



First of all, this is THE MOST DANGEROUS project for anyone to do. It should not be attempted in any manor unless you have significant experience with making rocket motors of this size. Manufacturing flaws can cause extremely violent and powerful failures in the structure of this motor, which can lead to property damage, personal injury or even death. I therefore, release myself of all responsibility with what you do with this page. Please exercise every possible safety precaution if you do decide to proceed.

What You'll Need

Casing Of Rocket

1. 1 Length of 1" (dia.) schedule 40 PVC pipe (hardware store; schedule 40 is standard)
- 2.1 PVC Male threaded reducing coupler 1" (hardware store; looks like the picture below)
3. 1 PVC end cap 1" (hardware store)
4. 1 can of standard PVC cement (hardware store)
5. 1 can of standard PVC purple primer (hardware store)

6. 1 can of Durham's Rock Hard Water Putty (comes in different amounts; pick amount depending on how many of these you plan to make) (hardware store)

7. Scrap piece [or small sheet] of 1/4" PVC (plastic supply)

Propellant and Casting Equipment

1. 78 g Potassium Nitrate (KNO₃) (Chemical Supply)

2. 42 g Confectioners sugar

3. Small (about one cup) metal pan

4. Larger metal pan

5. 6"x 1/2" Wood Dowel

6. Automotive Grease

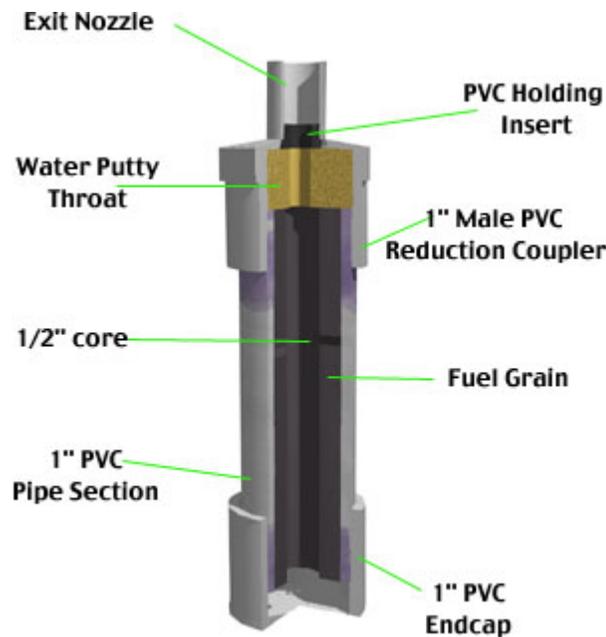
7. Stick for stirring

8. Shortening (I used Crisco)

9. Old coffee grinder, or something similar

10. Stove or hotplate

Procedure



Actual Photo of Engine

1. Cut a small disk out of the 1/4" PVC sheet/piece to the exact inside diameter of the "nozzle" on the PVC male reducer coupling (should be 3/4").

2. Using the purple primer and PVC cement, cement the disk into the inside of the nozzle right where the reduced part meets the main part of the coupler. (Labeled PVC Holding Insert in the drawing the left). Allow to dry.

3. Mix Durham's Rock hard Water Putty with water until it is the consistency of loose mayonnaise. Pour enough in the wide end of the male reducer coupling to fill it about half of the way from the cemented PVC insert to the wide end of the coupling (see drawing). Allow this to dry for a minimum of 48 hours.

4. Drill a 9/32" (.713cm) hole through the PVC holding insert, and all the way through the water putty. This is the throat of the engine.

5. Cut a piece approximately 5" long from your 1" PVC pipe. The exact length isn't important, as you will trim it to exact size later.

6. Measure out 78g of KNO₃ and 42g of Sugar (65% :35% FYI). The KNO₃ you bought is probably not fine enough for these purposes. This is what the coffee grinder is for. Put the KNO₃ in the old coffee grinder and grind it down as finely as



Nozzle section



Propellant Grain



possible. Now pour the KNO_3 , and the sugar into a small Tupperware container and shake for several minutes to thoroughly mix the two. Note that they should never be ground together in the coffee grinder!!

7. Widdle the end of your dowel to a point. Then coat the hole thing in a very thin coat of automotive grease.

8. Put enough shortening in your big pan to fill it up about half way when melted. Heat the shortening up to between 350 and 400 degrees F and then place your smaller pan in the bath with some of the propellant (enough to fill it up about half way in powder form) in it. Stir continuously and don't let the small pan touch the bottom of the big pan. The propellant should start to melt. As it does, pour more in, until it is all melted. I have had several e-mails about the melting process. You want to melt it without caremeling it. This means stirring continuously and not letting the melted propellant get any darker than a kind of yellow color. **IT SHOULD NOT BE BROWN!!**

9. The propellant should be about the consistency of honey, or a little thinner. Put your 1" PVC pipe section on a piece of wax paper and pour the melted propellant into the pipe.

10. Immediately put the dowel through the middle of your melted

External View of Propellant Grain

propellant. It should slide through easily. Wait about 10-15 minutes and pull the dowel out. It might be difficult, but it should slide out. Let the propellant cool for about 30 more minutes. Store it in an airtight bag in the freezer.

11. Using a handsaw, saw off the end of the pipe that isn't full of propellant so that both ends are flat.

12. Using your purple primer and PVC Cement, cement the propellant section into the nozzle section (the male reducer coupler) and then cap the other end off with the end cap in the same manner.

13. Let the cement dry for about 24 hours (just to be sure) and you're ready to go.

Congratulations! You have just built a low end "G" engine! This thing is extremely powerful for its size and can do extensive injury/damage if it fails. So please, static fire this motor well away from people, property or other liabilities and secure it properly when you do so. This motor has a maximum thrust of over 50lb and as such will go RIGHT THROUGH you if it is fired in your direction while firing. Be careful out there.

I have designed this motor to be as safe as possible. I have not had a single failure of the casing-although I have had several nozzle ejections while trying new things. If you build exactly according to these instructions, you should find it very reliable. The nozzle will blow at pressures well below that which the PVC casing will, and as such is an effective safety margin. But with this in mind, make sure that the ejection of the nozzle will not endanger anyone or anything in the case that it does. Good luck and be careful!!