

Figure 1 Thrust Restrictor Parts.

### **Materials:**

***This kit includes:***

- 1 Thrust Restrictor
- 9 Thrust Restrictor Orifices

***You will need:***

Launch Pro™ bottle rocket launcher or any other bottle rocket launcher.

### **Description:**

This thrust restrictor is an accessory item for varying the amount of thrust produced during the launch of a water rocket. Nine washers are provided with decreasing diameter holes. The area of each hole changes in 10% increments from 90% to 10% of the bottle's full opening.

For a complete listing of additional accessories, tools, construction techniques and other water rocket related items, experiments, and fun stuff, please contact your educational

materials distributor or visit our website at  
www.envisionlabs.com

***Related Accessories:***

- #20510 Rocket Builder Kit
- #20100 Single Stage Starter Kit

### **Assembly:**

The thrust restrictors are easy to assemble. Simply place the desired restrictor size inside the restrictor bottle orifice adaptor as shown in Figure 2. Make certain that the orifice sits flat inside the adaptor. Screw the adaptor onto your rocket bottle threaded neck as shown in Figure 3.

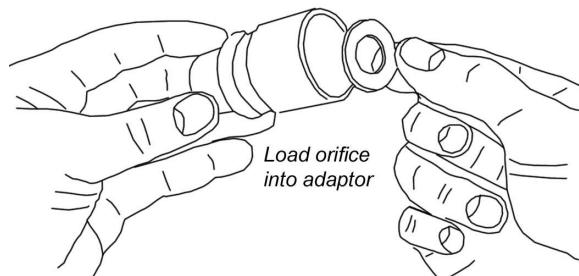


Figure 2 Assemble Restrictor.

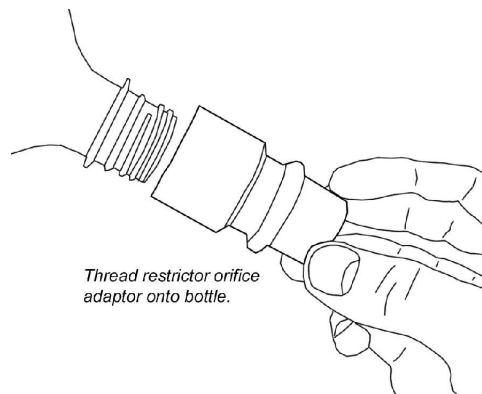


Figure 3 Screw on Restrictor Adaptor

## **Operation:**

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The adaptor now replaces the threaded bottle neck and can be loaded onto any bottle rocket launch base in the exact same way as the original bottle.

Do not use restrictors with multi-stage rockets. Multi-stage rockets as a general rule require maximum initial acceleration for proper operation.

Follow the instruction provided with your launcher for safe operation of the bottle rocket launcher.

### ***Fueling the Rocket:***

When using the smaller size orifices you may find fueling the rocket with water easier if the adaptor is placed on the bottle after the water is added to the bottle.

## **Maintenance:**

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Keep the orifice and adapter threads clean by rinsing with water only after each use. **Do not use solvents of any kind.**

## **Precautions:**

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- **Do Not use Thrust Restrictors with multi-stage Rockets.**
- **Safety is a state of mind, not just a set of rules.**
- Always THINK before you act. Don't get caught up in the excitement. Keep yourself and everyone around you SAFE. NO ONE wants to get hurt. This is always rule number one in anything that you do, be it a science experiment, or an activity at home.
- Be aware of your surroundings whenever you engage in any activity.
- Stop and think of the possible consequences of what you are doing.
- Remind others around you of any unsafe activity.

***The following is a set of guidelines to assure safe operation of the Launch Pro™ system.***

- **DO** Completely read and understand the operating instructions and safety guidelines before using the Launch Pro™ system.
- **DO** be sure the rocket is stable on the launch base before charging with compressed air. Wait 60 seconds to be sure the rocket remains upright. This is very important in

windy conditions. If you are not sure, do not pressurize the rocket.

- **DO** wear safety glasses when at the launch site.
- **DO** find a large open area for the launch site that is clear of obstructions and obstacles such as buildings, parked cars, people, and roadways. A 300 foot minimum radius from the launcher is recommended. Don't forget, what goes up must come down, and you don't want your returning rocket to hit anyone or anything.
- **DO** use soft, light materials such as foam insulation, and tape for constructing your rocket.
- **ALWAYS**, when trying out a rocket for the first time, start with low air pressures first! You can always increase pressures later when you've gained confidence in the rocket's performance.
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- **DO NOT** exceed 60 PSI(Pounds per Square Inch) when pressurizing the bottles.
- **DO NOT** launch in crowded area.
- **DO NOT** leave the rocket unattended while it is pressurized.
- **DO NOT** use any fluid other than **water only** as the fuel for the rocket
- **NEVER** use heavy or rigid materials in the construction of your rockets - **never use** metal, wood, or thick plastic.
- **NEVER** launch a rocket at an individual or object. Rockets in motion can have enough energy to do bodily harm or property damage.
- **NEVER** approach a charged rocket system. In the case of an aborted launch, after charging, bleed the pressure off through the charging line. This may take a few minutes. The best way to avoid this situation is to never charge the system until you are certain a launch is safely possible.
- If you decide to use an air compressor, use only a battery operated compressor or one that can be operated from a 12VDC outlet.

Following these simple guidelines will ensure safe launches and hours of fun. So don't forget rule one, nobody hurt, have fun.