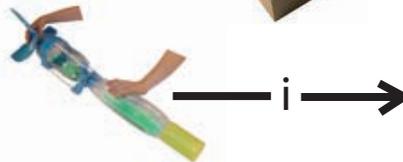
The plastic rocket parts and launcher are all themselves recyclable, being made of polyethylene polypropylene and polystyrene.



The packaging we use for shipping the rocket to you is made of cardboard and paper with no glossy inks or printed surfaces, for ease of recycling.



All brochures and instructions are distributed as paperless PDF files from the website to minimize paper usage and waste. You only use paper for exactly the pages you need.

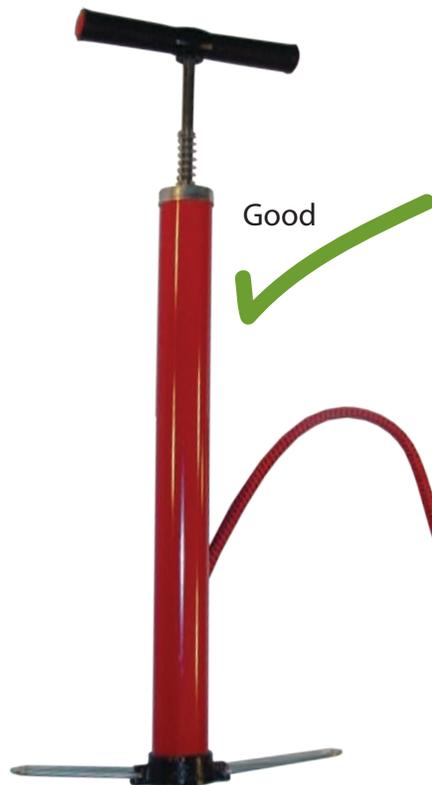
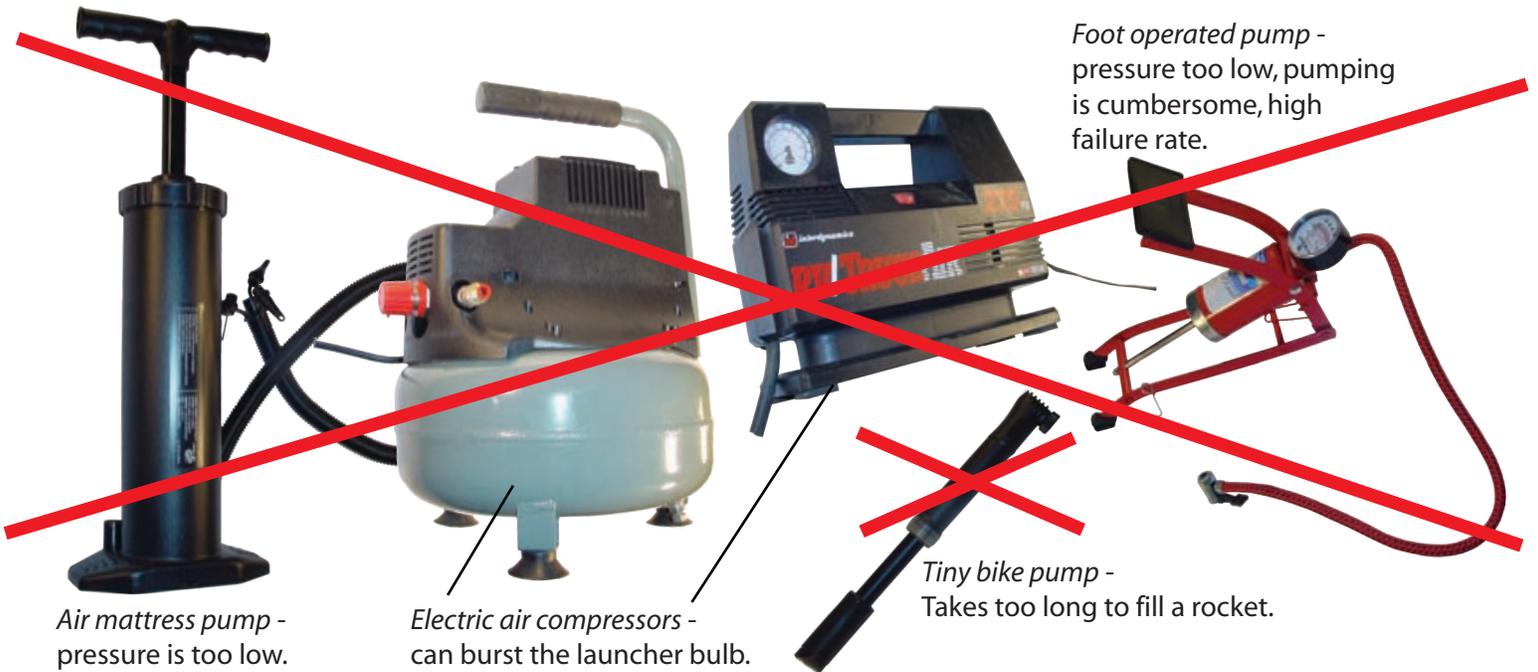


And perhaps most importantly, the activity of launching water rockets gets you outdoors into the sunshine and fresh air, away from computers, video games, big screen TVs and job stress, and provides an excellent opportunity for positive intergenerational interaction between family, friends and neighbors.

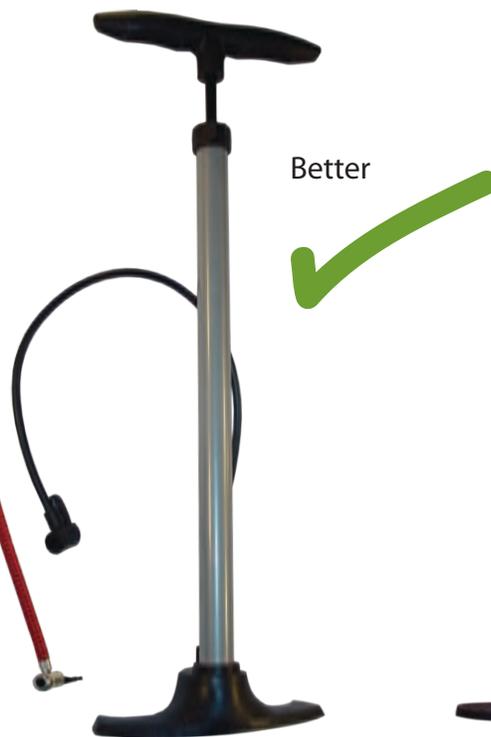


# Choosing an Air Pump for your Rocket

The best pump for use with AntiGravity rockets is a vertical hand powered pump with a stand-on base. The barrel should be 1.25 inch diameter, and the handle should have a 20 inch stroke.



**Generic pump** - has a 1.5 inch barrel, a 20 inch stroke. Somewhat difficult to pump, but useable.



**Name brand pump** - has a 1.25 inch barrel and a 20 inch stroke. Good performance, relatively good reliability.



**AntiGravity's Rocket Pump** - has a 1.25 inch barrel, 20 inch stroke, and a pressure reservoir tank to dissipate heat and absorb pressure peaks. Very high performance, reliability and ease of pumping.



Also included with your SkyLab 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 Pump
- 1 - Plastic pop bottle
- 100 ml water
- 1 - 1000' wide open field

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

# SkyLab

Water Rocket Kit 200 feet+

Entire rocket weighs only 60 grams, maximizing both altitude and safety.

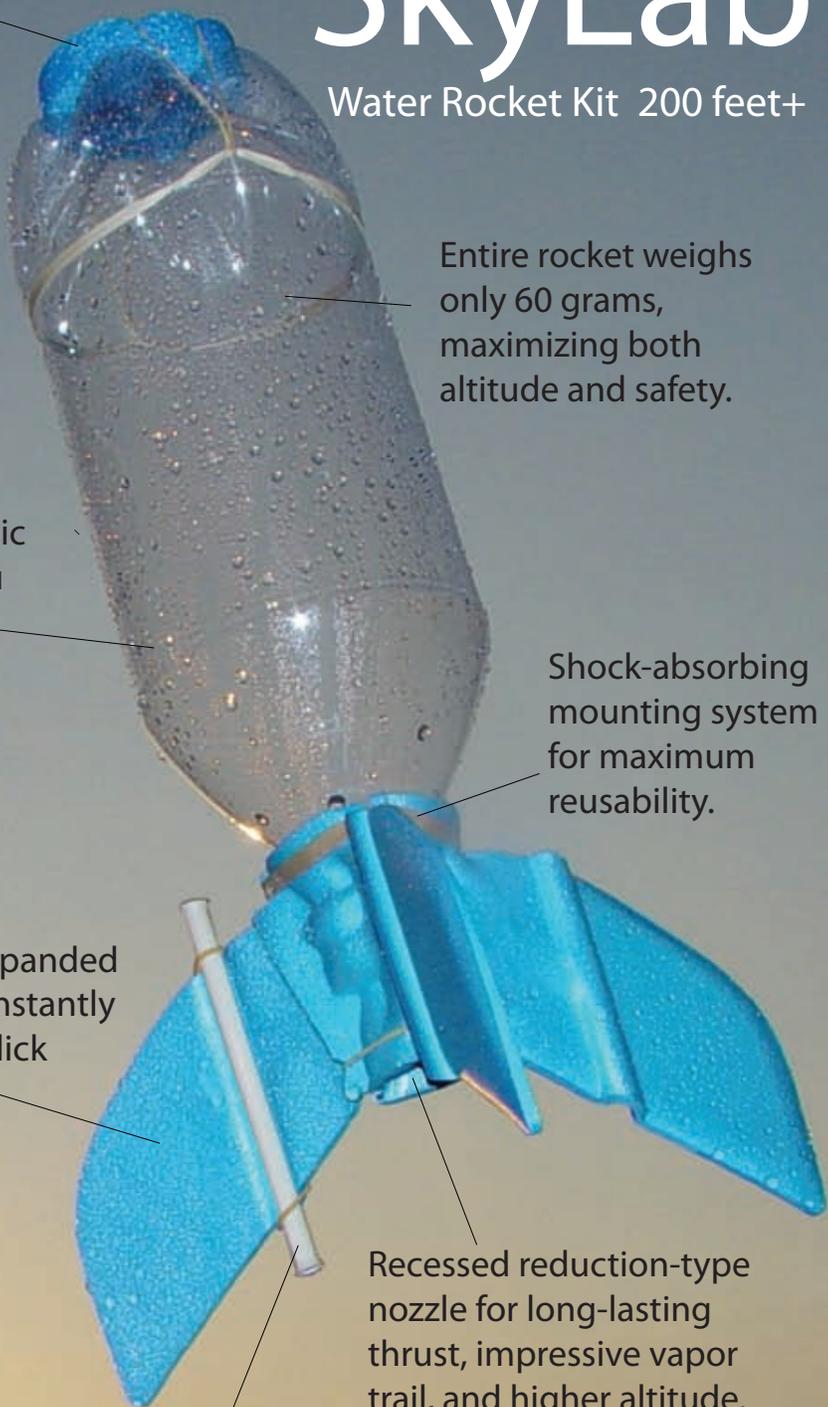
Designed to fit on any plastic pop bottle you choose.

Shock-absorbing mounting system for maximum reusability.

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

Recessed reduction-type nozzle for long-lasting thrust, impressive vapor trail, and higher altitude.

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



Reasonably priced spacecraft for the home, school or office.



Also included with the SkyLab Extreme kit:

**Filling Hose / Launcher**

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



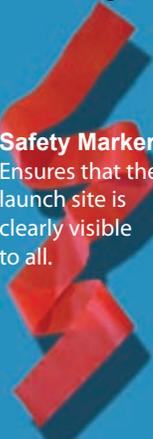
**Guide Rod**

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
- 100 ml water
- 1 - 1000' wide open field

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

# SkyLab Extreme

Water Rocket Kit  
To 300 feet

Entire rocket weighs only 60 grams, maximizing both altitude and safety.

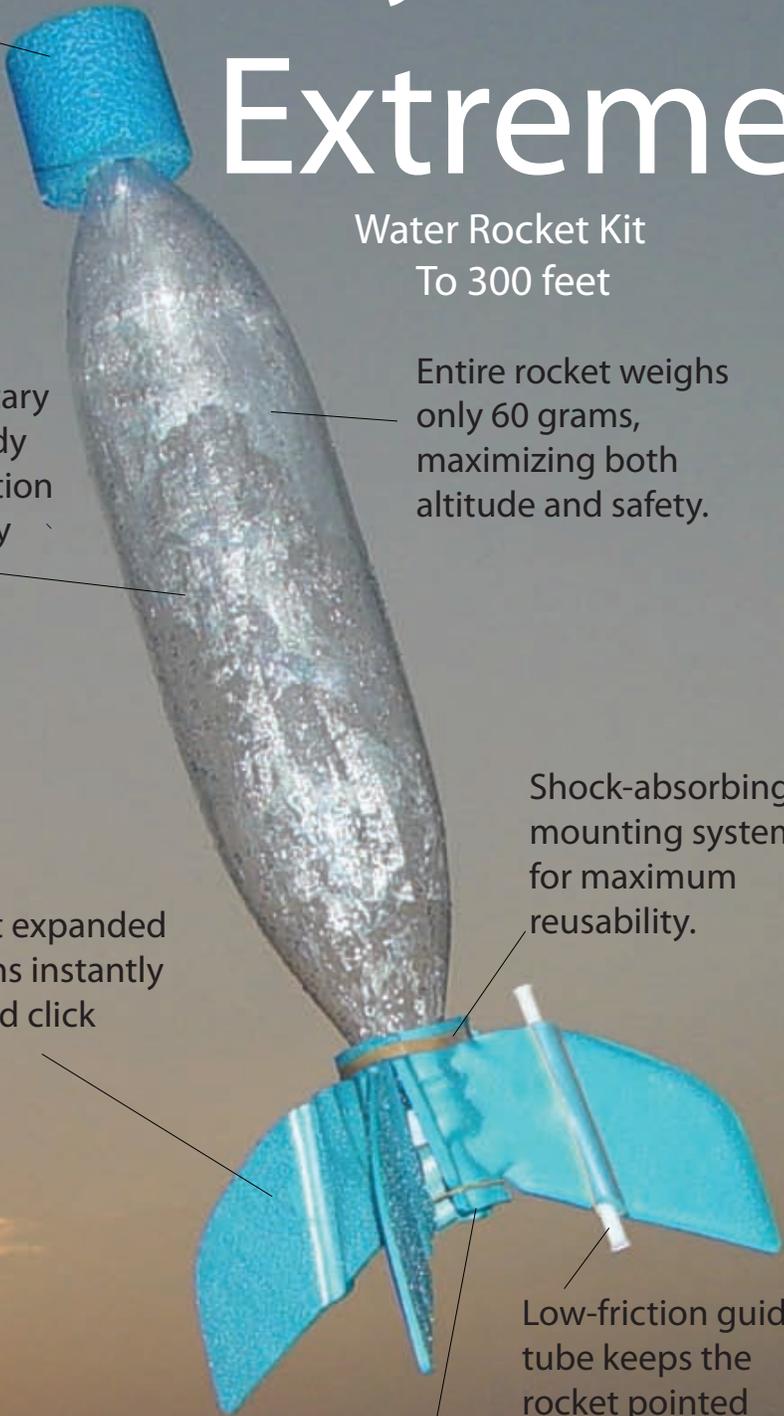
Included proprietary rocket-profile body minimizes air friction for higher velocity and altitude.

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

Shock-absorbing mounting system for maximum reusability.

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

Recessed reduction-type nozzle for long-lasting thrust, impressive vapor trail, and higher altitude.



Reasonably priced spacecraft for the home, school or office.

# Preparing the Rocket Bottle

Unless you bought one of our brand new 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

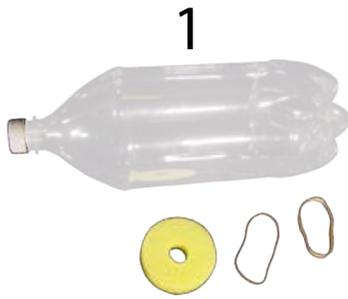


This is what the finished bottle should look like. Now you are ready to begin assembling the rocket.

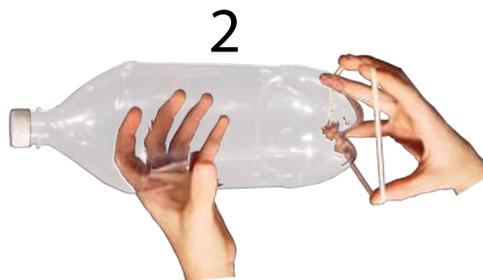


# Bumper Installation

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.



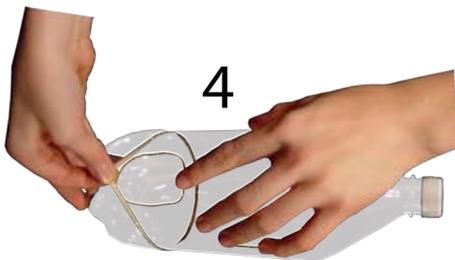
1  
Start with a bottle, a bumper pad, a fat elastic band and a long elastic band.



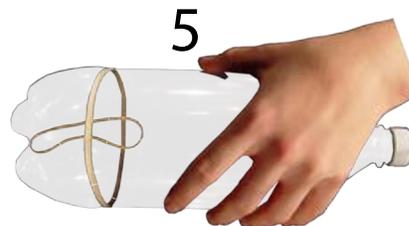
2  
Stretch the fat elastic band and put it over the bottom of the bottle.



3  
This is what it looks like with the fat elastic band in place.



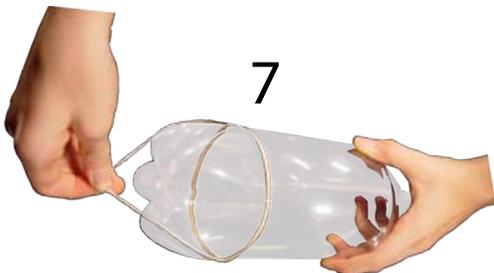
4  
Lift the fat elastic and slide the long elastic underneath it.



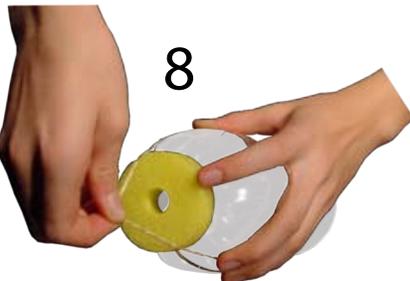
5  
The long elastic now passes beneath the fat elastic, making two loops.



6  
Pass both thumbs through both loops in the long elastic and slide your thumbs to opposite sides of the bottle.



7  
Pull the long elastic's loops up over the end of the bottle, high enough to slide the bumper under.



8  
Slide the bumper pad under the long elastic and let go of the elastic.

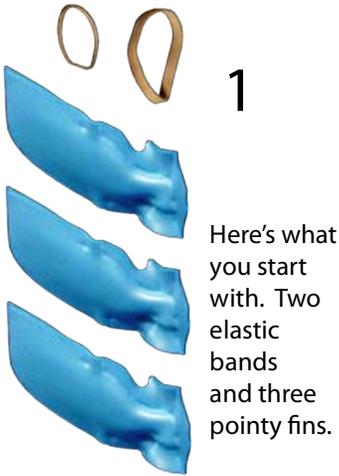


9  
This is exactly what the bumper pad should look like on your rocket.



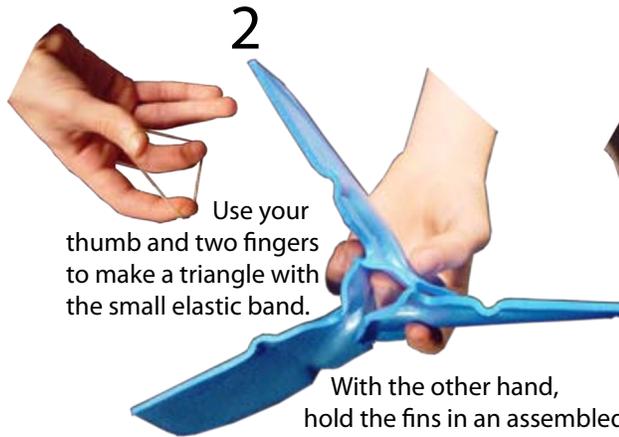
# The Tripod Fins

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.



1

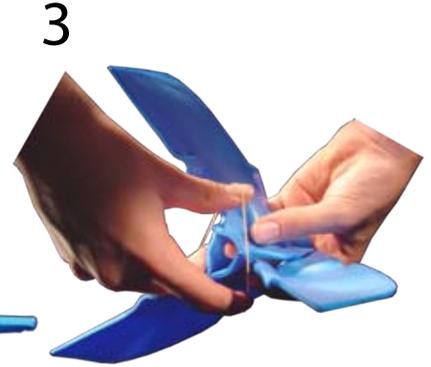
Here's what you start with. Two elastic bands and three pointy fins.



2

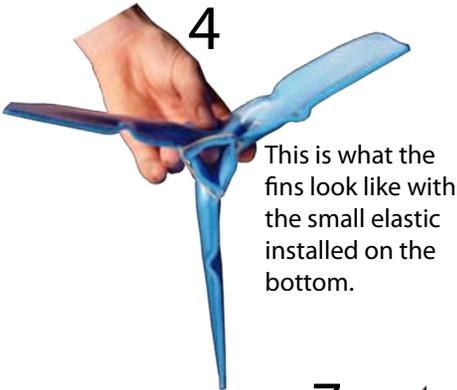
Use your thumb and two fingers to make a triangle with the small elastic band.

With the other hand, hold the fins in an assembled position with the points up, around your middle finger,



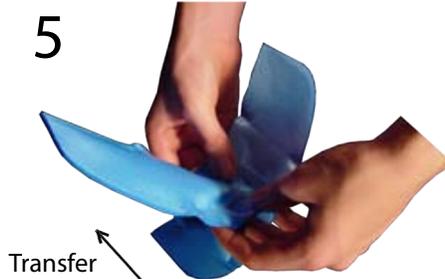
3

Install the small elastic on the bottom of the fins.



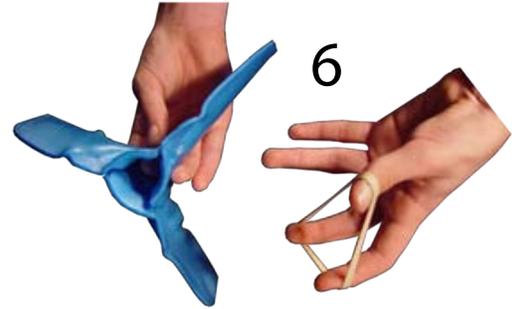
4

This is what the fins look like with the small elastic installed on the bottom.



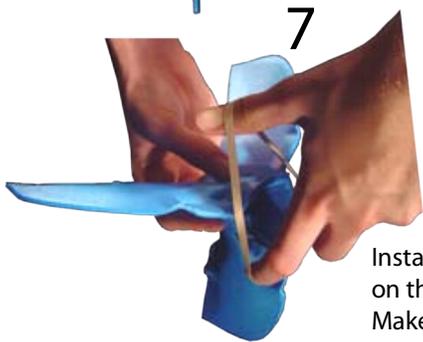
5

Transfer the fins to your other hand.



6

Use your thumb and two fingers to make a triangle with the fat elastic.



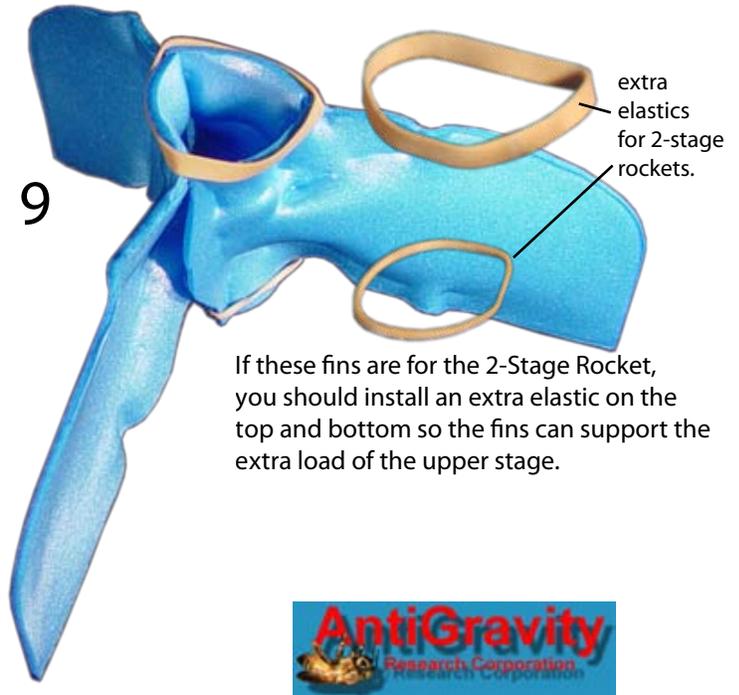
7

Install the fat elastic on the top of the fins. Make sure there are no twists in it.



8

The fat elastic band looks like this when properly installed.



9

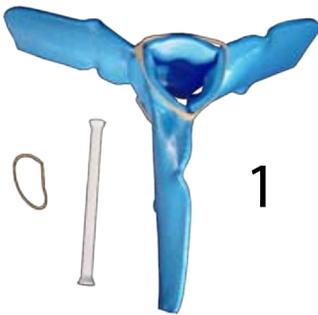
extra elastics for 2-stage rockets.

If these fins are for the 2-Stage Rocket, you should install an extra elastic on the top and bottom so the fins can support the extra load of the upper stage.



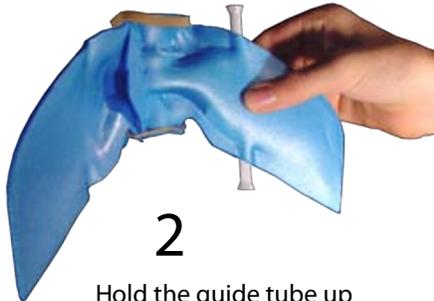
# Installing the Guide Tube

The Guide Tube keeps the rocket pointed upward until it is traveling fast enough for stable flight. As the rocket lifts off, the guide *tube* slides straight up the guide *rod* until the rocket is flying freely. Once the rocket is flying, the guide tube is small enough not to interfere with the flight.



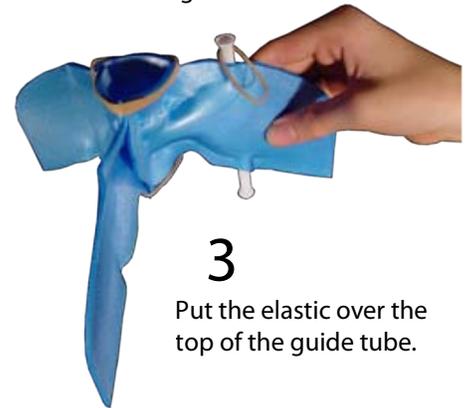
1

Start with the assembled tripod fins, a guide tube, and a mid-sized elastic band.



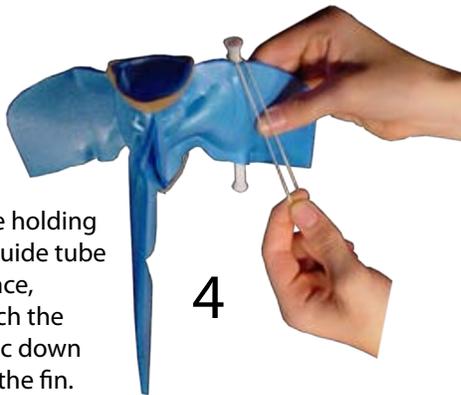
2

Hold the guide tube up against the groove in the hollow side of one of the fins.



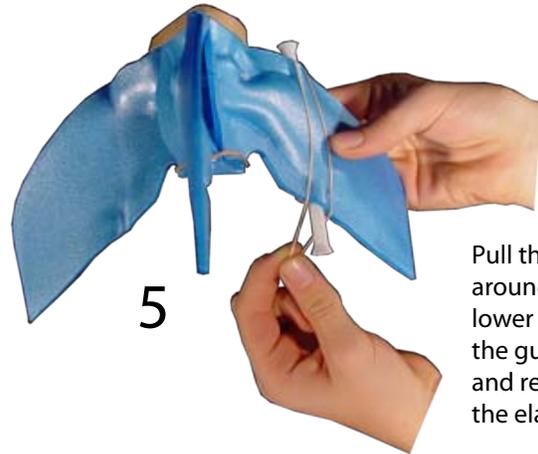
3

Put the elastic over the top of the guide tube.



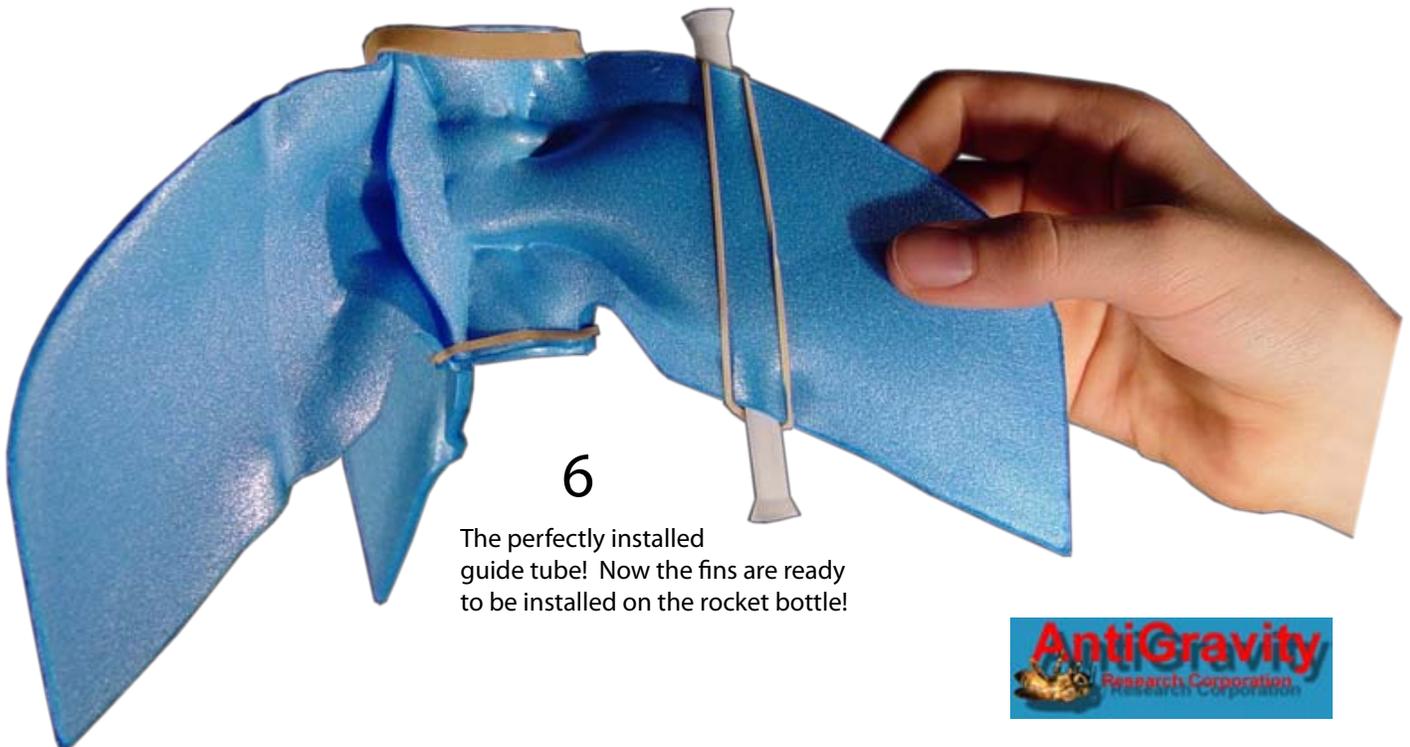
4

While holding the guide tube in place, stretch the elastic down over the fin.



5

Pull the elastic around the lower end of the guide tube and release the elastic.



6

The perfectly installed guide tube! Now the fins are ready to be installed on the rocket bottle!



# 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.

1



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

1



For a soap mixture, first add 100 ml to 250 ml of non-toxic hand-wash dish soap into a 2-liter bottle.

2



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



# SkyLab or SkyLab Extreme: Adding water and Connecting the Launcher

Once you put water in, keep the rocket on its side until you have completed step 4, otherwise the water will drain out!

1



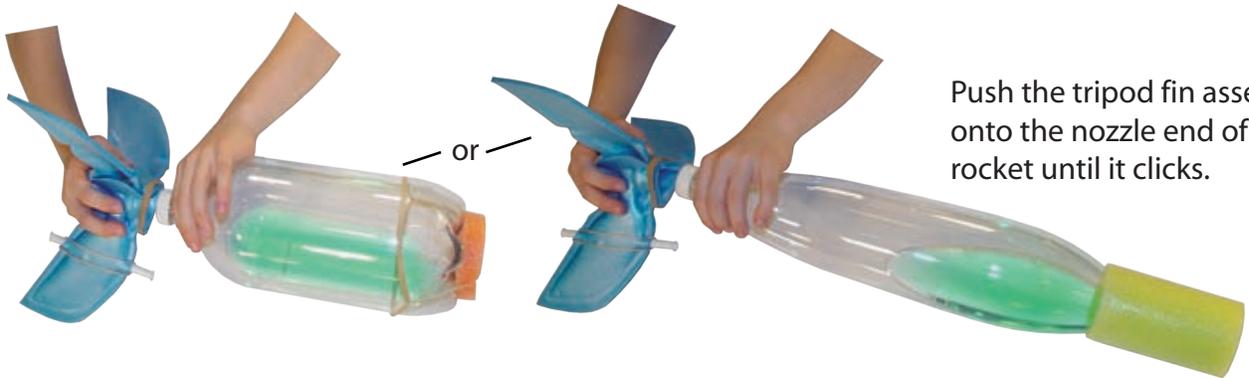
Pour 100 ml of water into the rocket bottle, about half an inch deep.

2

Screw on the nozzle firmly.



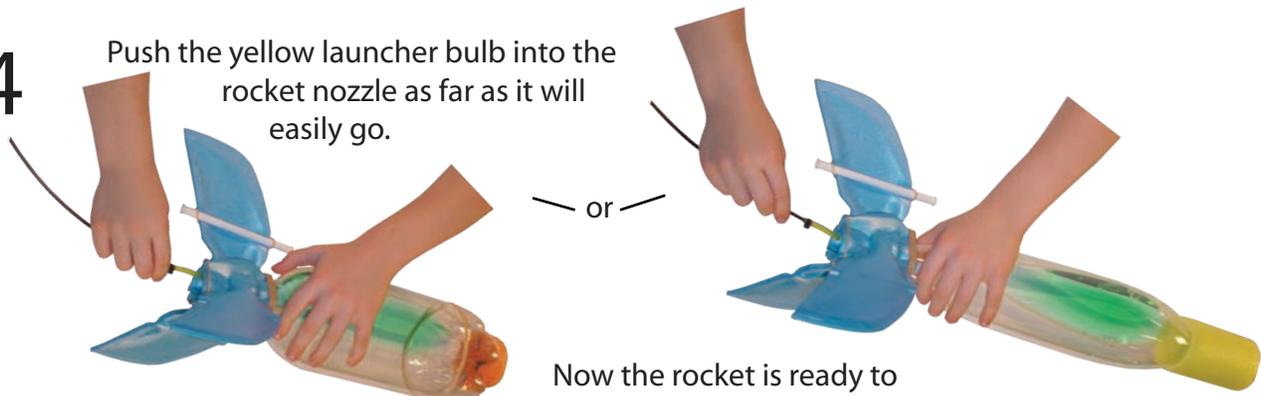
3



Push the tripod fin assembly onto the nozzle end of the rocket until it clicks.

4

Push the yellow launcher bulb into the rocket nozzle as far as it will easily go.



Now the rocket is ready to slide onto the guide rod!



# The Guide Rod

The guide rod keeps the rocket points 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.



Bag of connectors.



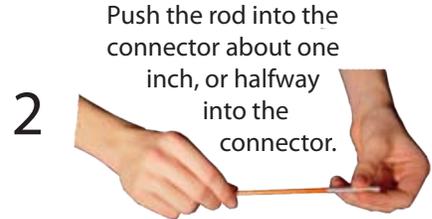
Connector. Push a rod into each end of the connector.



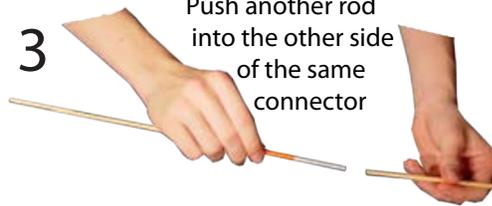
The safety marker prevents you from tripping over the guide rod by making it easy to see.



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



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.

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.



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.

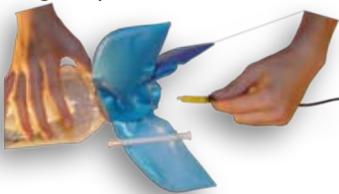
- 1 Push the launcher hose connector into the rocket pump connector.



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



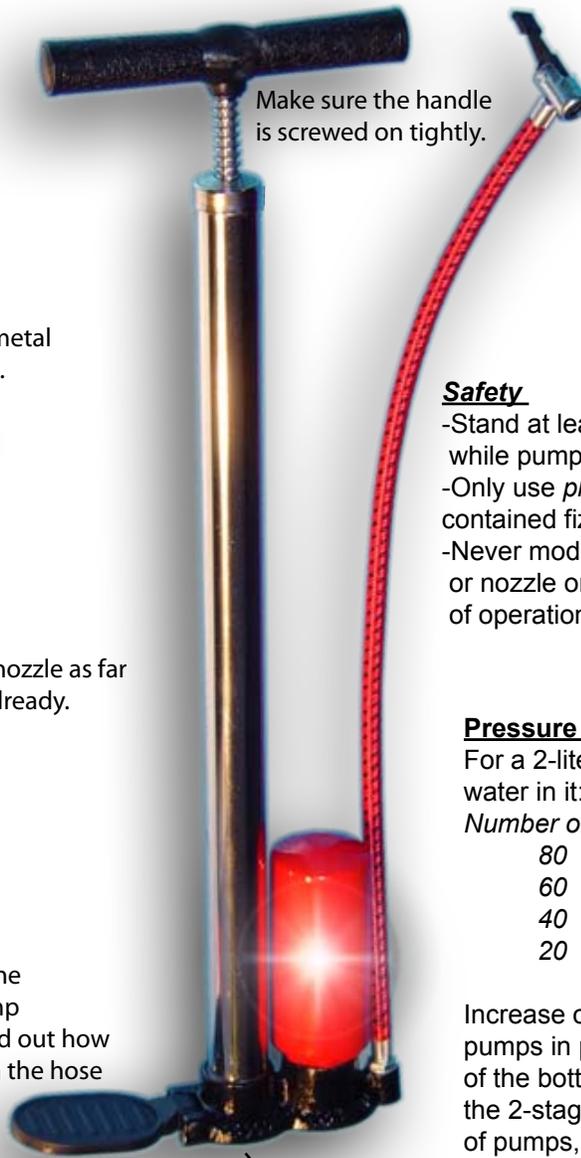
- 3 Push the yellow bulb into the rocket nozzle as far as it will go, if you haven't done this already.



- 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.



# Sky Lab Rocket: Quick One-Page Instructions

This instruction page is intended for large groups, where each participant requires a copy. On each of the panels below, starting with the bumper, begin at the left and work to the right. If your rocket is an Extreme SkyLab with the stretched bottle, it will already have the bumper installed and you can skip the bumper section. Assembly time: 5 minutes

## The Bumper

This is your supply of elastic bands. There are 3 different types: short, long, and wide. Keep the extras as spares.



Slide long elastic under wide one.



The soft bumper is held on with one wide elastic around the bottle, and one long elastic over the bumper.



Slip the foam bumper pad under the long elastic.



Now you're ready for the fins!

## The Fins

Use your thumb and two fingers to make a triangle with the small elastic band.



With the other hand, hold the fins in an assembled position with the points up, around your middle finger.

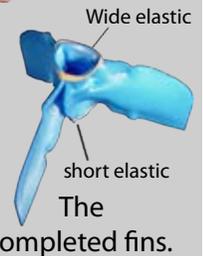


Install the small elastic on the bottom of the fins.

Transfer the fins to your other hand. Use your thumb and two fingers to make a triangle with the fat elastic.

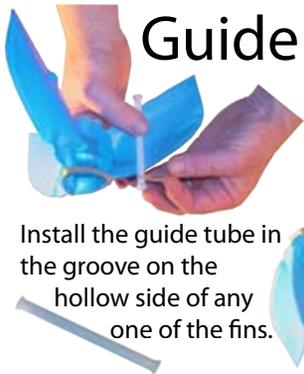


Install the fat elastic on the top of the fins. Make sure there are no twists in it.



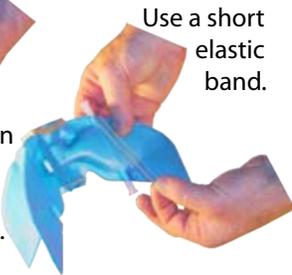
The completed fins.

## Guide Tube



Install the guide tube in the groove on the hollow side of any one of the fins.

Use a short elastic band.



## The bottle

Bring a 2-liter plastic pop bottle full of water with you to the field. From it, fill your rocket bottle with about half an inch of water. (100 ml).



Once your rocket bottle has water in it, install the nozzle-cap on the mouth of the bottle. Screw it on firmly. Make sure to snip off the bottle's retainer ring, or the fins won't sit properly.

if the retainer ring is still on, snip it off.

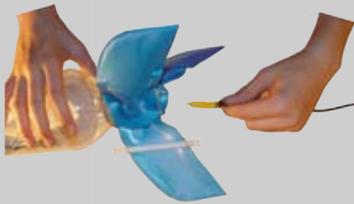


Push the fins onto the bottle until they click into position. Try not to spill any water!



## Countdown!

Push the yellow bulb on one end of the launcher hose into the nozzle cap. Now the water won't leak out.



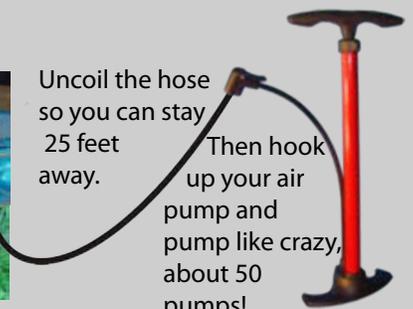
Press the guide rod through the red safety marker 2 inches into the ground in a big open field.

Then slide the rocket's guide tube over the rod.



Uncoil the hose so you can stay 25 feet away.

Then hook up your air pump and pump like crazy, about 50 pumps!



## Safety

Adult supervision required. Make sure to stay at least 20 feet away from the rocket while pumping.

## Launch!

Pump until the rocket launches. If you want to launch sooner, just stop pumping or disconnect your pump from the launcher hose.



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 High Altitude Pro Edition 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 - Plastic pop bottle
- 100 ml water
- 1 - 1000' wide open field

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

Designed to fit on any plastic pop bottle you choose.

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

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

Circular fin profile exhibits almost invisible aerodynamic drag characteristics.

# High Altitude Pro Edition

Water Rocket Kit  
To 250 feet

Entire rocket weighs only 60 grams, maximizing both altitude and safety.

Shock-absorbing mounting system for maximum reusability.

Reduction-type nozzle for long-lasting thrust, impressive vapor trail, and higher altitude.

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

Reasonably priced spacecraft for the home, school or office.



Also included with the Extreme Screamer 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
- 100 ml water
- 1 - 1000' wide open field



# Extreme Screamer

Water Rocket Kit  
Up to 350 feet

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



Included proprietary rocket-profile body minimizes air friction for higher velocity and altitude.

Entire rocket weighs only 60 grams, maximizing both altitude and safety.

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

Shock-absorbing mounting system for maximum reusability.

Reduction-type nozzle for long-lasting thrust, impressive vapor trail, and higher altitude.

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

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

Circular fin profile exhibits almost invisible aerodynamic drag characteristics.

Reasonably priced spacecraft for the home, school or office.

# Preparing the Rocket Bottle

Unless you bought one of our brand new 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.

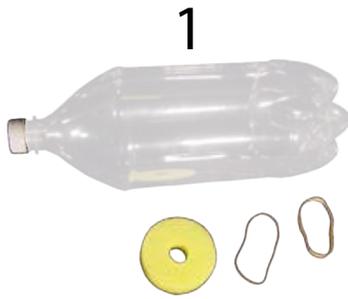
**3**

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

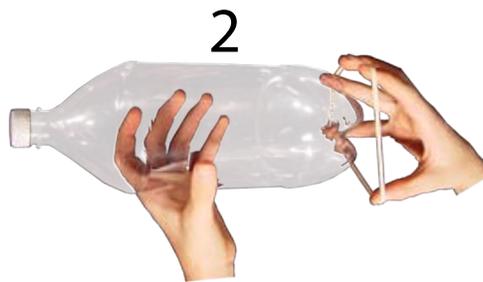


# Bumper Installation

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.



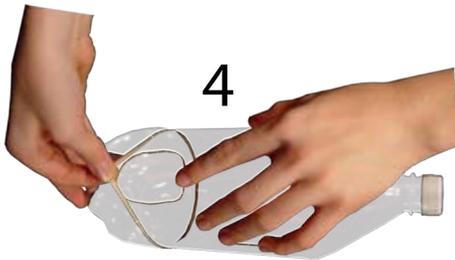
1  
Start with a bottle, a bumper pad, a fat elastic band and a long elastic band.



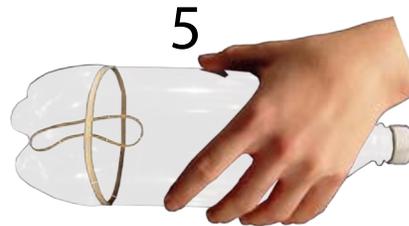
2  
Stretch the fat elastic band and put it over the bottom of the bottle.



3  
This is what it looks like with the fat elastic band in place.



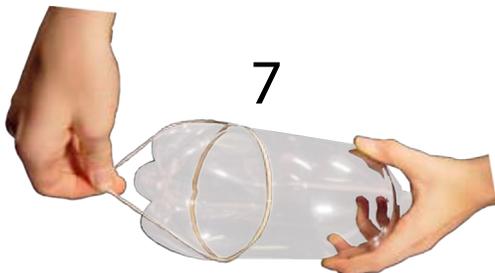
4  
Lift the fat elastic and slide the long elastic underneath it.



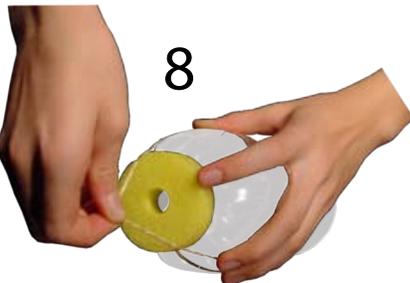
5  
The long elastic now passes beneath the fat elastic, making two loops.



6  
Pass both thumbs through both loops in the long elastic and slide your thumbs to opposite sides of the bottle.



7  
Pull the long elastic's loops up over the end of the bottle, high enough to slide the bumper under.



8  
Slide the bumper pad under the long elastic and let go of the elastic.

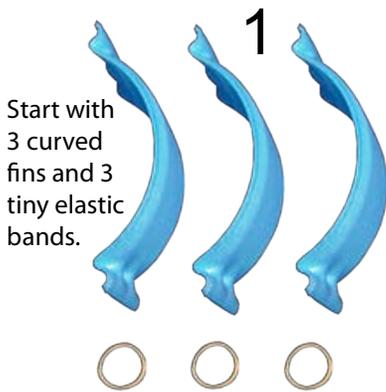


9  
This is exactly what the bumper pad should look like on your rocket.



# 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.



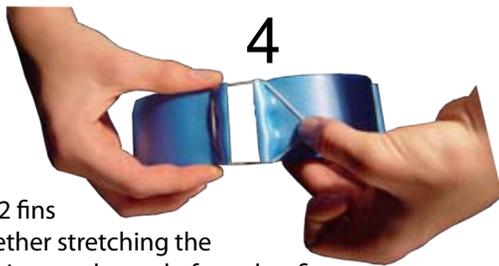
Start with 3 curved fins and 3 tiny elastic bands.



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.



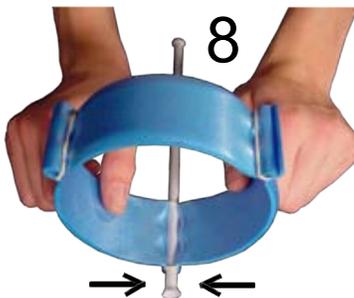
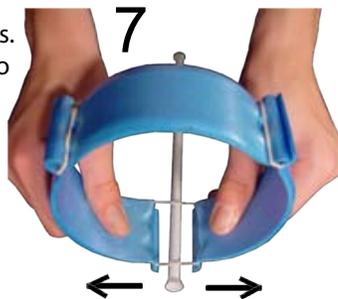
Put 2 fins together 3 times. Now the fins make a ring.

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.

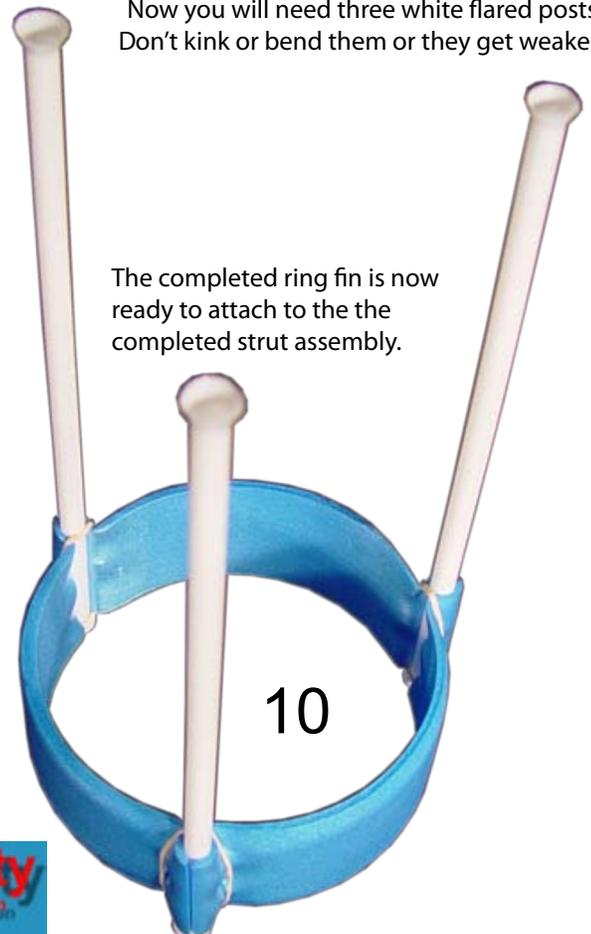


With the post resting on a table, pull apart 2 of the fins and allow them to close around the post. Repeat this for all 3 posts.



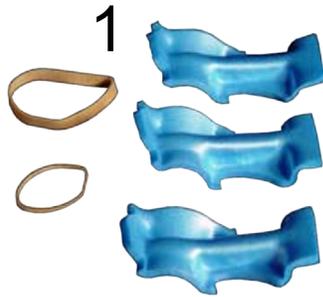
Push each post in until it stops at the flared end.

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



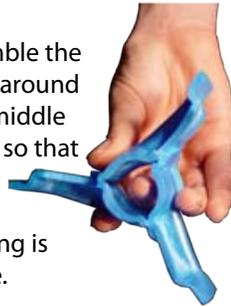
# Assembling the Struts

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.



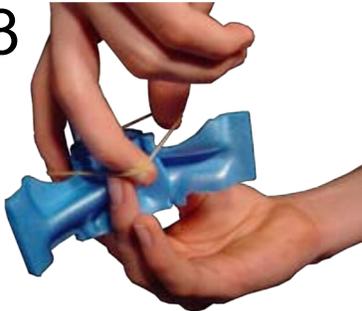
2

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



3

Install the small elastic on the small opening.



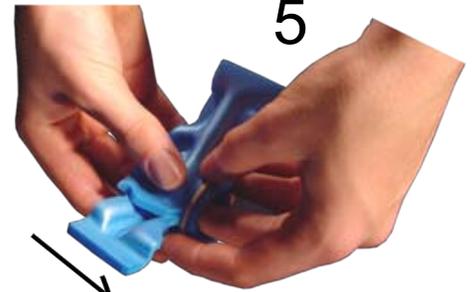
4

This is what the properly installed small elastic looks like.



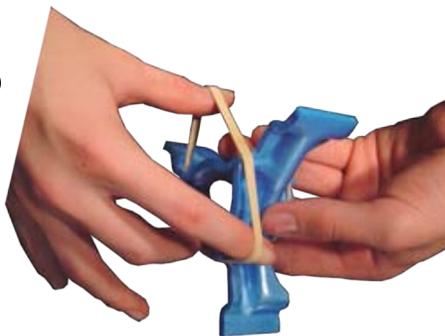
5

Transfer the assembly to your other hand.



6

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



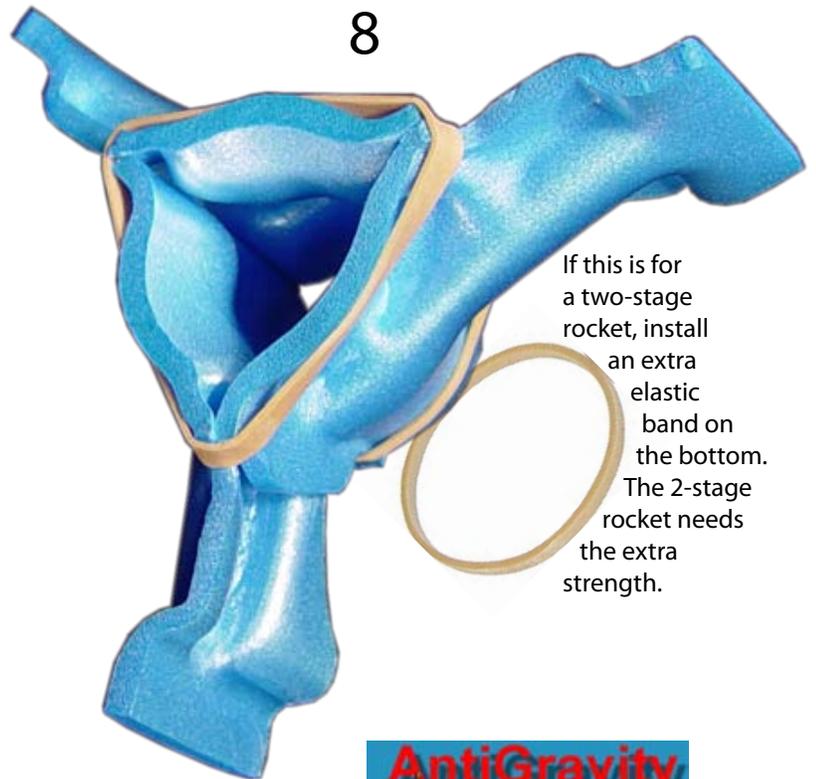
7

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



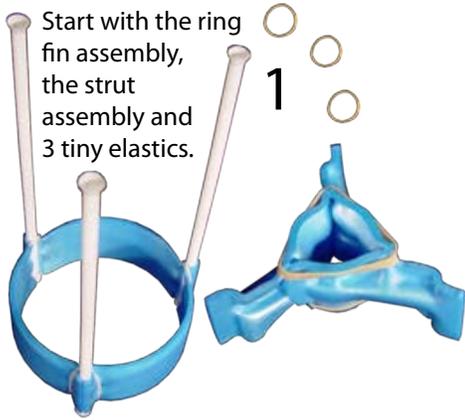
8

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



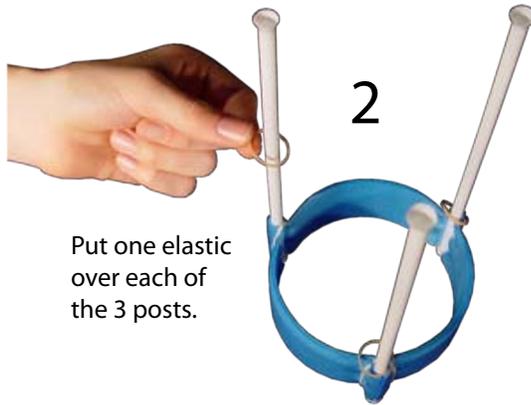
# Combining the Upper Struts with the Ring Fin

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



Start with the ring fin assembly, the strut assembly and 3 tiny elastics.

1



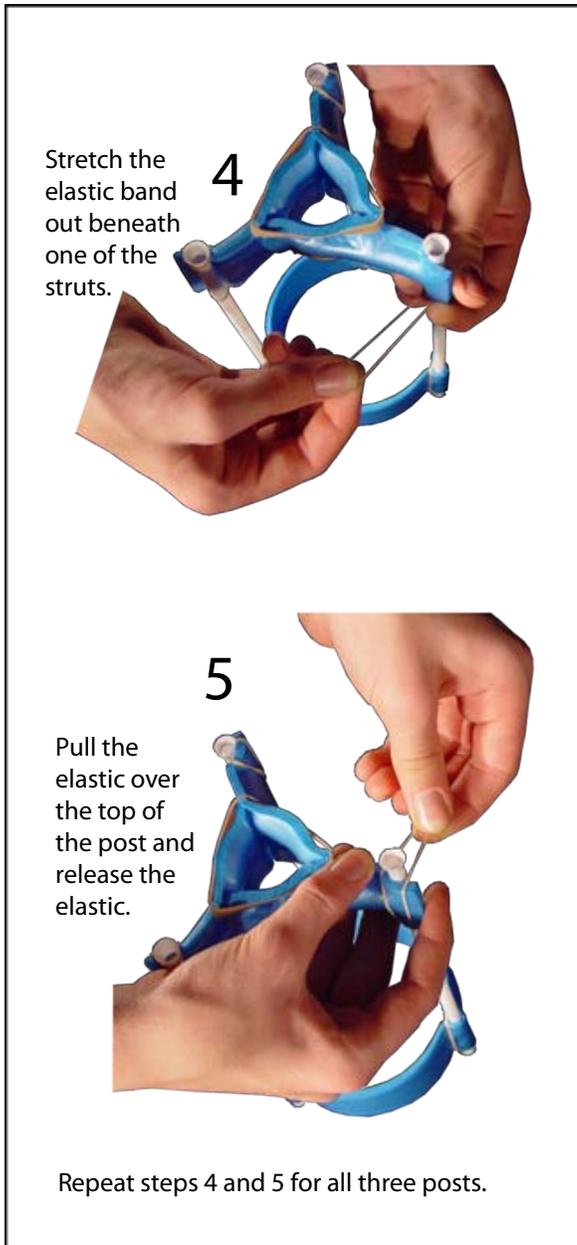
Put one elastic over each of the 3 posts.

2



Hold the strut assembly in place near the top of the posts.

3



Stretch the elastic band out beneath one of the struts.

4

Pull the elastic over the top of the post and release the elastic.

5

Repeat steps 4 and 5 for all three posts.



Now your ready to install the fin/strut assembly on your rocket!

6



# 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.

1



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

1



For a soap mixture, first add 100 ml to 250 ml of non-toxic hand-wash dish soap into a 2-liter bottle.

2

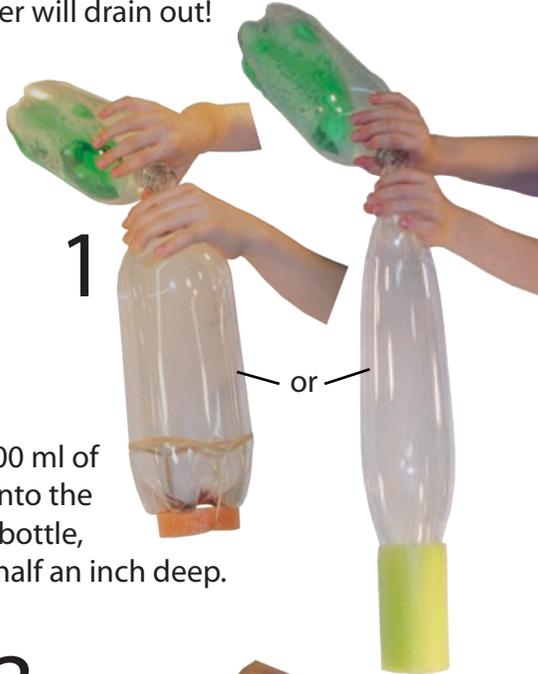


Then fill the rest of the bottle with water, put the cap on and gently shake until mixed.



# High Altitude Pro or Extreme Screamer: Adding water and Connecting the Launcher

Once you put water in, keep the rocket on its side until you have completed step 4, otherwise the water will drain out!



1

Pour 100 ml of water into the rocket bottle, about half an inch deep.

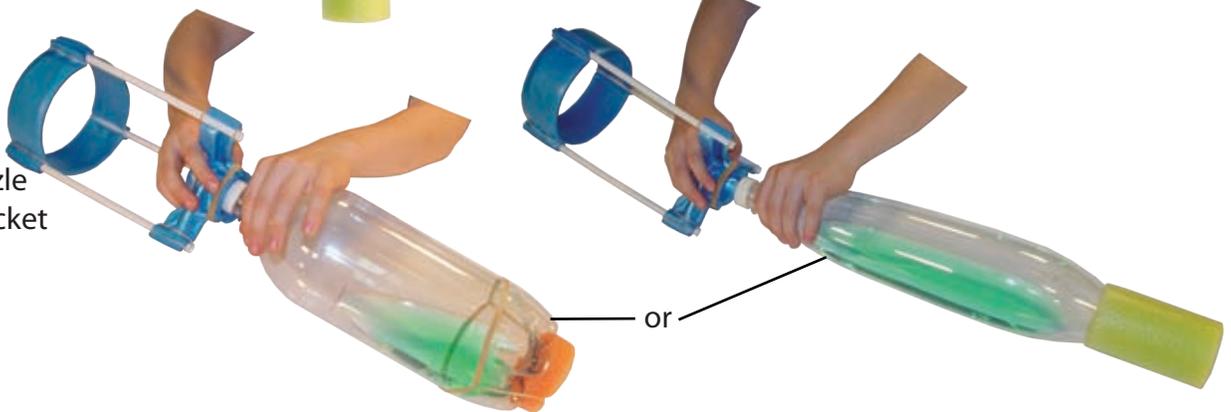
2

Screw on the nozzle firmly.



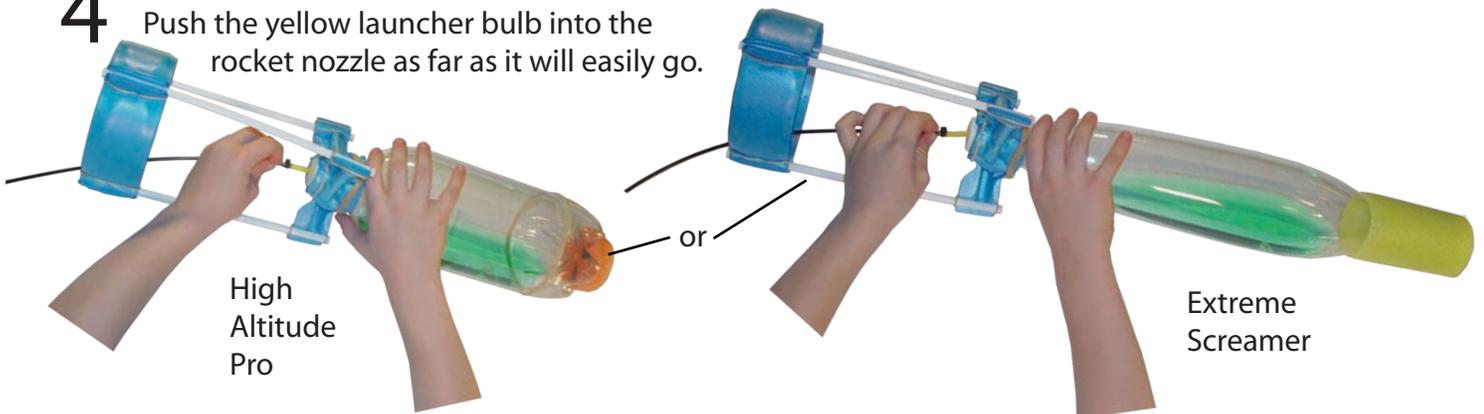
3

Push the ring fin assembly onto the nozzle end of the rocket until it clicks.



4

Push the yellow launcher bulb into the rocket nozzle as far as it will easily go.



High  
Altitude  
Pro

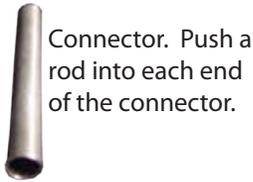
Extreme  
Screamer

Now the rocket is ready to slide onto the guide rod!



# The Guide Rod

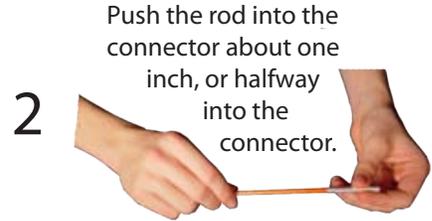
The guide rod keeps the rocket points straight up until it is going fast enough to be stable. The longer the guide rod, the more vertical the flight. The rocket should have water in it and be connected to the filling hose already. If your guide rod is a 12-inch single stick, go directly to step 4. For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



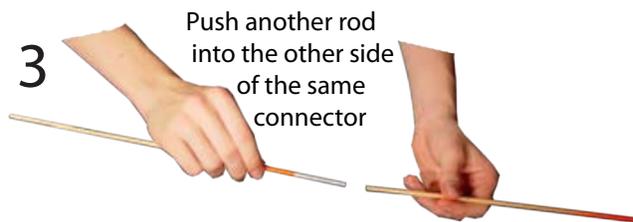
The safety marker prevents you from tripping over the guide rod by making it easy to see.



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



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.

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.

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.

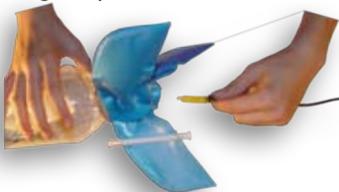
- 1 Push the launcher hose connector into the rocket pump connector.



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



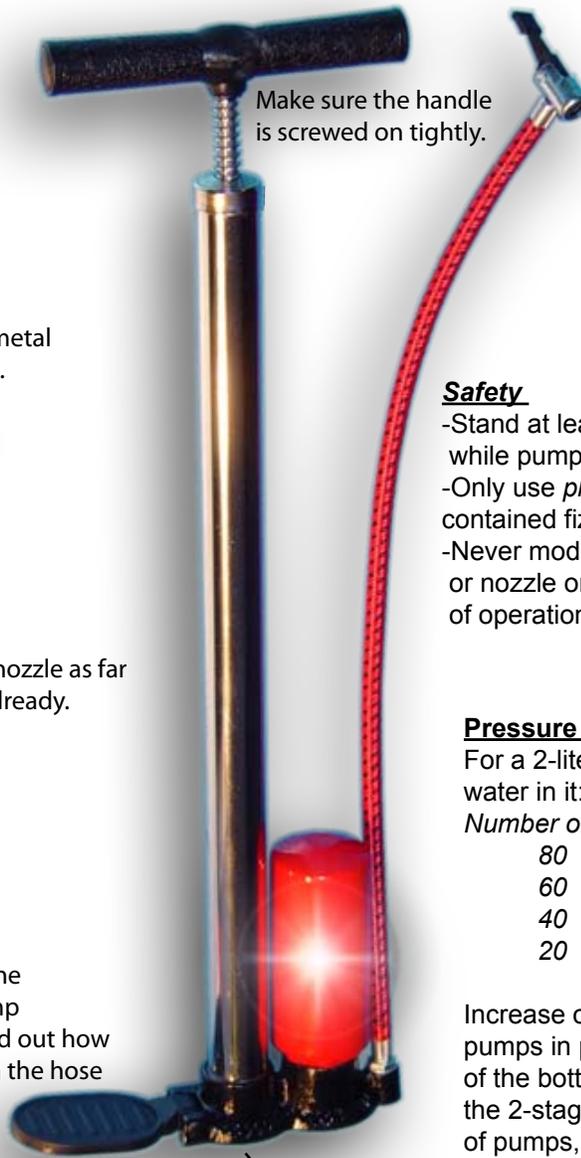
- 3 Push the yellow bulb into the rocket nozzle as far as it will go, if you haven't done this already.



- 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.



Make sure the handle is screwed on tightly.

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.



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.

Also included with your Extreme 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
- 200 ml water
- 1 - 1000' wide open field

# Extreme 2-Stage

Water Rocket Kit. Up to 600 feet

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

Included proprietary rocket-profile body minimizes upper-stage air friction for higher velocity and altitude.

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

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

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

Stage Separation at +30 ft

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.

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

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.

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 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.

1



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

2



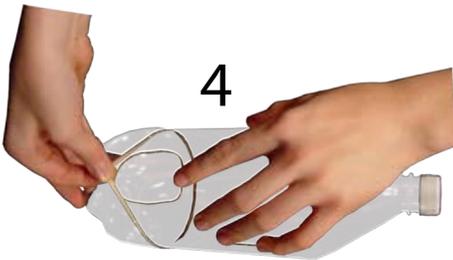
Stretch the fat elastic band and put it over the bottom of the bottle.

3



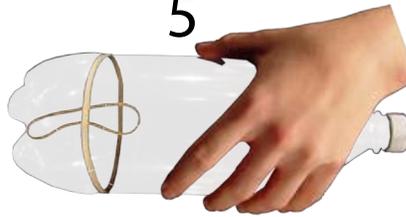
This is what it looks like with the fat elastic band in place.

4



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

5



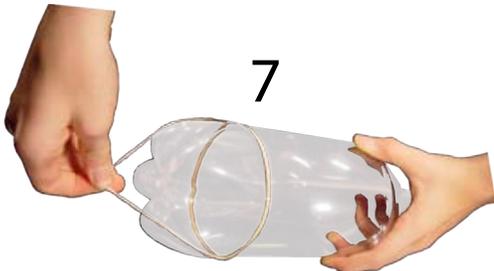
The long elastic now passes beneath the fat elastic, making two loops.

6



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

7

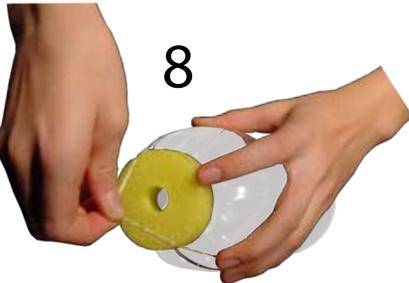


Pull the long elastic's loops up over the end of the bottle, high enough to slide the bumper under.

9

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

8

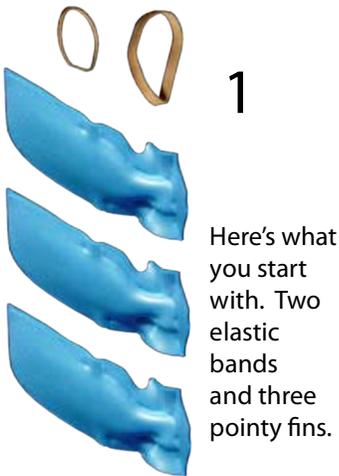


Slide the bumper pad under the long elastic and let go of the elastic.

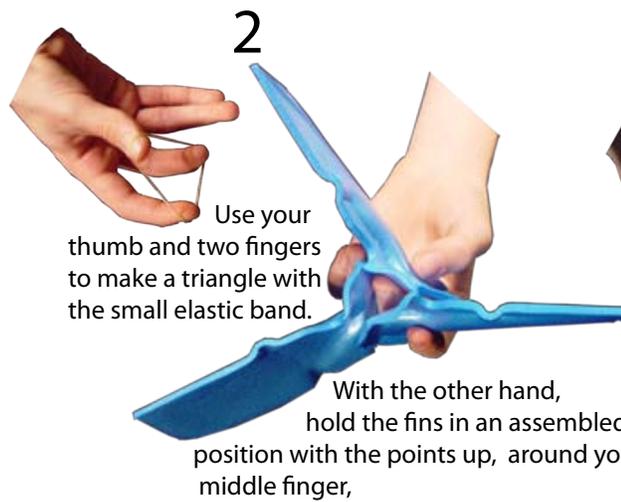


# The Tripod Fins

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.

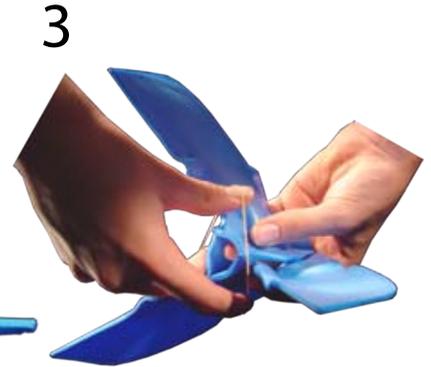


1 Here's what you start with. Two elastic bands and three pointy fins.

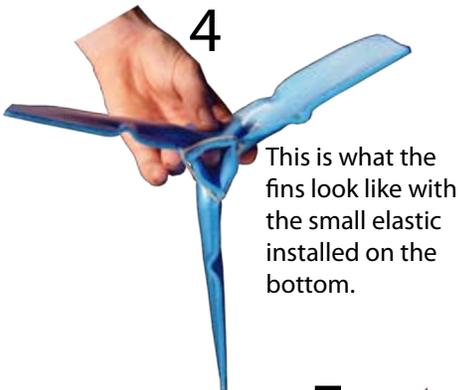


2 Use your thumb and two fingers to make a triangle with the small elastic band.

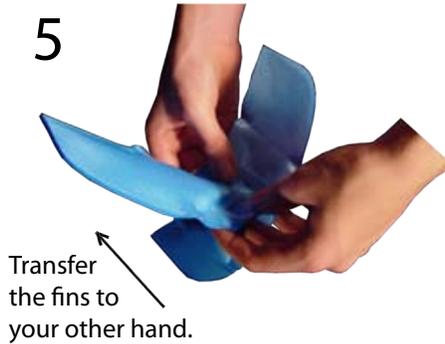
With the other hand, hold the fins in an assembled position with the points up, around your middle finger,



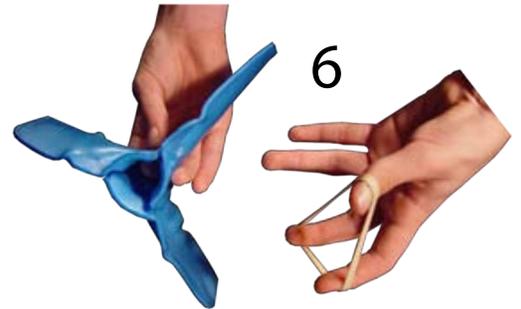
3 Install the small elastic on the bottom of the fins.



4 This is what the fins look like with the small elastic installed on the bottom.



5 Transfer the fins to your other hand.



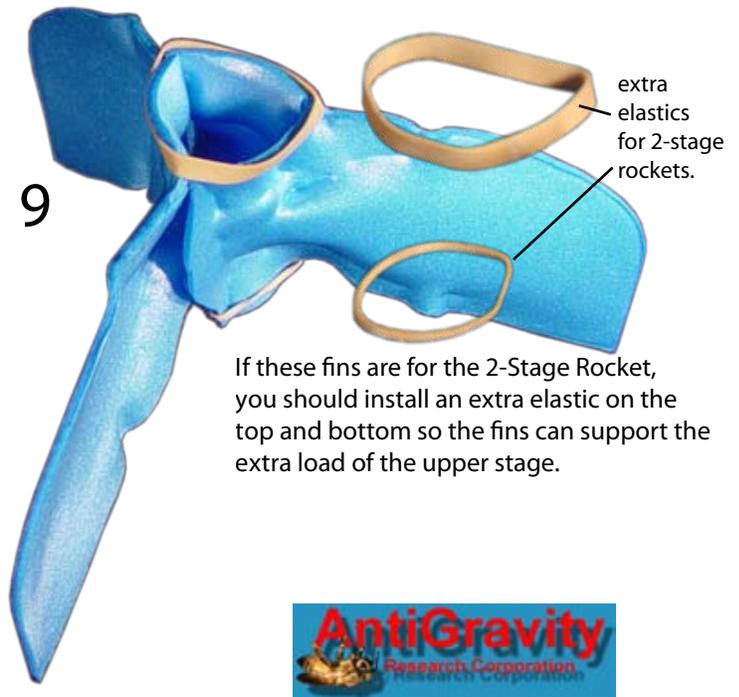
6 Use your thumb and two fingers to make a triangle with the fat elastic.



7 Install the fat elastic on the top of the fins. Make sure there are no twists in it.



8 The fat elastic band looks like this when properly installed.

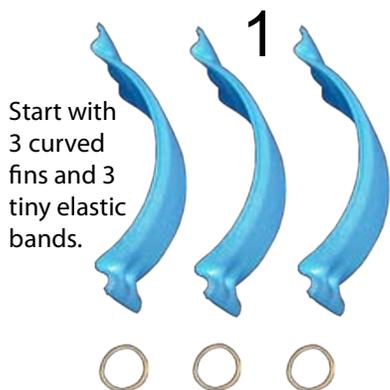


9 If these fins are for the 2-Stage Rocket, you should install an extra elastic on the top and bottom so the fins can support the extra load of the upper stage.

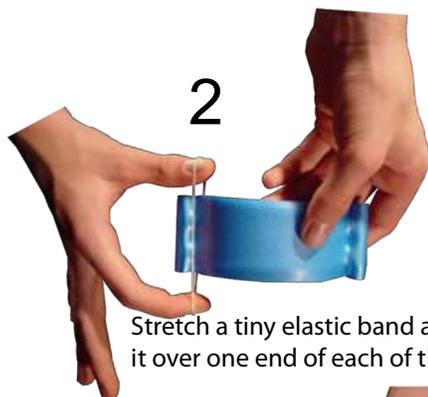


# Assembling the Ring Fin

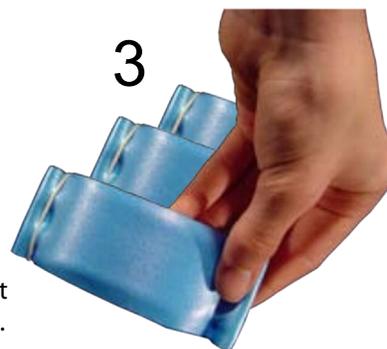
The ring fin is a very light, low friction system for keeping your rocket stable. It is useful for two-stage rockets, high altitude single-stage rockets, double fin rockets and just about any type of rocket your imagination can create.



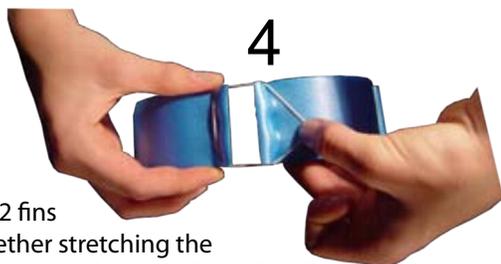
Start with 3 curved fins and 3 tiny elastic bands.



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?

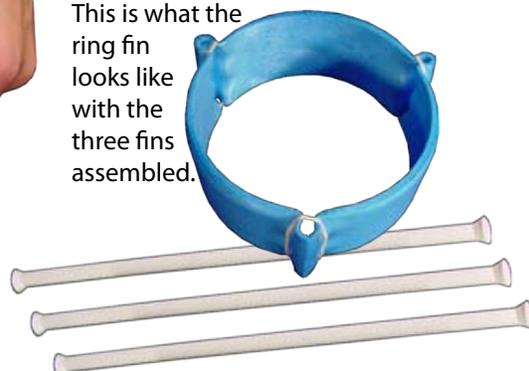


Put 2 fins together stretching the elastic over the end of another fin.



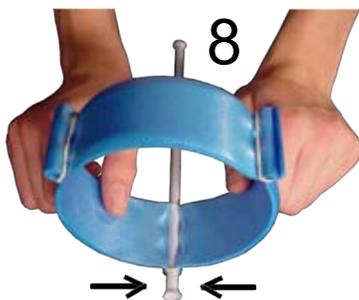
Put 2 fins together 3 times. Now the fins make a ring.

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.

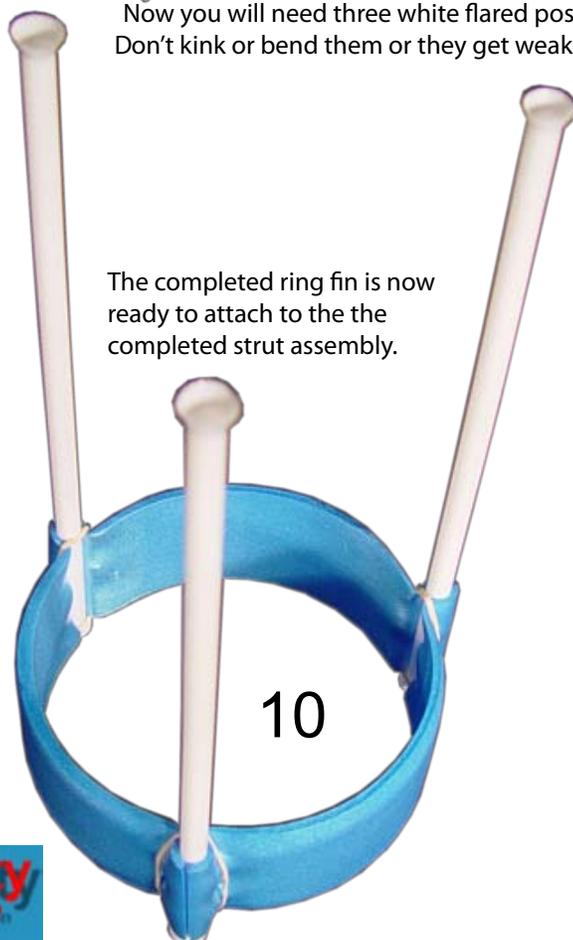


With the post resting on a table, pull apart 2 of the fins and allow them to close around the post. Repeat this for all 3 posts.



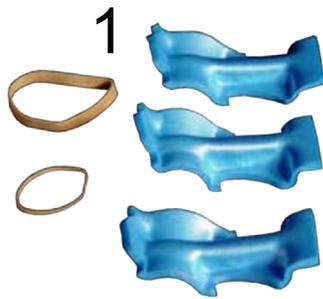
Push each post in until it stops at the flared end.

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



# 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.

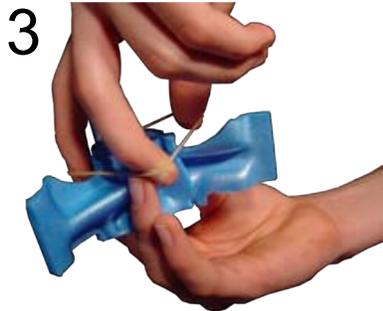
Assemble the struts around your middle finger so that the small opening is visible.



2



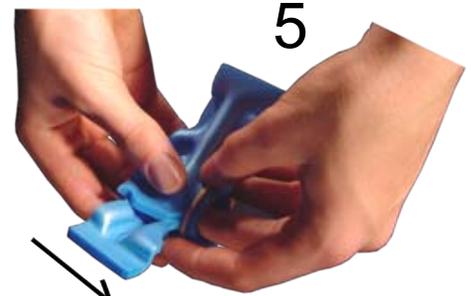
Use your thumb and 2 fingers to stretch the small elastic into a triangle shape.



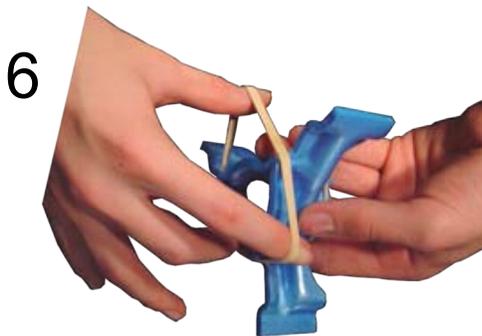
Install the small elastic on the small opening.



This is what the properly installed small elastic looks like.



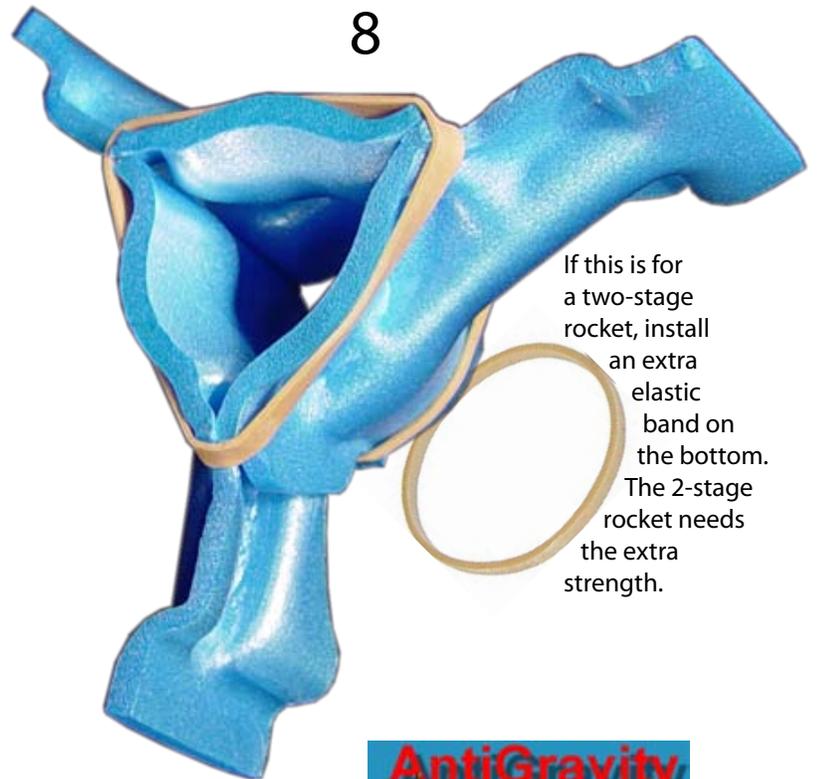
Transfer the assembly to your other hand.



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

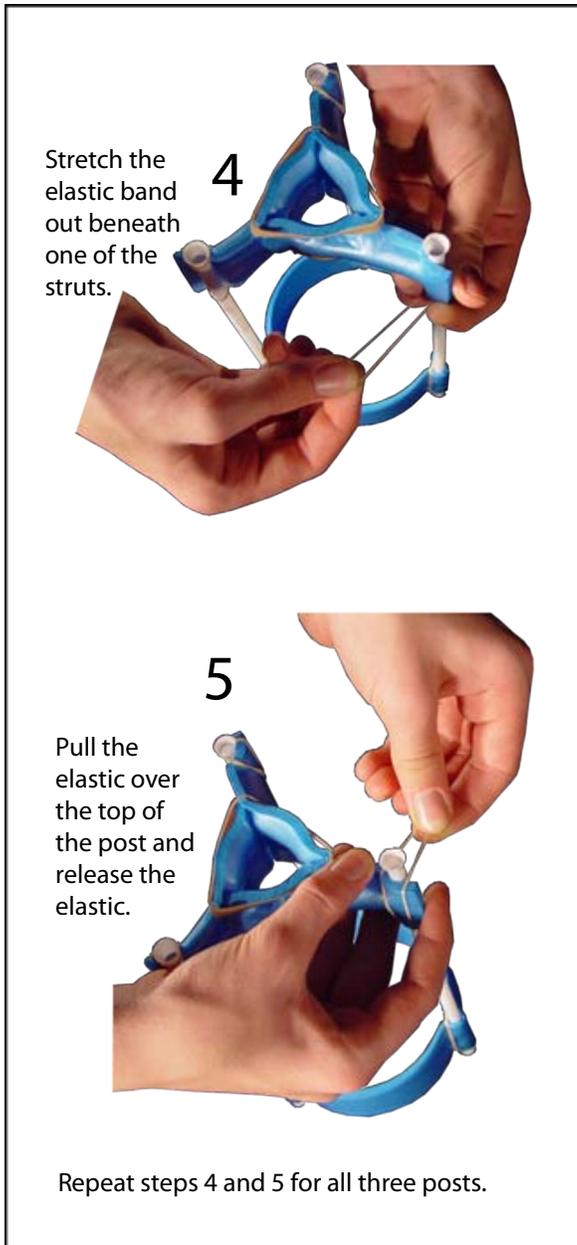
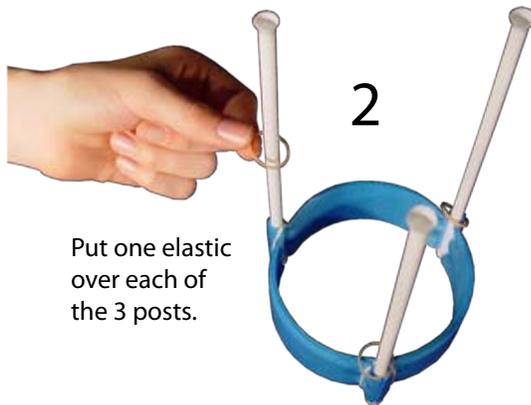
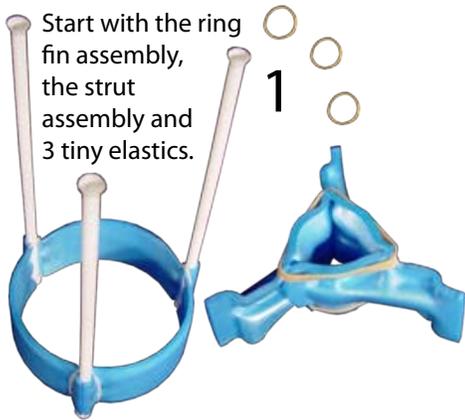


This is what the properly installed fat elastic band looks like.



# 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.

1



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

1



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

2



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 points 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.



Bag of connectors.



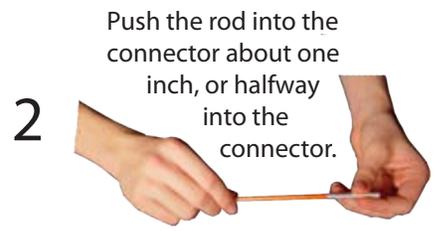
Connector. Push a rod into each end of the connector.



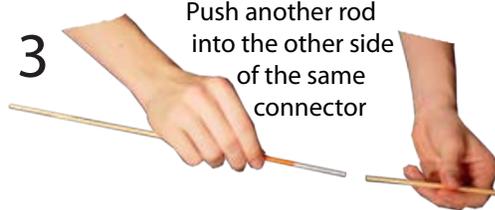
The safety marker prevents you from tripping over the guide rod by making it easy to see.



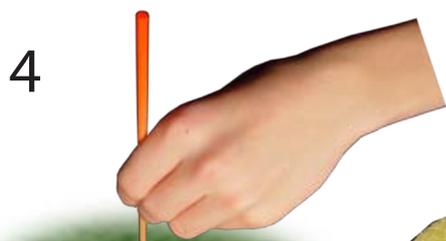
1 Push a metal connector onto a rod.



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



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.

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.



5 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.



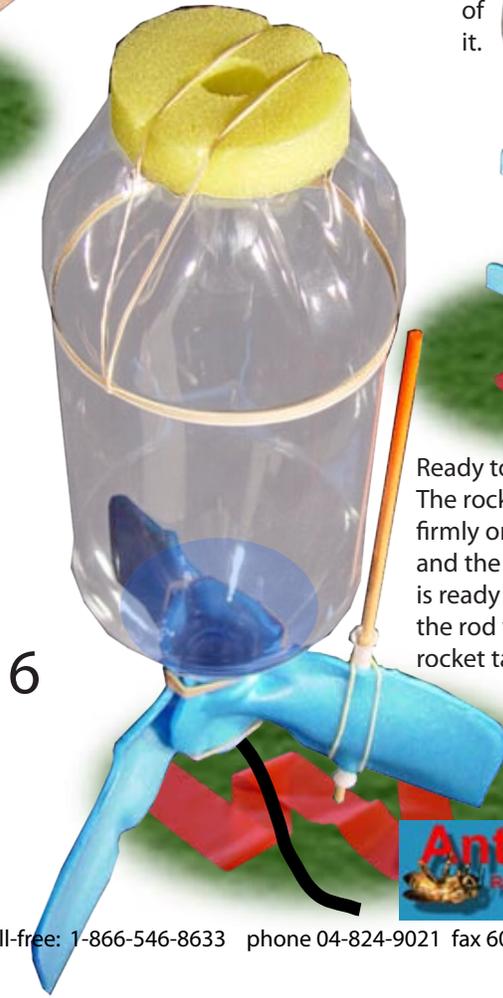
3-foot rod



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



# 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.

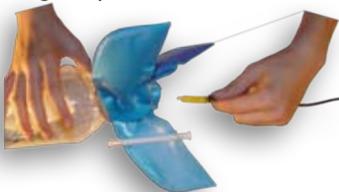
- 1 Push the launcher hose connector into the rocket pump connector.



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



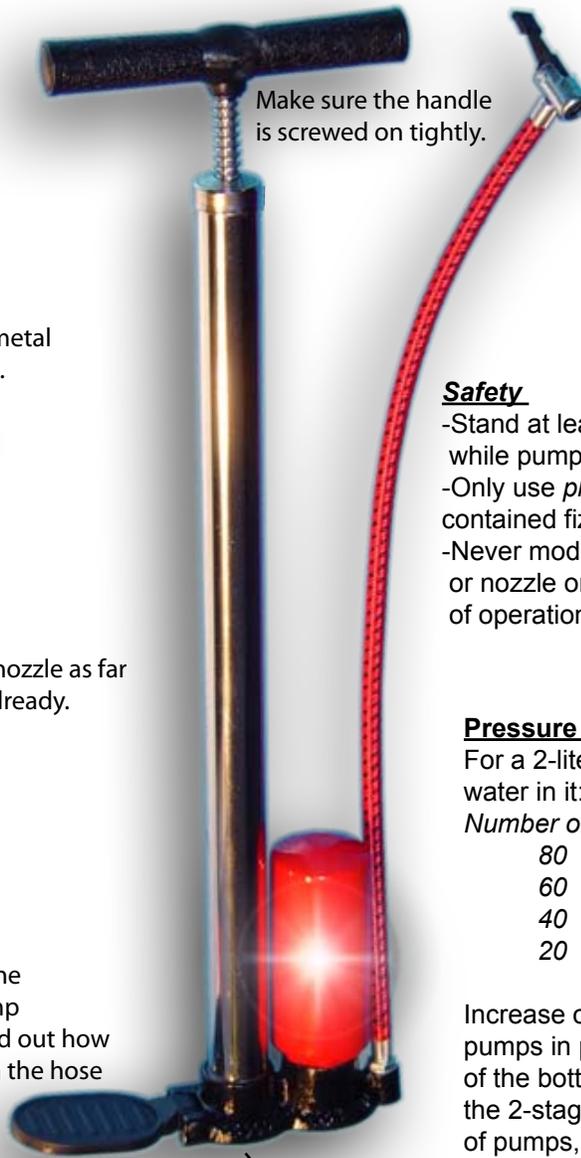
- 3 Push the yellow bulb into the rocket nozzle as far as it will go, if you haven't done this already.



- 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** with 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. You can also use 220 grit sandpaper to roughen the surface of the yellow interstage release bulb to make it hang on longer.
- 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.



Take a closer look at the AntiGravity Payload Rocket Super-thrust lifter nozzle so powerful



it pushes the earth away from your payload!



Flexible harness holds firm but gentle, just in case your egg hatches.

Load pod has aero-fingers for reliable separation and chute deployment.



Plenty of spare elastic bands to help you keep everthing together.

Resilient expanded polystyrene triple stabilizer fins with special shock-mount system.



All the instructions you could ever want to look at, and less.



AntiGravity's expanding-bulb launcher keeps you 25 feet away from the pressurized bottle.



When you get tired of sending eggs up, try a digital camera.



When the rocket stops pushing, the pod falls up and dumps, hundreds of feet off the ground.

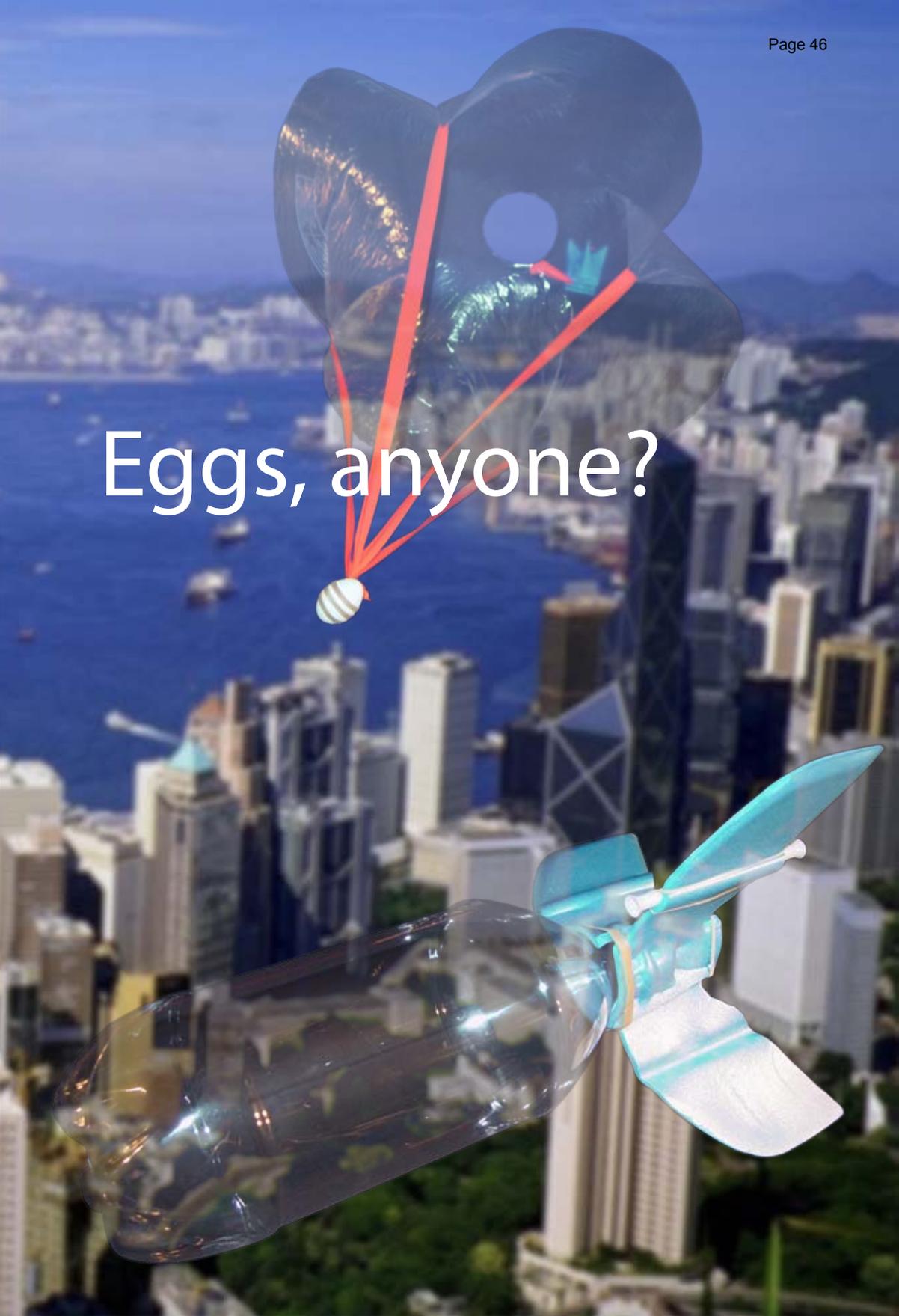


Guide rod for vertical liftoffs.

Not included in this kit: egg, camera, bottle, pump.

**AntiGravity**  
Research Corporation

# Eggs, anyone?



Let's face it, having eggs prepared the same way every day can get pretty predictable: over easy, soft boiled, hard boiled, devilled, scrambled, microwave flambe. Isn't it about time for something new? How about Eggs Altitude? Lift the humble egg way up where it was meant to be. Just follow this simple recipe:

To one AntiGravity Payload water rocket, add 200 ml of water, top with egg, parachute and passive deployment pod. Season lightly with air from your bicycle pump and voila! Eggs just got exciting again. For variety, try using a digital camera instead of an egg. AntiGravity's new Payload Rocket.

# Payload Rocket: Step by Step Instructions

On each of the panels below, begin at the left and work to the right. Relax, and take your time, and before you know it, you'll be a real rocket scientist! Assembly time: 5 minutes.

**Boing!**  
This is your supply of elastic bands. There are 2 different types: thin and thick. Keep the extras as spares.



## Parachute

Carefully install the egg in the harness.



Fan-fold the parachute starting at the pod end. Fold it small enough to fit in the blue pod, parachute first.



Loosely stuff the parachute into the pod and place the egg carefully on top in the very center.



## The Fins

Use your thumb and two fingers to make a triangle with the small elastic band.



With the other hand, hold the fins in an assembled position with the points up, around your middle finger.

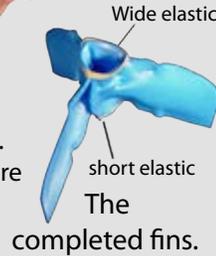


Install the small elastic on the bottom of the fins.

Transfer the fins to your other hand. Use your thumb and two fingers to make a triangle with the fat elastic.

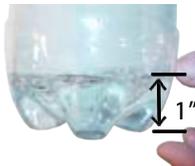


Install the fat elastic on the top of the fins. Make sure there are no twists in it.



## The bottle

Bring a 2-liter plastic pop bottle full of water with you to the field. From it, fill your rocket bottle with about 1 inch of water. (200 ml).



If the retainer ring is still on, snip it off.

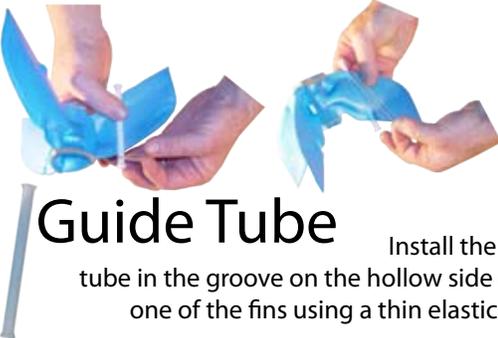


Push the fins onto the bottle until they click into position. Try not to spill any water!



## Guide Tube

Install the guide tube in the groove on the hollow side of any one of the fins using a thin elastic band.



Once your rocket bottle has water in it, install the nozzle-cap on the mouth of the bottle. Screw it on firmly.

## Countdown!

Press the guide rod through the red safety marker 2 inches into the ground in a big open field.



Then slide the rocket's guide tube over the rod.



Carefully place the parachute pod on top of the rocket.



Then hook up your air pump and pump like crazy, about 50 pumps!



## Safety!

Adult supervision required.

Make sure to stay at least 20 feet away from the rocket while pumping.

Don't launch around crowds of people. They might get hit by falling objects.

Don't climb up high or dangerous places to retrieve your parachute or rocket. Be safe!



A view from the parachute.

Never send anything up that might hurt when it comes down.

Suffocation hazard: Keep the parachute away from small children.

## Launch!

Pump until the rocket launches. If you want to launch sooner, disconnect from the bicycle pump. The rocket travels as high as 200 feet!

For extra protection, wear a helmet with face shield. Also, get one for all your spectators!

The reusable Payload Rocket can be launched over and over!

For additional ideas, application information, and troubleshooting hints, visit [www.antigravityresearch.com](http://www.antigravityresearch.com).



[www.antigravityresearch.com](http://www.antigravityresearch.com)  
email: [sales@antigravityresearch.com](mailto:sales@antigravityresearch.com)  
toll-free: 1-866-546-8633  
phone 604-824-9021 fax 604-648-8192

# Payload Rocket Extra Instructions

1. The following items are not included in the Payload Rocket Kit, and must be provided by the rocket user: empty 2-liter plastic pop bottle, egg or camera, bicycle air pump.
2. It is very important that the egg or payload be firmly placed in the exact center of the parachute-filled cup. If it is off center it may fall off of the rocket on the way up, instead of at the top of the flight.
3. Don't launch the rocket on a windy day. The parachute may travel too far and not be retrievable.
4. Never get the parachute wet, soapy or sticky. It will not open up properly and your payload will come crashing down.
5. Using 10% to 20% non-toxic handwash dishsoap in the rocket water will help the rocket to fly up to 50% higher. It raises the center of gravity by foaming up during pressurization, and allows you to put more water in the rocket.
6. If you want to try putting more water in your payload rocket, increase it gradually from one flight to the next. Too much water will make your rocket tip over and fly sideways when launched.
7. Danger: never launch the rocket under or near overhead electrical wires.

\*\*\*\*\*



### Take a look at what you get with Rocket Car

Precision-cut high-definition nozzle gives just the right balance between power and sustain.



Reinforced front-end cradle with low-friction skids.

Closed cell expanded polyethelene front safety bumper.



Plenty of spare elastic bands to help you keep everthing together.

Resilient expanded polystyrene triple stabilizer fins with special shock-mount system.



All the instructions you could ever want to look at, and less.



AntiGravity's expanding-bulb launcher keeps you 25 feet away from the pressurized bottle.

If you get tired of being earthbound aim it straight up and head for the stars.



Hey, this rocket car seems to

be jumping right out of the picture. Get back in there!

Will I need to provide anything? Just a 2-liter pop bottle and a bicycle pump.



Look no further! The AntiGravity Rocket Car has every feature you've dreamed of. Unlike most other rockets, this one stays on the ground where you can easily measure distance, speed, acceleration, thrust, mass and friction. Don't waste your time searching for wheels: they've been replaced with attention-getting low-mass, low-friction polymer skids. It's a super swift, sleek 70-gram package

all held together with elastic bands and topped off with a pineapple slice in case of direct impact with brick walls. When you get tired of being earthbound, aim it straight up. And power? Just try and name one other car that does 0 to 60 in less than 1 second. Rocket Car. From AntiGravity Research Corporation.

# Looking for a New Car?

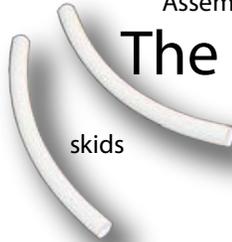


# Rocket Car: Putting it all together

On each of the panels below, starting with the skids, begin at the left and work to the right. Relax, and take your time, and before you know it, you'll be a real rocket scientist!  
 Assembly time: 5 minutes.

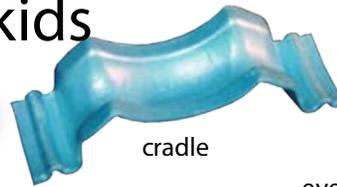


This is your supply of elastic bands. There are 3 different types: short, long, and wide. Keep the extras as spares.



skids

## The skids



cradle



Use the short elastics to attach the skids to the cradle.

For use on snow or water, you don't even need the skids, just use the cradle.

## The Fins

Use your thumb and two fingers to make a triangle with the small elastic band.



With the other hand, hold the fins in an assembled position with the points up, around your middle finger.

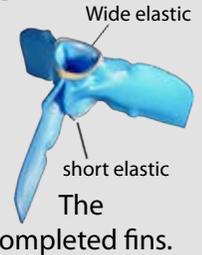


Install the small elastic on the bottom of the fins.

Transfer the fins to your other hand. Use your thumb and two fingers to make a triangle with the fat elastic.



Install the fat elastic on the top of the fins. Make sure there are no twists in it.



Wide elastic

short elastic

The completed fins.

Slide long elastic under wide one.



Pull one end of long elastic to other side of bottle.



Pull both halves of long elastic to top.



## The bottle



Now we're ready for the final steps!

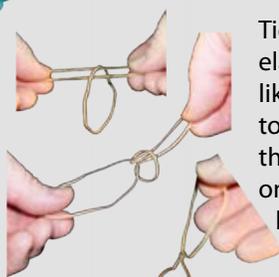
The soft bumper is held on with one wide elastic around the bottle, and one long elastic over the bumper. This is the toughest part of assembling the rocket car. Once you've done this, you're home-free!

Guess where the nozzle cap goes! Screw it on firmly.



Push the fins onto the bottle until they click into position.

## Final assembly



Tie 2 long elastics together like this, to hold the skids onto the bottle.



Put the cradle as far forward as it can go, using the ridge on the bottle as a guide.

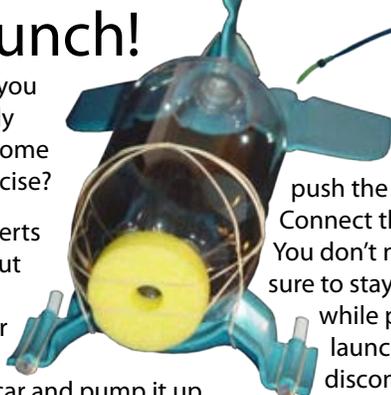


Idea: move cradle farther back for each launch. Rocket Car will almost lift off the ground.

## Launch!

Are you ready for some exercise?

For experts only: put 100 ml of water in the rocket car and pump it up. Then buy another rocket car!



Unravel the launch hose, then push the yellow end into the rocket's nozzle. Connect the other end to the bicycle pump. You don't need any water for this rocket. Make sure to stay at least 20 feet away from the rocket car while pumping. Pump until the rocket car launches. If you want to launch sooner, disconnect from the bicycle pump. Travels as far as 200 feet per launch.

Reusable rocket car can be launched over and over!



To launch vertically, remove the skid cradle and stand the rocket up. Don't put any water in the rocket or it will tip over and travel sideways.



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

# Rocket Car Extra Instructions

1. **Adult supervision required.**
2. **Stay at least 20 feet away from the bottle when pressurizing it. Make sure that everyone present stays at least 20 feet away from the bottle when you are pressurizing it, in case the bottle bursts. It is very loud if it bursts.**
3. **Don't launch the rocket indoors unless everyone present wears earmuff type hearing protection. If the plastic bottle bursts, it is very loud indoors. If the bottle bursts outdoors, it is not nearly as loud.**
4. **Never launch the rocket car without the front foam bumper attached. The bumper protects the rocket and whatever it may hit.**
5. **Never put more than 50 pumps of air into the rocket from your standard bicycle air pump. If the rocket hasn't launched by the time you have pumped 50 pumps, open the lever on the pump's connector and the rocket car should launch. Over-pressurizing the bottle could cause it to burst.** Using a typical bicycle pump with a cylinder diameter of 1.25 inches and a stroke length of 20 inches, the rocket car requires about 25 pumps (40 psi) to work well. 37 pumps (60 psi) runs it at the maximum speed that it can stay on the ground. 50 pumps (80 psi) may move the rocket car fast enough that it lifts off of the ground.
6. If the rocket car lifts off the ground or tips over when you launch it add about 10 grams of weight to the front of the rocket by folding 2 sheets of 8.5 x 11 inch paper in half several times so that it fits behind the foam bumper pad. Experiment by adding weight (more sheets of paper) until the rocket car is stable. This added weight should always be put behind the foam bumper pad for safety. You can also cut the fins shorter to eliminate spin, but this is more difficult to reverse than adding folded paper behind the bumper.
7. If the rocket car lifts off the ground when moving, put the skid cradle farther forward on the bottle. If the rocket car has too much friction on the skids when moving, put the skid cradle back farther on the bottle.
8. If the rocket car turns left or right, or tips over while moving, adjust the fins to align with the body of the rocket.
9. To use as a vertical rocket, remove the skid cradle and stand the rocket vertically on its fins, then launch. Don't put water in the rocket when using it vertically. It will tip over and fly sideways because the nozzle is too small to lift the extra weight of the water.
10. The rocket car doesn't need any water in it to work properly. If you do put water in it, don't put much in, only 100 ml maximum or the rocket will be too heavy to sit properly on its fins before launch. With water in the rocket car, it is much more likely to be damaged on impact than without water. Never use water when launching the rocket car vertically or the rocket will tip over and travel sideways.

\*\*\*\*\*



Build and launch all of these water rockets.



## The Ultimate Water Rocket Experimenter's Kit

Jump start yourself into the space age with this comprehensive kit. It comes with everything you need to build 11 rocket variations, including two 2-stage rockets, six single stage rockets, two types of rocket cars and a payload lifter/parachute rocket. You also get everything you need to send the rockets

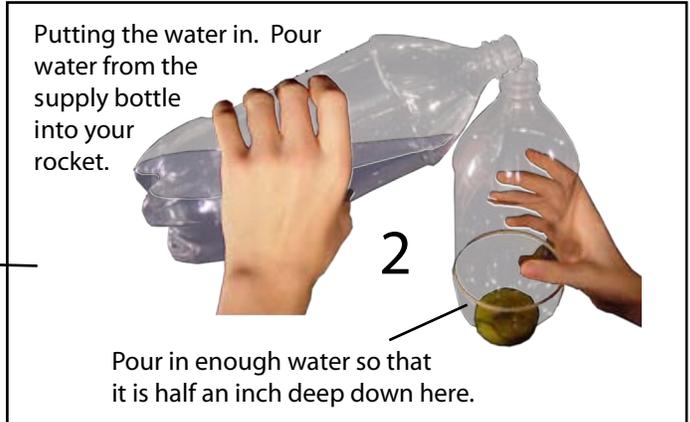
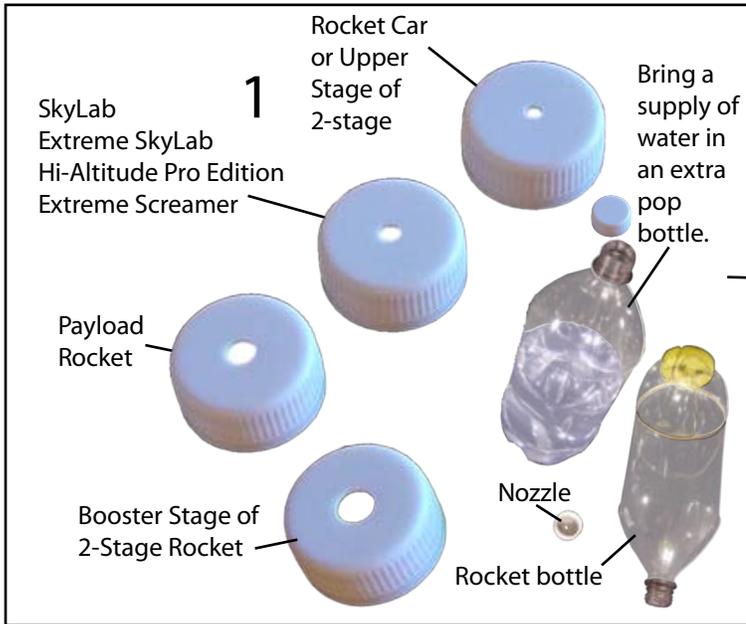
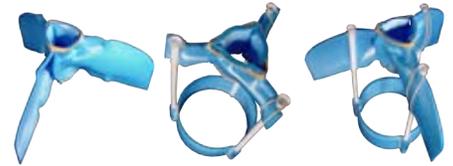
into the sky: four specialized launchers, a segmented 72-inch launch rod, and AntiGravity's famous rocket pump for reliable power. You even get all the bottles you need to make everything work, including AntiGravity's super streamlined U14 design. Ideal for educational applications.

www.antigravityresearch.com email: sales@antigravityresearch.com toll-free: 1-866-546-8633 phone 604-824-9021 fax 604-648-8192  
Price and product are subject to change without notice.



# Installing Water, Nozzle and Fins

Put the water into your rocket bottle before installing the nozzle. Use the nozzle size that fits the launcher you are using. The right nozzle fits snugly on the yellow launcher bulb. If it is loose, or if it won't fit in at all, then you are using the wrong nozzle. Follow these instructions for all three types of fin assemblies.

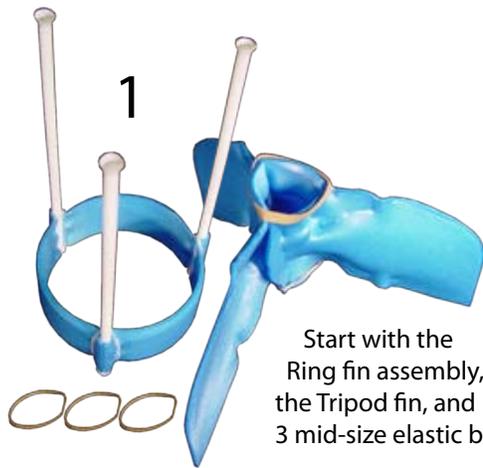


**7** Loaded with water and ready to slide onto the guide rod.

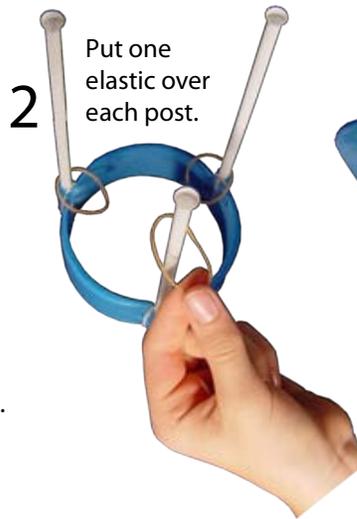


# Double Fin Assembly

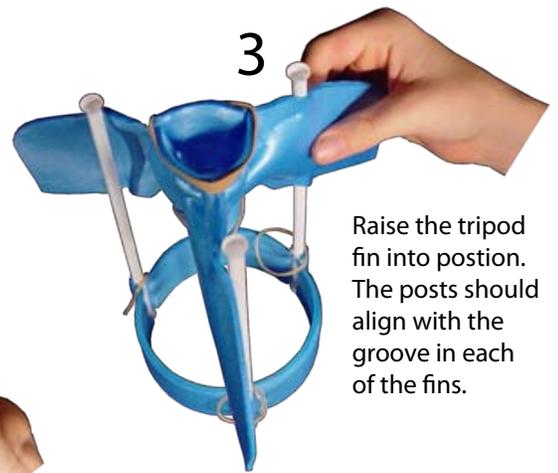
Use this for very demanding industrial applications, where extra aerodynamic stability is of paramount importance. Center of pressure is much farther back when you use the double fin, allowing greater water-carrying capacity.



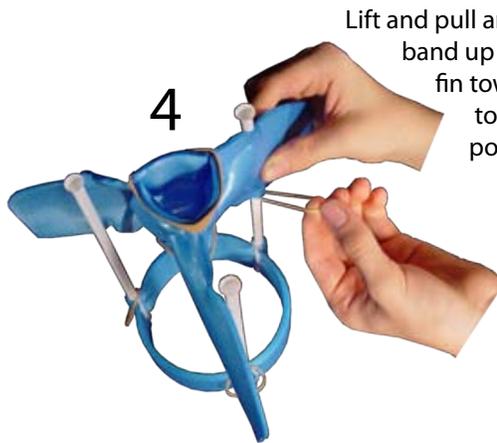
1  
Start with the Ring fin assembly, the Tripod fin, and 3 mid-size elastic bands.



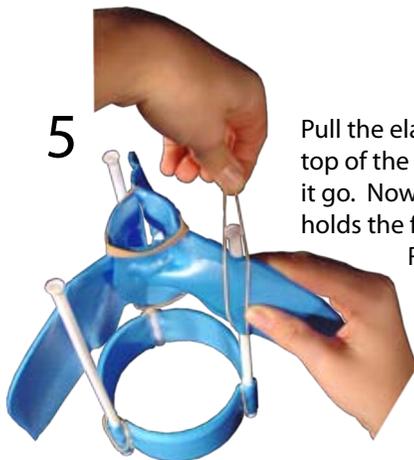
2  
Put one elastic over each post.



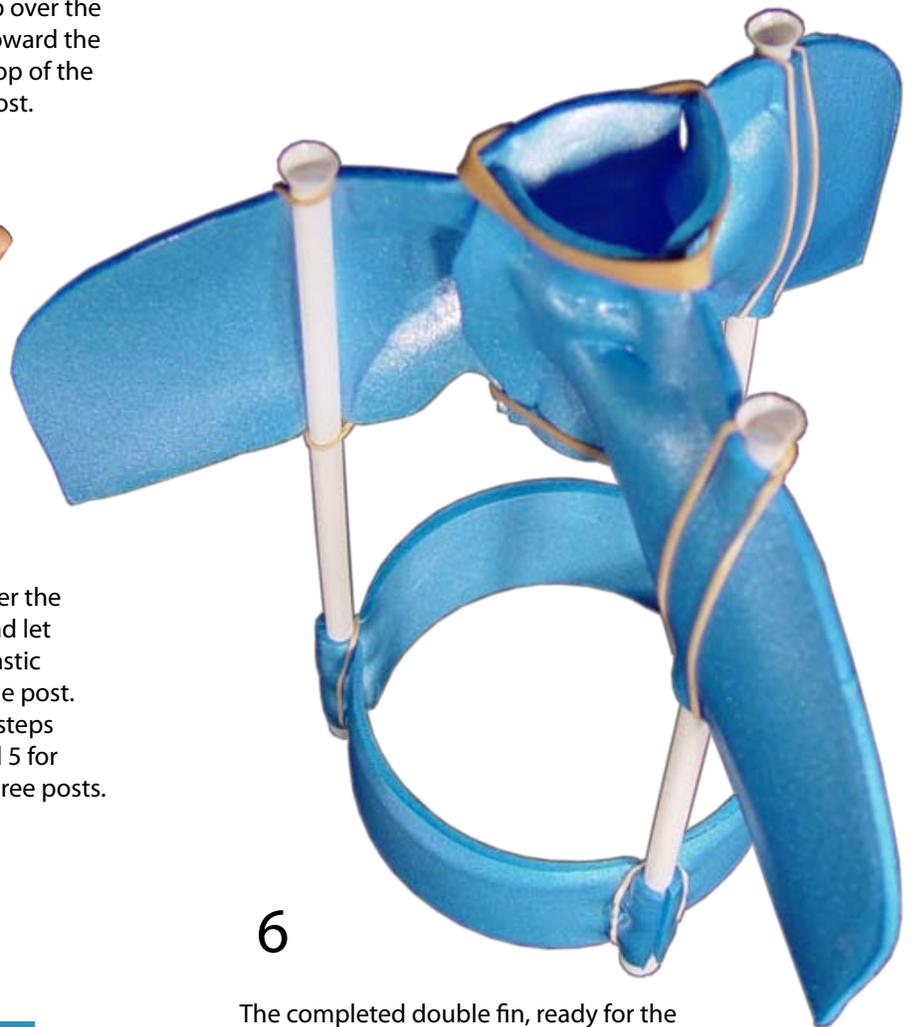
3  
Raise the tripod fin into position. The posts should align with the groove in each of the fins.



4  
Lift and pull an elastic band up over the fin toward the top of the post.



5  
Pull the elastic over the top of the post and let it go. Now the elastic holds the fin to the post. Repeat steps 4 and 5 for all three posts.



6

The completed double fin, ready for the toughest rocket work you've got!



## The Skylab 50 Pak

You get everything except the 2-liter plastic pop bottles. Make sure everyone brings one.

Excellent fun for large groups of kids age 10 and up.

Comes with fifty rockets and four complete launchers.

Four guide rods, to make sure the rockets go straight up.

Four high-visibility markers for the guide rods.

Don't forget to bring a bicycle pump to power each launcher.



# Fifty Water Rockets

# Have them ready by Wednesday.

Preparing an exciting and educational craft activity for a group of fifty kids can be quite a task, even if you do happen to be a rocket scientist. That's why we make AntiGravity's SkyLab water rockets kits available in packs of fifty. 50 complete rockets, with four launchers and four launch rods.

So don't spend your evenings and weekends stressed to the max while whittling away at your sanity with an exacto knife. Instead, get us to do that for you. You'll be free to guide and direct young minds to think about space, rockets, and science. AntiGravity Research Corporation.

# A Rocket Dodge Ball kit includes

10 - Rocket Guide Rods

10 - Launchers



10 - Safety Markers



10 - Clear Pictorial Instructions



10 - Rockets

(Includes fins, guide tube, bumper, elastics and nozzle)

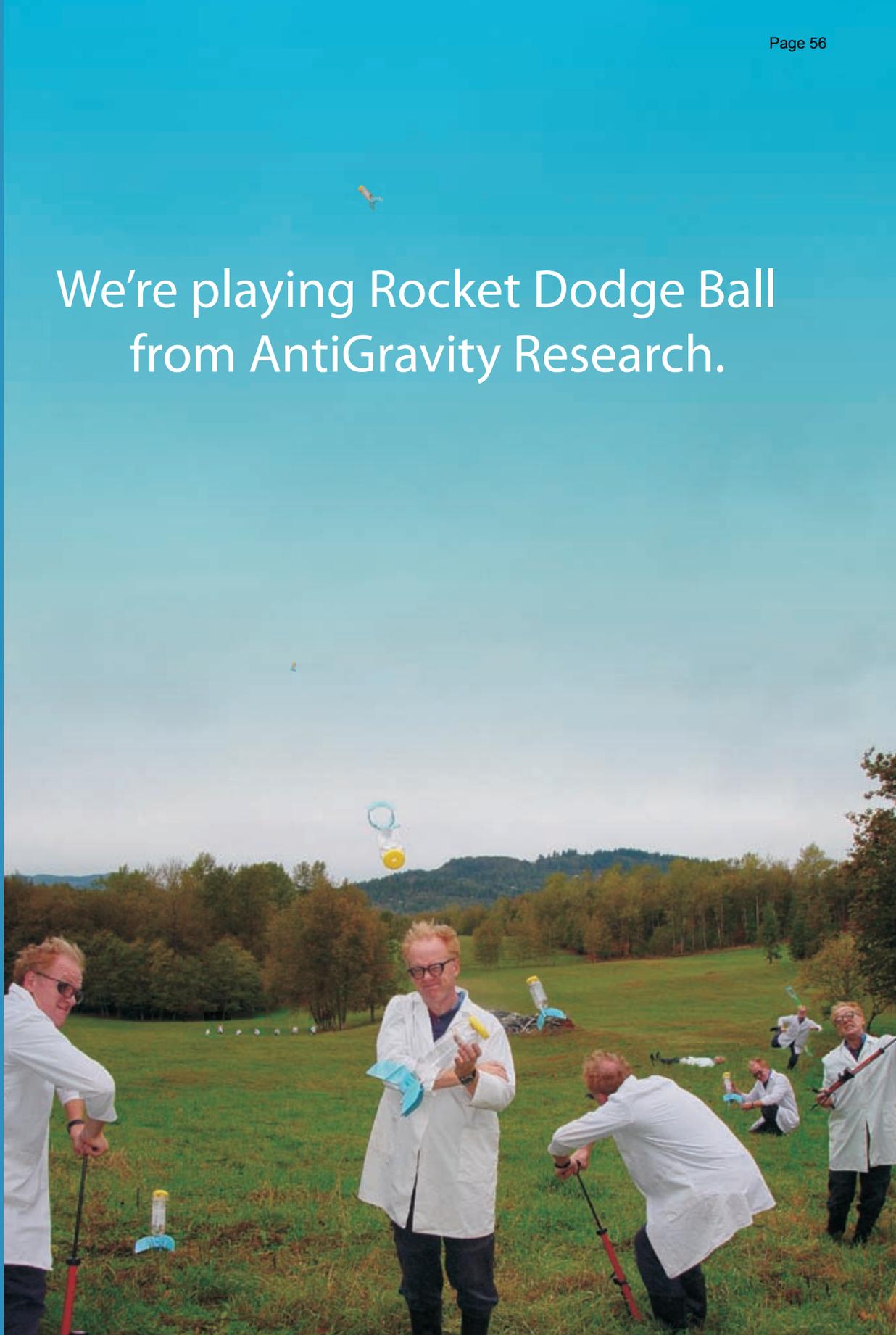


Bottles not included

### Requirements

- 10 - 2-liter pop bottles
- 10 - Bicycle pumps
- Water
- 1 - Wide open field

# We're playing Rocket Dodge Ball from AntiGravity Research.



Remember when you played dodge ball in elementary school and your best friend would carom one of those heavy red bouncy balls off your head from ten feet away? Wasn't that fun? Now that you're big you can do the same thing with water rockets from 350 feet.

The rockets are very light, only 60 grams, and have a big fluffy pad in front in case they hit your big fluffy head. Why not practice up a bit and when you get really good at hitting a target invite that same best friend from elementary school out for a game of Rocket Dodge Ball. Wouldn't that be fun?



# The best water rocket air pump you can get.

We've tried every type of air pump in the world. This is the best one of all, bar none.

Throw away your collection of broken bicycle pumps.

Standard pumps are meant to be used

once a year to 40 psi. A water rocket uses more air than a bike tire, 50 times a day to 80 psi! It takes a great pump to handle that kind of punishment.



Feel the difference that a pressure reservoir tank makes. The smoothest pumping action ever! Absorbs each pump and sends it smoothly to your rocket, minimizing the mechanical stress on every part of the system, including you.

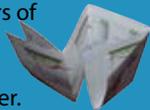


Never needs batteries. Almost like a perpetual-motion machine, this pump always has energy exactly when you do. When you're ready for action, so's the pump!



The only bicycle pump that comes with rocket instructions.

Benefit from our years of experience using bike pumps and water rockets together. A little knowledge makes your rocket go a long, long way. Up.



Built tough to stand the rigors of rocketry, day in, day out. We know that when you head out to the field for a day of water rocketry, the last thing you want is trouble from your air pump.



Because higher altitude is what it's all about.

At AntiGravity we'll never be satisfied until we land a water rocket on Mars. Why not come along for the ride?



# Lift Heavy Loads



Serious water rocket enthusiasts don't waste their time with just any old bicycle pump. They get the Rocket Pump from AntiGravity Research Corporation. Built tough to take the punishment. Check out the precision cast footing, durable chrome-plated steel cylinder, folding foot rest,

reinforced output hose, spring-smooth pumping action, two-fisted grip handle, and a high temperature steel-ball check valve. Best of all, the resin-coated pressure reservoir dissipates heat and eliminates unwanted pressure peaks.



**Proven components for the water rocket experimenter:**

Fins, Struts and Mounts



Elastics and Fasteners



Payload/ Parachute Deployment Pods



Pictorial Instructions



Bottles, Boosters Interstage Releases



Precision Nozzles



Safety Bumpers



Guide rods and connectors



Guide Tubes

Launchers



# Serious Water Rocket Components



When you're building your own water rocket, make use of the best, lightest and strongest components available. AntiGravity's modular rocket building blocks can be mixed, matched and re-configured to quickly bring your good ideas to the field testing stage without the burden of having to re-invent every piece.

From shock-mounted fins and struts to precision-engineered nozzles, aerodynamically superior bottles to interstage release mechanisms, launchers to launch rods, you'll find exactly the components you need to realize even the wildest design. Make your water rocket design a reality. AntiGravity Research Corporation.



From the people who set the World Altitude Record for pop bottle water rockets.

Integral closed-cell foam bumper for safety on impact, or payload and tool mounting.



The U14 bottle has much more sleek, streamlined shape.

Volume:  
2 liters

Maximum Working Pressure:  
80 psi

Length:  
19 inches

Weight:  
55 grams

Diameter:  
3.75 inches

Material:  
PET



# The Ultimate Water Rocket Bottle

For your water rocket experiments, get the U14 bottle from AntiGravity. And break a few records.



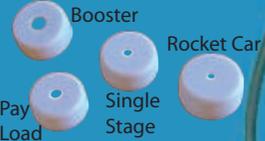
## Launcher Features



Rugged connectors firmly bonded to a tough vinyl hose for long-lasting service

Fits any standard bicycle air pump.

Four sizes to choose from, each with matching nozzle:



Holds on to the rocket as long as you are pumping air, up to 80 psi.

Fill pinhole

Expanded bulb holds rocket down. Safely releases the rocket in case of over-pressure.

25 long feet of hose to keep you a safe distance away.

# That's not a rocket launcher!



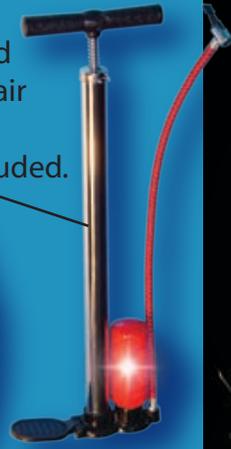
Oh yes it is, smarty-pants. It's AntiGravity's revolutionary new expanding-bulb water rocket launcher. By comparison, all other launchers are big, cumbersome relics from pre-history. Which is okay if you're just launching dinosaurs into outer space.

But if it's water rockets you plan on launching, get the new expanding-bulb launching system from AntiGravity Research Corporation. It'll help you get your water rockets off the ground. And maybe you'll make a little history yourself.



## The Versatile Launcher.

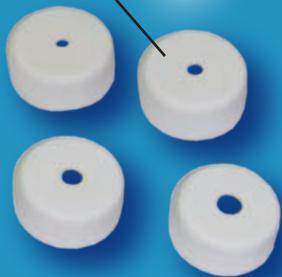
Fits any standard bicycle air pump, not included.



Quick-change connector allows you to easily select the exact launcher you need.



Four precision-cut nozzles, each perfectly matched to its own expansion launcher bulb.



## The Versatile Launcher.



# Launch just about anything.



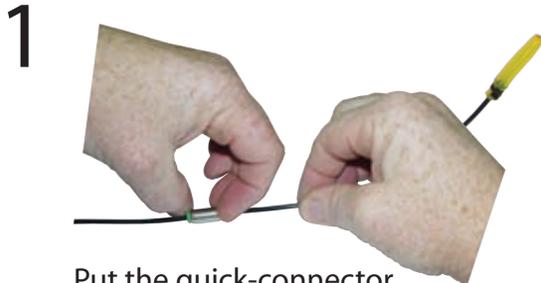
**Now**, every water rocket you create can have precisely the nozzle it needs. The **Versatile Launcher** from AntiGravity Research Corporation is really four launchers in one. With it you can launch every type of rocket we make. But more importantly, it'll launch every type of rocket **you** make. Everything from single stage rockets to booster stages to sustainer stages, from payload rockets to rocket cars to rocket

planes. So go ahead. Experiment to your heart's content. Match the thrust of your rocket exactly to requirements of load, air friction, acceleration and application. Make new designs thrive in the sky in ways that you never thought possible. And surprise yourself by proving some of your wilder theories. The **Versatile Launcher** from AntiGravity Research Corporation. Give your rockets a **real** boost.

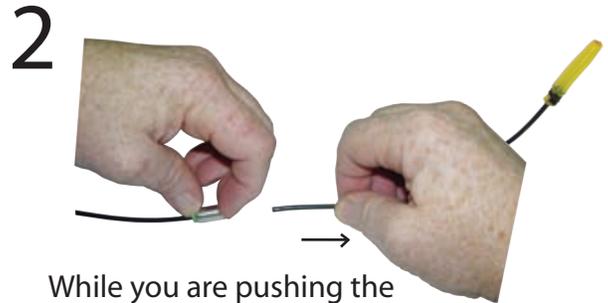
# Versatile Launcher Instructions

This launcher works the same as all the other AntiGravity launchers except for one thing: the yellow bulb can be removed and replaced with a different size bulb to fit a different size nozzle. A smaller nozzle has less thrust for a longer time, and a larger nozzle has more thrust for less time.

## Removing a yellow bulb

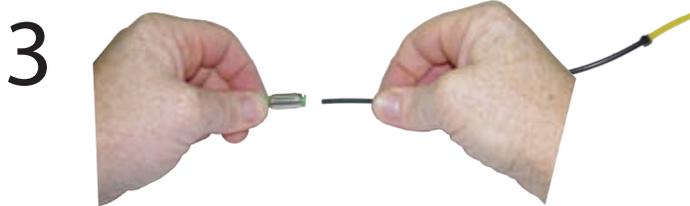


Put the quick-connector onto a hard surface and push the rings at each end toward each other very firmly.

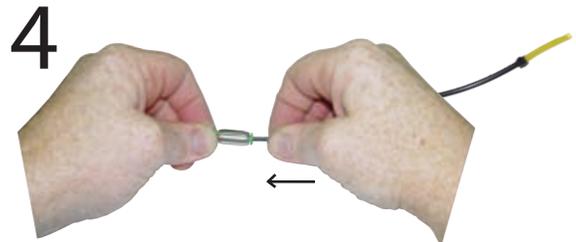


While you are pushing the rings together with one hand, use the other hand to pull the yellow bulb's hose out of the connector.

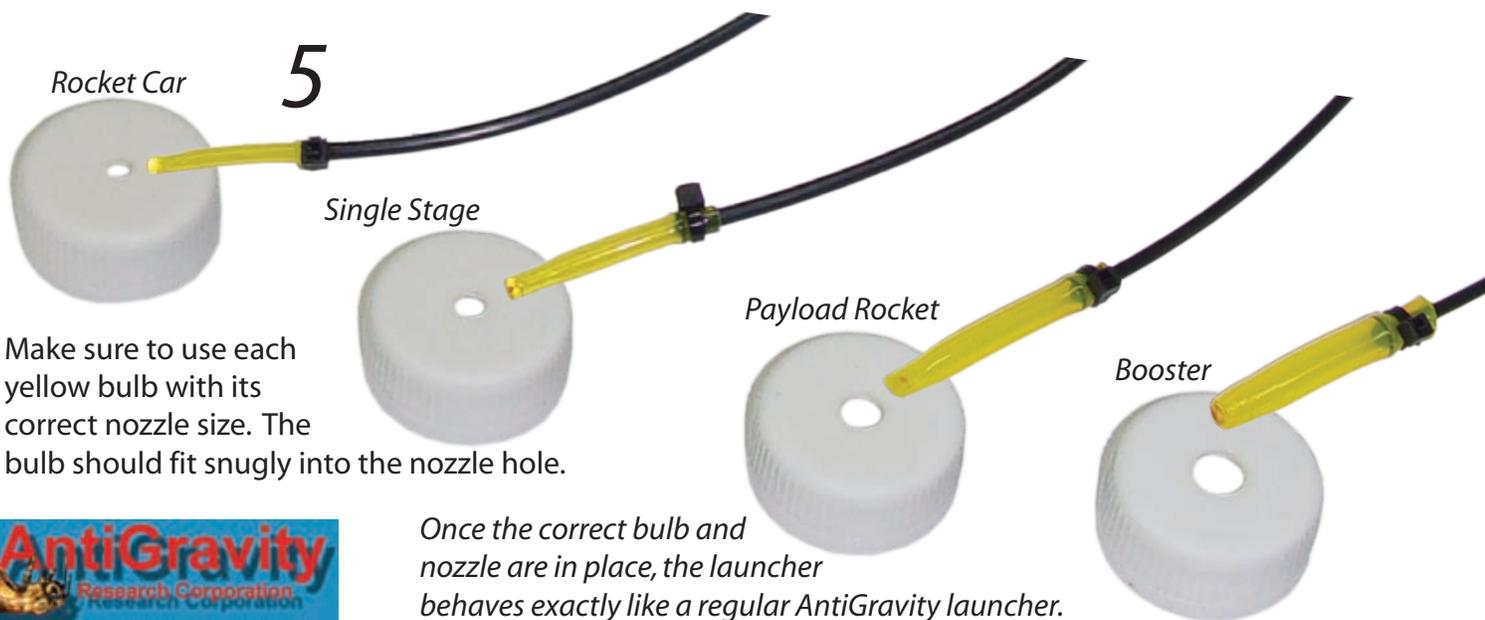
## Connecting a yellow bulb



Grasp the quick-connector firmly and push the yellow bulb's hose into the open end.



Push both hoses firmly into the quick-connector until they won't go any further.



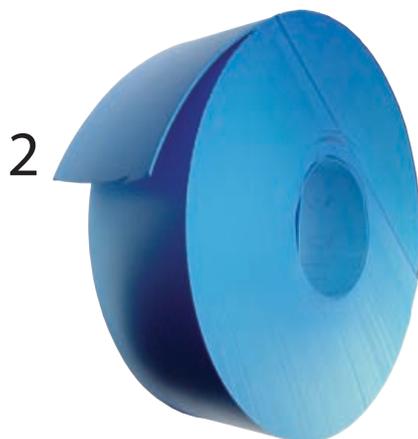
# How the Rocket Fins are Made

At AntiGravity Research Corporation, we're always striving to improve. We design and build our own machines and systems to do the best manufacturing job possible so that you get the best rocket possible. We use automatic machines and specially designed tools in almost every area. Here's a look at how we make the rocket fins and struts.



1

Giant rolls of foam plastic are sliced to the correct width on our hot-wire slicing machine.



2

Once they are cut to width, the rolls are ready to feed into our fin molding machines.



3

Each of our three electro-pneumatic fin molding machines can produce millions of parts per year. They heat, mold and cut out the finished pieces.



4

Closeups of the parts as they are being automatically molded and cut.



5

Closeup of the hotwire cutter, mold and cooling nozzles. The 2-part mold presses on both sides of the hot plastic to shape it. The hot wire melts through the plastic from below to cut out the finished piece.

6



These finished parts are ready to go into our rocket kits. They can be combined in many ways to build a wide range of different rockets.



Whether you need one rocket for a science project, 25 rockets for group activities or team-building exercises, or 25,000 rockets to educate a new generation of rocket scientists, AntiGravity is always ready with the rockets you'll need.

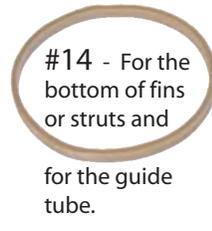


# Rocket Maintenance and Repair

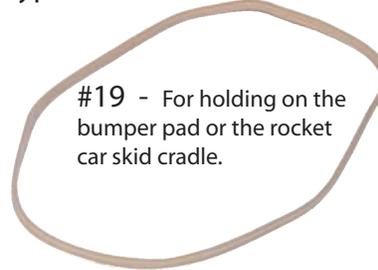
**1. Elastic bands** - Try to find the elastic bands after each rocket flight or soon you won't have enough to assemble your rocket. And elastic bands can lose their stretchiness or crack and break after a while. If you need more elastic bands, they are available from AntiGravity, or if you wish to buy standard elastic bands from your local stationary retailer, the types are as follows:



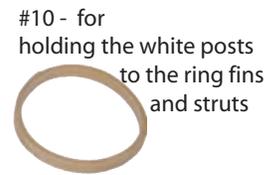
#63 - For the top of fins or struts and for the bumper pad.



#14 - For the bottom of fins or struts and for the guide tube.



#19 - For holding on the bumper pad or the rocket car skid cradle.



#10 - for holding the white posts to the ring fins and struts

**2. Fin and strut repair** - If your fins or struts break, save all the pieces so that you can reassemble them. Use a small low-temperature glue gun to hold everything together. Or if you prefer, you can use fast epoxy glue. Before glueing, make sure that the parts are clean and dry. If the pieces have dish soap on them make sure to wash and dry them first, before glueing.



**3. Posts and guide tube** - If these break or crack you can strengthen them by wrapping the broken part with packing tape or duct tape. If they need replacement they are available from AntiGravity, or sometimes you can use your straw from your latest fast-food meal as long as it is a wide milkshake straw.

**4. Guide rod and marker** - If the guide rod breaks or is lost, you can usually get another one at a local building supplies store. Get a round wooden dowel, 3/16 inch diameter, at least 12 inches long for single stage rockets, or 36 inches long for two stage rockets. Spray paint it bright fluorescent red and make sure to use a bright red marker tape when you stick it into the ground, for high visibility so nobody trips over it. Or you can fix the old one with tape.



**5. Bottle Worn, Cracked or Damaged** - Replace with a new plastic 2-liter bottle that previously held fizzy pop. You can't repair these. Don't use a water bottle because they aren't strong enough to hold the pressure.

**6. Damaged or missing bumper pad** - Never use your rocket without the bumper pad in place or it may cause injury or damage on impact. Use a 5/8 inch thick slice of a foam pool noodle as a replacement bumper pad for a standard 2-liter bottle. Never use the AntiGravity U14 stretched bottle if the bumper is missing or damaged.



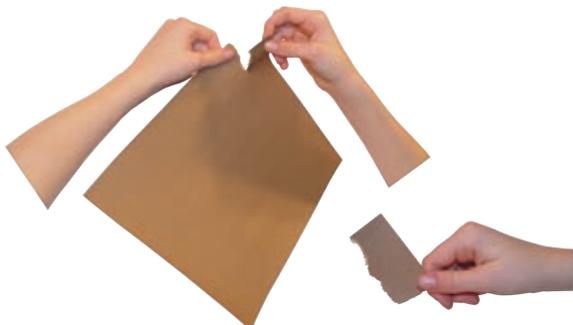
**7. Launcher hose & Nozzle** - typically, no maintenance or repair has been required on AntiGravity launchers or nozzles. Replace with new ones as required.



## For Experts Only: Achieving Extra Altitude

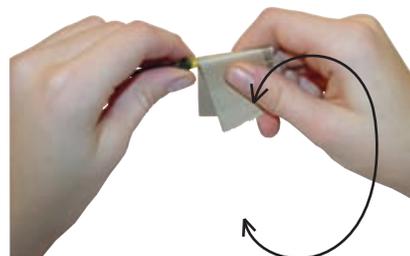
This special modification of any of the AntiGravity launchers or the interstage release mechanism allows them to hang onto the rocket at much higher pressures, releasing the rocket only when you depressurize the line by disconnecting it from the bicycle pump. Use extra caution when using this method because the higher pressures involved can put the bottle much closer to its burst pressure. Make sure to keep yourself and others at least 20 feet away from the pressurized bottle, and keep in mind that for a 2-liter bottle, you add about 1 psi of pressure per stroke of your bicycle pump.

1



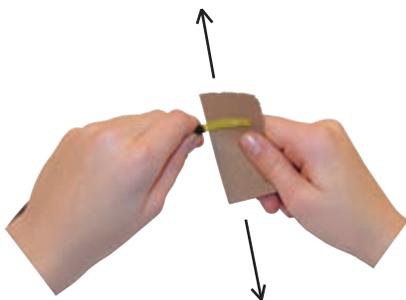
Tear a small piece from a sheet of 220 grit (very fine) sandpaper.

2



Use the sandpaper to roughen the surface of the yellow launcher bulb. Wrap the sandpaper around the bulb, then twist the bulb and the sandpaper back and forth. This makes the scratches go around the bulb (radially). Scratches should **not** be lengthwise.

3



Make sure that the entire surface of the bulb is rough, but don't sand away any of the yellow bulb. Only surface scratches are needed.

4



This is what the bulb looks like when it is properly modified. Notice how the surface is not as shiny as the unsanded bulb.

6

The bulb will be more difficult to insert into the rocket nozzle because of the increased friction, so you may have to vigorously wiggle the bulb to insert it.

5



This method works for all AntiGravity launchers and for the 2-Stage rocket's interstage release mechanism.



# Price List

Prices are FOB our door, in US dollars. Prices are subject to change without notice. Shipping costs are extra. Brokerage, duties and taxes are extra. A 10% discount applies to any order of ten or more of any single line item.

## *Standard kits and accessories*

SkyLab Kit	19.99
Extra rocket	10.00
Extreme SkyLab	29.99
Extra rocket	20.00
Hi Altitude Pro Edition	29.99
Extra rocket	20.00
Extreme Screamer	39.99
Extra rocket	30.00
Ozone Probe 2-Stage Kit	57.99
Extra rocket	48.00
Extreme 2-Stage Kit	67.99
Extra rocket	58.00
Rocket Car	19.99
Extra rocket	10.00
Payload Rocket	39.99
Extra rocket	30.00
Rocket Pump	29.99
Ultimate Water Rocket Exp. Kit	199.99
Rocket Dodgeball Kit	149.99
Standard Launcher with Nozzle	14.99
All-in-one Launcher with 4 Nozzles	49.99
U14 Extreme Bottle	11.99
Plastic 2-Liter Bottle	1.99

## *Small Parts*

Tripod Fin Set	7.99
Ring Fin Set	17.99
Standard Bumper	3.99
Interstage Bumper	5.99
Elastic Pak	3.99
Strut Set	5.99
Guide Tube	3.99
12-inch Launch Rod	3.99
36-inch Launch Rod	7.99
72-inch Launch Rod	9.95
Shim Set	3.99
Booster Bottle	15.99
Interstage Release	5.99
Nozzle (Rocket Car, Single Stage, Payload, or Booster)	5.99

## *Rockets in bulk package for large groups*

SkyLab or Rocket Car	
25 Pak with 2 launchers	264.99
50 Pak with 4 launchers	499.99
100 Pak with 8 launchers	979.99
SkyLab Extreme or Hi Altitude Pro	
25 Pak with 2 launchers	397.99
50 Pak with 4 launchers	749.99
100 Pak with 8 launchers	1469.99
Extreme Screamer or Payload Rocket	
25 Pak with 2 launchers	529.99
50 Pak with 4 launchers	999.99
100 Pak with 8 launchers	1959.99
Ozone Probe	
25 Pak with 2 launchers	1199.00
50 Pak with 4 launchers	2199.99
100 Pak with 8 launchers	4149.99
Extreme 2-Stage	
25 Pak with 2 launchers	1399.99
50 Pak with 4 launchers	2599.99
100 Pak with 8 launchers	5139.99

## *Ten rockets with ten launchers in bulk package*

10 Skylab	149.99
10 Skylab Extreme	224.99
10 Hi Altitude Pro	224.99
10 Extreme Screamer	299.99
10 Ozone Probe	434.99
10 Extreme 2-stage	509.99
10 Rocket Car	149.99
10 Payload Rocket	299.99

