

# Grandpa's Homemade Rocket for About a Dollar!

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**The most common items needed: (The number of Rocket parts from each item is before the parts name and its proportionate cost is after.)**

3/4 inch slip PVC cap. (1 Nose cone and 1 Shock cord retainer ring) **36¢**

Small sheet of card stock (check your junk mail). (1 Nose cone point)

3 feet of 1/8 inch nylon cord (find an old mini-blind). (1 Shock cord)

16 inch square piece of cardboard. (1 Parachute template)

1 **black** Husky **42** gallon **2** mil trash bag. (**8** Parachutes) **5¢**

6 permanent loose leaf paper reinforcement labels. **6¢**

7½ feet of kite string. (**6** Parachute cords) **2¢**

10 inches of 3/4 inch thin wall PVC pipe. (1 Body) **11¢**

3 inches of 3/4 inch CPVC pipe. (1 Engine compartment) **6¢**

3/4 inch slip PVC coupling. (**2** Fin mount rings) **21¢**

1 old or blank compact disc. (CD or DVD). (**8** Fins)

1½ inch wide masking tape. (Fin reinforcement) **1¢**

5 #212 screw eyes. (Retainer screws and Launch lugs) **35¢**

**Total cost: \$1.23**

**Based on 2012 Home Depot and Walmart prices.**

## **Recommended Tools and Equipment:**

To mark PVC, a Sanford ultra fine point permanent marker works best.

To cut the PVC pipe and fittings you will need a PVC pipe cutter or miter saw and to notch the Fin mount rings, a metal cutting Sawzall blade will do nicely.

For finishing a *perfect* notch in the Fin mount rings the Sawzall blade is best, if using a hacksaw a ladies emery board (nail file) finishes to the exact size.

You will need a drill with a 3/32 inch drill bit.

A gallon wooden paint stirrer is helpful for making the Parachute template.

A scissor will be needed to cut the CD, cardboard, nylon cord and string.

A utility knife or blade will be needed to trim the plastic trash bag.

*If you choose to paint the Rocket and Fins a good can of spray paint for Plastic, such as Krylon or Rustoleum brand, works best.*

**Note: Traditionally when using PVC pipe, a cleaner and cement are used, however, these instructions are not intended for that method.**

**Loctite or Scotch brand Liquid Super Glue works very well and dries quickly without the need for cleaning and the extra steps involved.**

## **Directions:**

### *1. Prepare the Body and Engine compartment:*

On the 10 inches of 3/4 inch thin wall PVC pipe, draw a reference line down the middle of the Front Body and another down the middle of the Back Body.

On the Front Body reference line put a mark at 1½ and 2¼ inches from the bottom and another mark at 1 inch from the top of the Body.

Glue the 3 inches of 3/4 inch CPVC pipe to the inside, flush with the bottom.

### *2. Prepare the Shock cord retainer:*

Cut a 1/2 inch ring off the bottom of the 3/4 inch slip PVC cap and slide it onto the Body so its base is even with the 1 inch mark and glue it in place.

Cut a V notch on the top end of the Front Body, above the 1 inch mark deep enough so the Shock cord fits through it after the Nose cone is mounted.

### *3. Prepare the Fins:*

Place the CD onto Diagram #3 and center the hole of the CD with the center of the diagram. With the marker and a ruler, extend the eight lines on the Diagram across the surface of the CD. Cut the CD along each line with the scissor and remove any labeling from the CD by patting it with masking tape.

### *4. Prepare the Fin mount rings:*

Cut a 1/2 inch wide ring from each end of the 3/4 inch slip PVC coupling, this will ensure a straight and even end on each ring.

Place one ring with the straight end down onto Diagram #4. Mark the base of the side at the four lines drawn and mark the base with an **X** at the **X** drawn.

Turn the ring over and place the second ring with the straight end down on top of the first ring and mark its side with the same marks at the same positions.

The **X** marks will be used to align the two rings properly for the Fins when the Fin mount rings are glued onto the Body.

Turn the top ring over so both straight ends are facing up and saw straight across each opposite pair of marks with a Sawzall blade at least 3/16 inch deep on both rings. Each notch should be wide enough for the Fin to lock in place without the need for tape. If using a thinner blade, a *perfect* sized notch for the Fin will be formed using a ladies emery board (nail file) to finish sanding the notches. Check for a snug fit by trying a Fin in each notch before you glue the Fin mount rings onto the Body.

*5. Glue the Fin mount rings onto the Body:*

With the notches of the first Fin mount ring facing down, slide it up onto the Body from the bottom so its base is even with the 2¼ inch mark.

Position the **X** mark on the Fin mount ring at the reference line on the Front Body. The Launch lug screw eyes will be positioned *in between* the notches so the Fins will *not* interfere with the Launching rod.

With the notches of the second Fin mount ring facing up, slide it up onto the Body from the bottom so its base is even with the base of the Body.

Position the **X** mark on the Fin mount ring at the reference line on the Front Body. The two Fin mount rings should now be aligned with each other.

Apply glue around both Fin mount rings, be careful not to get glue in the notches of the lower Fin mount ring and let them dry.

*6. Prepare the Parachute and the Shock cord:*

Into the gallon wooden paint stirrer, drill two 3/32 inch holes 8 inches apart. Use one hole to nail it to the center of the 16 inch square piece of cardboard and insert a pencil into the other hole, then rotate it once around completely.

Cut the drawn 16 inch circle out of the cardboard, this is the *template*.

Mark a point on the edge of the circle and measure 8 inches straight across to the next edge and mark that position, then continue until you have 6 marks.

Mark another point 1/2 inch in from the edge at each of the 6 marks.

Fold the black Husky 42 gallon 2 mil trash bag twice to make a 16 inch square and center the template on top. (Place a heavy weight on it to hold it in place.)

Trim the plastic around the outer edge of the template with a utility knife.

Tap through all the layers at each of the 6 **inside** marks with a large nail, these holes will be used for the Parachute cords. This makes 8 Parachutes in all.

Take a Parachute from the stack and fold it in half several times to form a point in the center and trim 1/4 inch off. This relief hole prevents excessive drifting and returns the Rocket in a closer proximity to the launch site.

Glue a permanent reinforcement label to each of the 6 holes in the parachute.

Cut a 15 inch piece of kite string and tie it to a ring at one of the 6 holes and repeat this for the other 5 holes, then tie all 6 ends together to form one knot.

Tie this knot to a #212 screw eye.

Tie one end of the 3 feet of 1/8 inch nylon cord to this screw eye and tie the other end to another #212 screw eye.

To prevent the nylon cord from unraveling, melt the ends to seal them.

To prevent each knot from unraveling, put a drop of Super Glue on them.

7. *Prepare the Nose cone with point and connect to the Shock cord:*
- Twist a piece of card stock into a cone and wrap it with tape. Trim its base to fit on top of the 3/4 inch slip PVC cap and wrap them together with tape.
  - Drill a 3/32 inch hole in the center of the inside top of the PVC cap. Screw in the #212 screw eye that the Shock cord and Parachute are tied to.

8. *Prepare the Body for Retainer screw eyes and Launch lugs:*

On the Front Body, drill a 3/32 inch hole in the center of the Shock cord retainer ring above the 1 inch mark on the reference line and drill another hole through both pieces of pipe at the 1-1/2 inch mark on the reference line.

On the Back Body, drill a 3/32 inch hole in the center of the Shock cord retainer ring on the reference line and drill another hole in the center of the top Fin mount ring on the reference line. These Launch lug holes should align.

**To remove all marks from the Body use fine sandpaper.**  
**Paint the Rocket and Fins before attaching the screw eyes.**

9. *Attach the Launch lugs: File the points off for more grip.*

On the Back Body, screw a #212 screw eye into each of the two holes. Turn the screw eyes so they are horizontal to fit onto the Launch rod.

10. *Attach the Engine retainer: Do not file the point off.*

On the Front Body, screw a #212 screw eye into the hole at the 1 1/2 inch mark. Tighten this screw eye into the Engine casing enough to retain it for the flight and loosen it to remove the Engine casing after the flight.

11. *Mount the Fins:*

With the smallest ends facing up, position the Fins into the notches of both Fin mount rings. To reinforce each Fin apply 1-1/2 inch masking tape across the Fin, to the Body and then across the opposite facing Fin. Not gluing the Fins in place will enable you to replace them. While CD/DVDs are sturdy, they are breakable. If a Fin breaks at the Body, remove its pieces from the Fin mount rings, reverse or replace the Fin and reinsert it into the notches and re-tape.

12. *Attach the Shock cord to the Body: File the point off for more grip.*

Screw the #212 screw eye attached to the end of the Shock cord into the hole in the Shock cord retainer ring at the 1 inch mark on the Front Body.

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## - Diagram -

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