PVC Paper Rocket Launcher

by **sheffijm** on October 8, 2010

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Intro: PVC Paper Rocket Launcher

This Instructable covers how to build the portable PVC paper rocket launchers seen at the Phoenix District 2010 Day Camp and at SHAC Jam (the United State's second largest 100th Anniversary of BSA celebration 2010). Paper rockets are an inexpensive and age appropriate activity for any Cub Scouts. It doesn't require an air source other than the cub scout himself. After some pretty hardcore QA testing by upwards of several thousand Cub Scouts (and a few Boy Scouts too), I found a few areas that will need improvement depending on how rambunctious your boys get with the launcher. I've noted them in the first image, so hover over the yellow boxes to learn more.

For our Day Camp, the scouts made construction paper rockets which I will detail in another Instructable. These are simply construction paper wrapped around a short section of 1/2" PVC pipe, taped, and then a nose cone and fins are added.

For SHAC Jam, the scouts followed a similar process, but due to the large (nearly 9000) number of cub scouts, the construction of the rockets was simplified to a basic construction paper tube (wrapped on the same short section of 1/2" PVC) with the nose end taped over, and crepe streamers added for stability. This greatly cuts down on the time to build and allows more scouts to enjoy launching without having to spend as much time building. I will detail this construction in a separate Instructable as well. Those that were at SHAC Jam on Saturday saw that a large number of boys (and siblings too) could make it through the long line in a relatively short time frame due to the basic design.

This design is free to use by anyone for non-commercial use provided attribution is given. If you have ideas on how to make it better, please feel free to comment and I'll add them to a later revision if it is cost effective and improves the design.

If you like this design, and feel inclined to show your appreciation, by all means buy me a cup of coffee here , and it'll give me some pep to come up with more PVC and Scouting related projects. As always thank you for taking the time to take a look at this.

Jason Sheffield
Head PVC Architect
Phoenix District Quarter Master

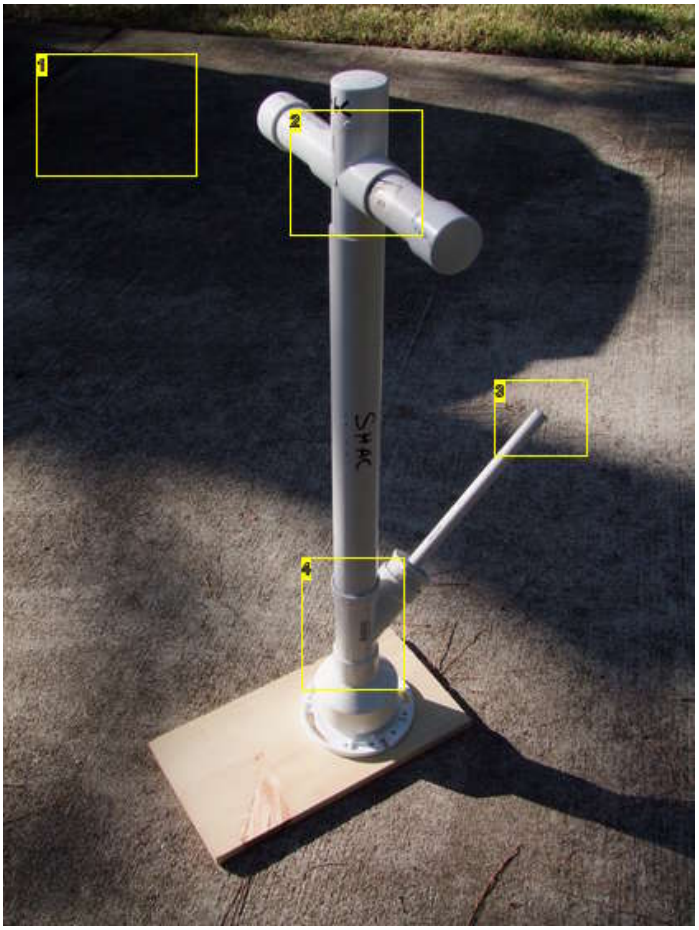


Image Notes

1. Kid powered plunger based propulsion system. You'd be surprised how high and far a motivated third or fourth grader can get a paper rocket to go!
2. This area was one of the first places to show cracks and break free. The simple act of the boys pushing the plunger down will cause the handles to come off if not glued, and will eventually break. You can either stick a solid object of the correct diameter through the handle to reinforce the inside or wrap the cross with fiber reinforced strapping tape (Duct tape, while fantastic in it's own right just doesn't have the tensile strength).
3. If you have a sander, it would be a good idea to chamfer or round the outside edge of the launch tube to make it easier to slide the rockets on. If the rocket was made tightly on the 1/2" form, then it may be difficult to get it on to the tube without crushing the inner layers of paper.
4. The top and bottom vertical joints on the Wye tend to take the brunt of the force exerted by the boys and will also show signs of stress quickly. Make sure that you are able to primer the joints cleanly, and seat the joining pipe as far into the socket as possible. This will prolong the time before breakage, but will not stop it from happening. I would also recommend using fiber reinforced strapping tape here as well to give the joint added strength.

Step 1: Items needed to build

To build this paper rocket launcher, you'll need to acquire a few things. If you don't already have a few or even all of the items listed here, the full cost to build this should be around $25-$27 USD depending on locale, volume, and availability of the hardware.

Tools Needed per launcher:
1x Safety Goggles (first and foremost, protect those eyes!)
1x 3 foot length of 2" Schedule 40 PVC pipe
1x 4 foot length of 1 1/2" SCH40 PVC pipe
1x 5-6 foot length of 1/2" SCH40 PVC pipe (12" for the launch tube, the rest for forms to wrap the construction paper around to make the rockets)
1x piece of wood at least 10" wide and 18" long
1x 4" PVC toilet flange (open is easiest and cheapest)
1x 4"x2" SCH40 PVC reducer
1x 2" SCH40 PVC Wye
1x 2"x1/2" reducing bushing (slip type - non threaded)
1x 1 1/2" test cap
1x 2" test cap
1x 1 1/2" Cross
3x 1 1/2" caps (slip type - non threaded)
1x roll of duct tape or clear shipping tape to wrap the end of the plunger
1x roll of fiber reinforced clear strapping tape to strengthen weaker joints
1x jar of Vaseline to allow the plunger to move smoothly
1x set of Pipe cutters (hacksaw, sawzall, or ratchet style cutters)
1 ea. PVC primer and glue

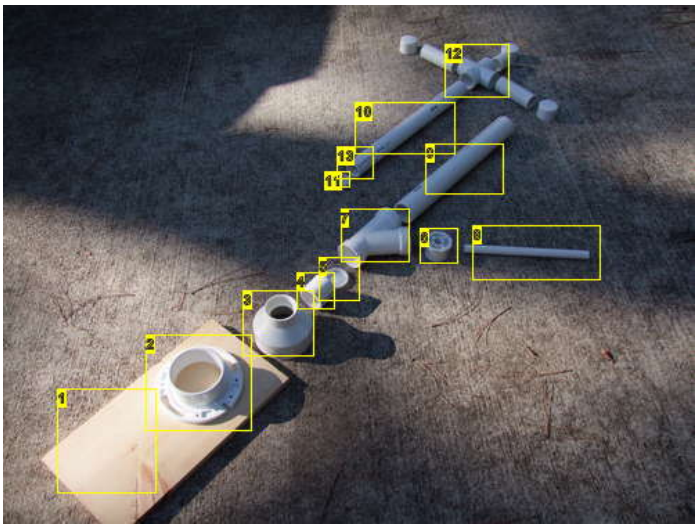
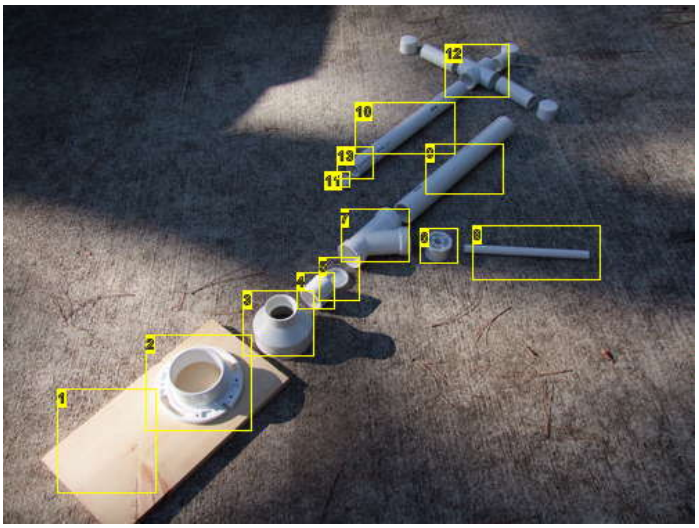


Image Notes
1. Pine board, MDF, or Plywood at least 18"x10". This gives the launchers a stable base and less prone to fall over. Without this, the launchers will tip over forward when let go, and will likely crack or break the launch tube.
2. 4" PVC toilet flange turned upside down and screwed to the board
3. 4"x2" PVC reducer acts as the base of the launcher. The joint here that buts closely to the wye is a weak point and should be reinforced with fiber reinforced strapping tape.
4. 2" section of SCH40 PVC pipe used to join the reducer, test cap, and wye together. Glue these three together in this order: Prime and glue the 2" portion of the reducer and short pipe together. Then prime and glue the test cap to the inside of the bottom of the wye. This cap acts as a block to keep air from escaping from the bottom.
5. 2" test cap to be fitted and glued to the bottom of the wye.
6. 2" x 1/2" reducer bushing. Prime and glue this into the 45 degree portion of wye. DO glue the 1/2 pipe into the bushing unless you have a lot of extra launch tubes and don't mind if a few break or fall out under heavy use.
7. 2" SCH40 PVC Wye
8. 12" section of 1/2" SCH40 PVC pipe for the launch tube.
9. This piece can either be cut at 23" or as 18" pieces depending on the height and age of your scouts. The joint here that buts closely to the top of the wye is a weak point and should be reinforced with fiber reinforced strapping tape.
10. Cut this piece of 1 1/2" SCH40 pipe to be an inch or so longer than the corresponding main 2" tube. This will allow the plunger to go all the way down to force the maximum amount of air out.
11. This 1 1/2" test cap is glued to the bottom of the plunger to keep air from simply filling the plunger and not being forced out. You will also need to wrap duct tape (or similar style of tape) around the bottom 2" of the plunger with enough wraps to create a gasket between the 1 1/2" plunger and the 2" launcher body. This will create a good seal between the plunger and the body tube. Use a couple of finger scoops full of Vaseline to grease the inside of the 2" pipe to make the duct tape to PVC pipe contact slide easier.
12. 1 1/2 SCH40 PVC Cross. Make sure to prime, glue and wrap this joint as it is prone to fail. The joints here that connect to the handles are weak points and should be reinforced with fiber reinforced strapping tape.
13. Wrap duct tape (or similar) around the outside bottom of the plunger tube and apply Vaseline jelly to the tape to make sure it slides smoothly without sticking.

Step 2: Prime, Glue, and Assemble

I HIGHLY recommend that you do the Primer and PVC gluing in a well ventilated area so as not to cause headaches, nausea, dizziness.

Prime, Glue and assemble the pieces as shown in the photo.



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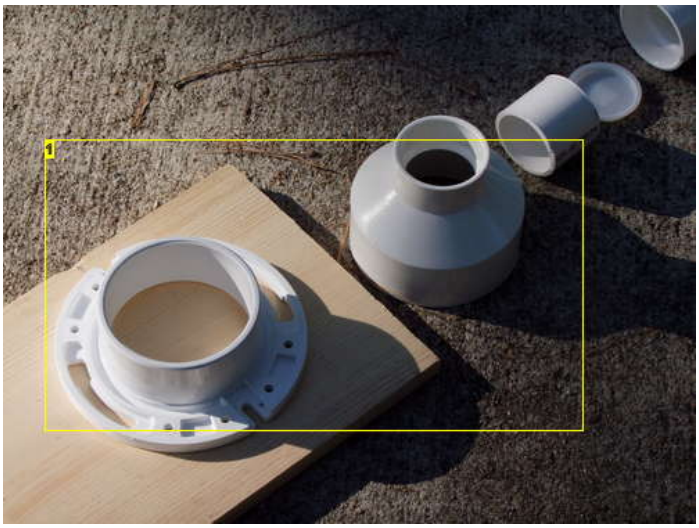

Image Notes

1. Do NOT prime and glue these two items together. This will allow for disassembly when it comes time to transport or storage.

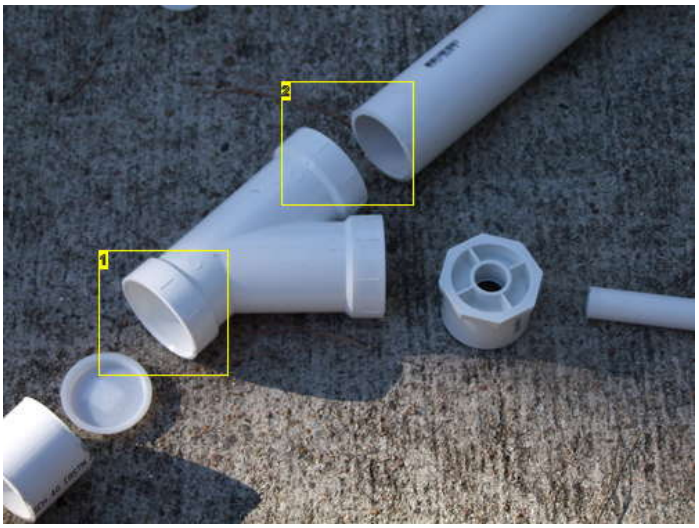

Image Notes
1. Weak point in this design. Needs reinforcement by wrapping it around the joint with fiber reinforced strapping tape.
2. Same here - Weak point in this design. Needs reinforcement by wrapping it around the joint with fiber reinforced strapping tape.

Step 3: Build your rockets, and fire away

Construct the rockets according to one of the other Instructables (added as soon as I get the SHAC Jam items back), slide them on, then give it a good, fast push to launch!

Related Instructables

Easy to build, easy to use, water bottle launcher! by bpwagner

Cub Scout Camp bucket transport wagon by sheffijm

DIY Summer Camp! by Holly504Main

Paper Match Rockets with launcher by pmac93

How to decide on a summer camp for your child by bongoman

water bottle rocket launcher (Photos) by skippyconsuelo

Comments

1 comments **Add Comment**

seamster says: May 15, 2011. 8:30 PM **REPLY**

This is pretty cool. I posted a version of paper stomp rockets a little while ago on here that I use for some summer recreation programs that I run. I like your method, and will probably build a few in the next couple of weeks to try out. Thanks for posting this!