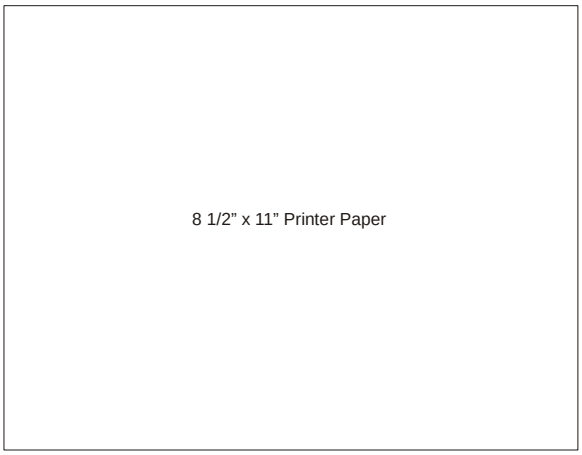
Rockets: Design and Build a Rocket

Materials Needed:
1 - ½” Conduit 12” Long
(Sold in varying lengths at Lowe’s)
1 – ¾” Wood Dowel 12” Long
3 - 8 ½” x 11” Printer Paper (White or Colored)
1 - 8” x 8” Cardboard or Balsa Wood
(This will be used for the fins)
1 - 3 grams of Modeling Clay
1 - Penny
1 - Large Paper Clip
1 - 1/16” string 10” long
(Most any small string will work)

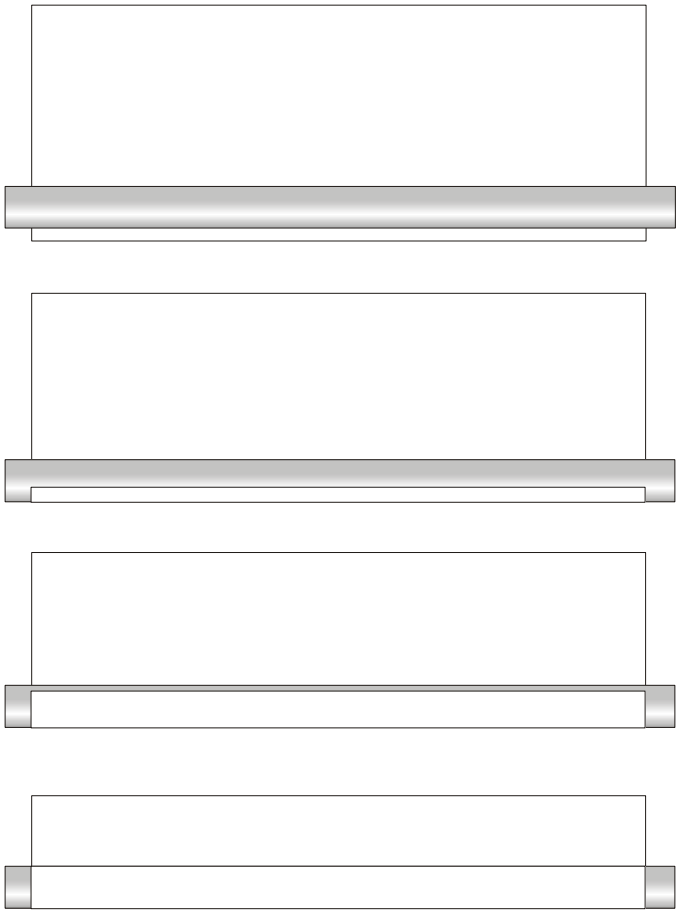
Tools:
Scissors
Hot Glue Gun
Pencil
White Paper Glue (Elmer’s Glue)
Needle Nose Pliers with wire cutter
Safety Glasses

1. Start with a full 8 ½” x 11” sheet of paper.

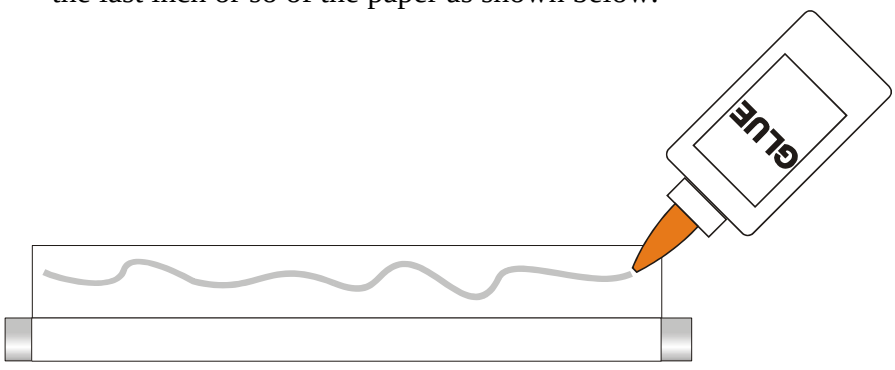


2. Now we are going to make this piece of paper into the body of our rocket.

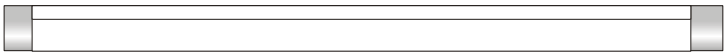
3. Lay the paper flat on a table and roll it around the conduit as shown.



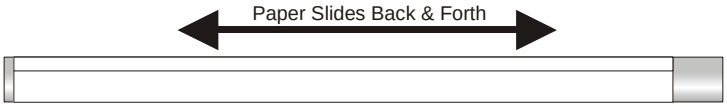
4. Before you finish rolling the paper around the conduit add a little bit of white glue to the last inch or so of the paper as shown below.



5. Now finish rolling the paper and smooth out the glue.

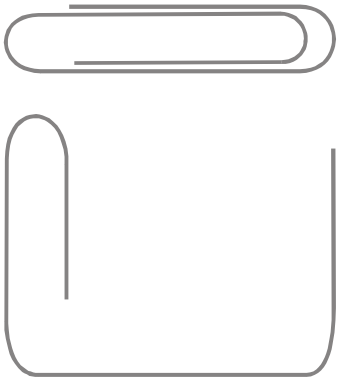


6. Make sure that your “body tube” slides on the conduit.

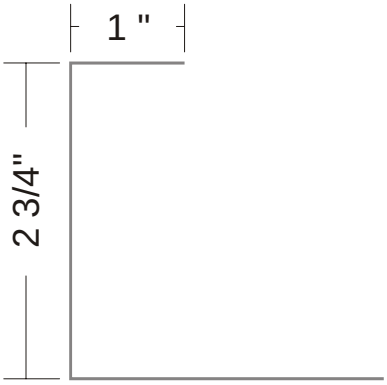


7. Now set that aside to dry.

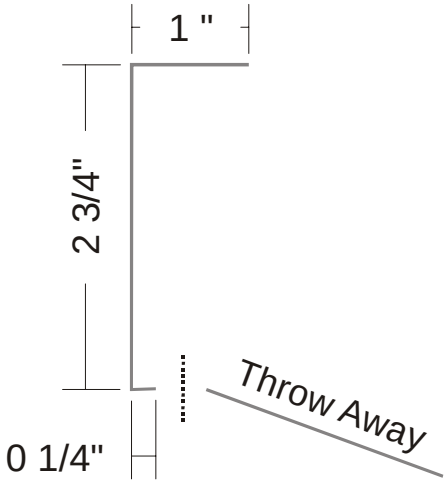
8. Now we will make the “Engine Retainer Clip”. This is the part that holds the engine in so it is VERY important that this is correct. A poorly made Engine Retainer Clip makes for a poor rocket flight.
   Straighten out the Paper Clip and as best as you can. The needle nose pliers can be used to do this.



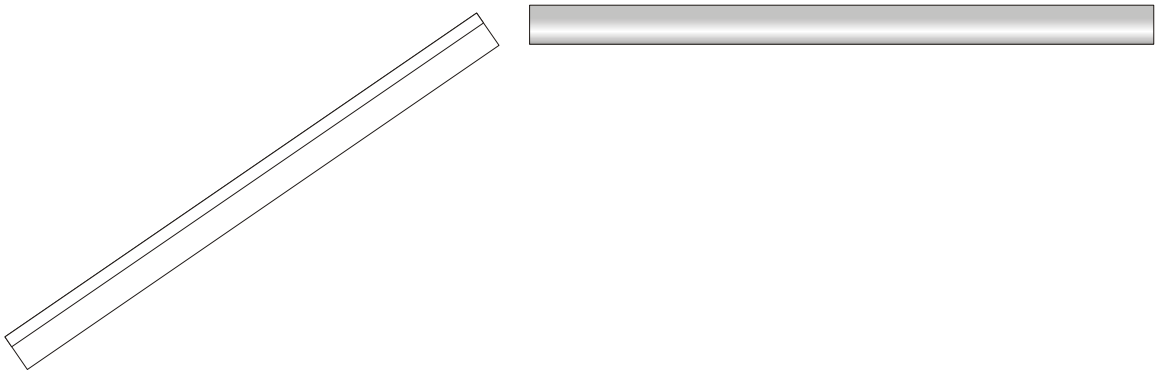
9. Now starting at one end bend the paper clip to the measurements below. Try to make the bends as close to 90 degrees as you can. The pliers are useful for bending. Be sure to measure precisely.



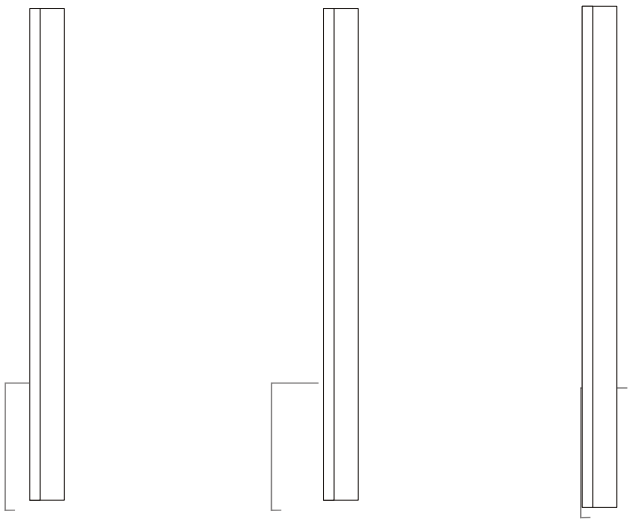
10. Now measure ¼” on the bottom and cut off the extra with the needle nose pliers.



11. Remove the “body tube” from the conduit

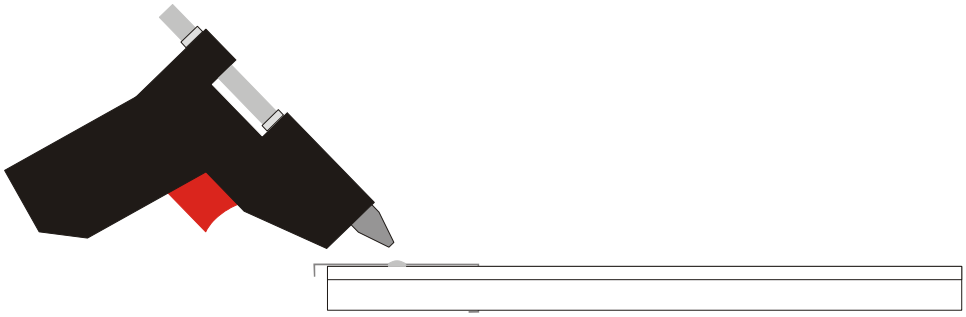


12. Poke the long end of the Engine Retainer Clip through the Body Tube so that the ¼” end of the clip hangs about ¼” below the tube (see below)



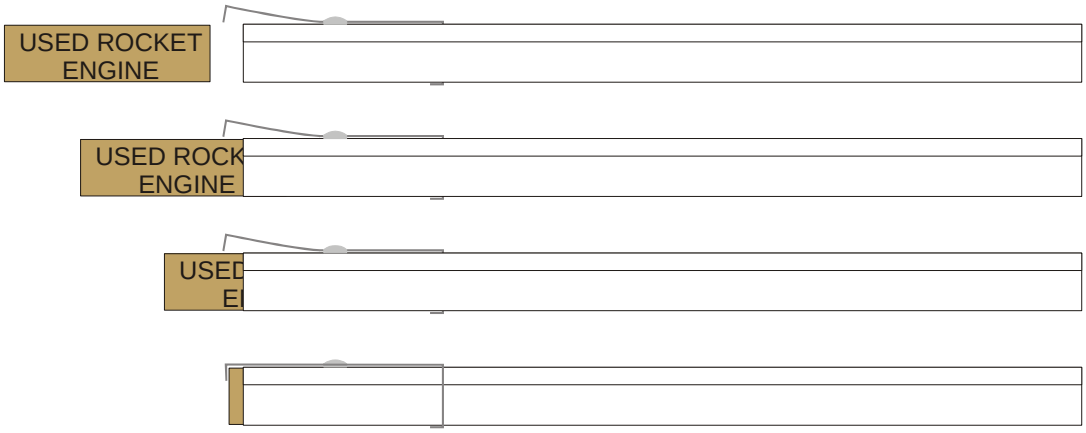
13. Use the Needle Nose Piers to bend over the short piece of paper clip that is sticking out of the side of the rockets tube as shown below

14. Bending over the clip will prevent the top of the clip and rocket engine from becoming dislodged during the initial stages of flight. Add a dot of hot glue to the middle of the long side of the clip as shown below.

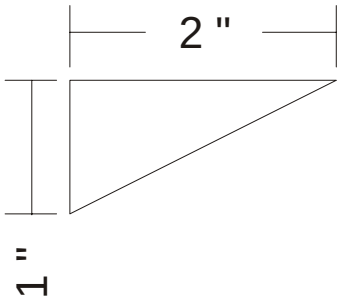


This will allow the Engine Retainer Clip to be sprung out of the way to insert an engine. This will also allow the clip to "hook" onto the rocket engine to prevent it from falling out during the ejection charge.

You may check to make sure your engine will fit by inserting a used engine and removing it. DO NOT LEAVE THE ENGINE IN YOUR BODY TUBE! A new engine will be inserted just before launch.

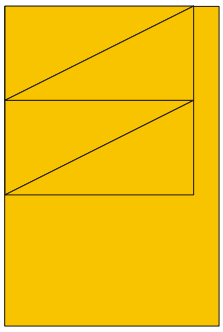


15. We now need to add fins to the rocket so it will be stable in flight. You can make the fins any shape or size that you want. However, the design of the fins has a critical impact on the overall flight of the rocket. These instructions will use simple triangle shaped fins. On a piece of scrap paper draw a small triangle as shown below.

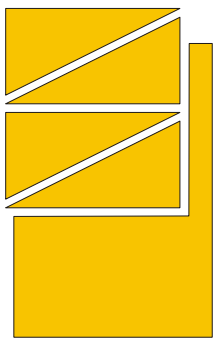


This will be the pattern that will be traced onto the fin material. You can use cardboard, 1/16” – 1/8” wood, plastic, or whatever else you can find. DO NOT USE METAL OR GLASS FOR YOUR FIN MATERIAL.

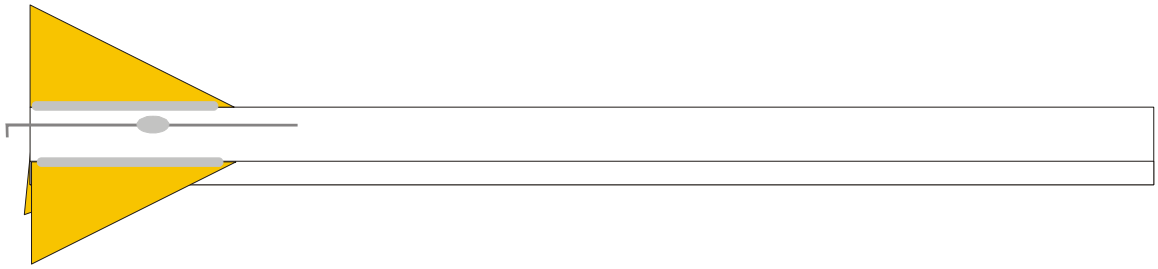
Using your pattern trace the number of fins that you want on your rocket. 3 or 4 fins work best in my experience.



16. Carefully cut out the fins using the appropriate tool for the fin material that you selected.

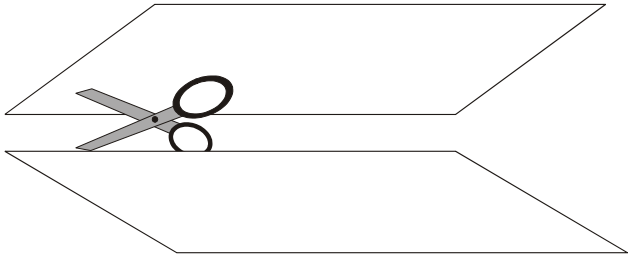


17. Using the hot glue gun carefully glue the fins onto the rocket body tube. Be sure to space the fins evenly and at the bottom of the rocket. (The bottom is the end with the engine retainer clip.) Be sure to not glue over the engine retainer clip.

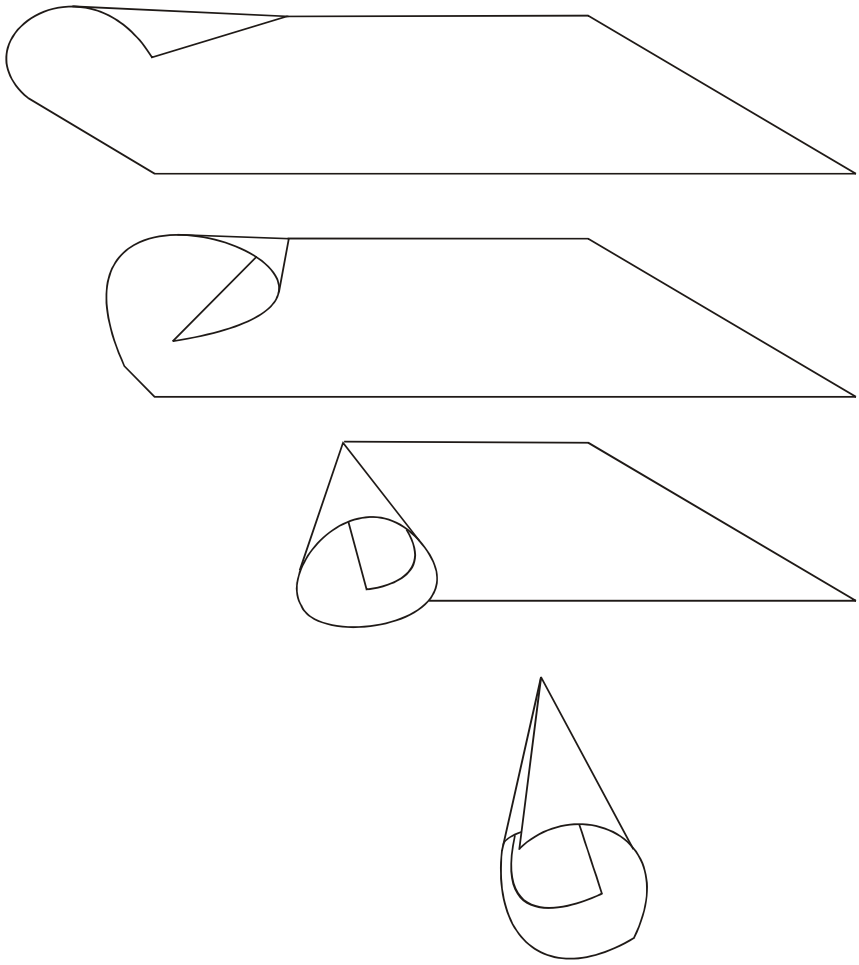


18. Set the rocket aside to dry/cool.

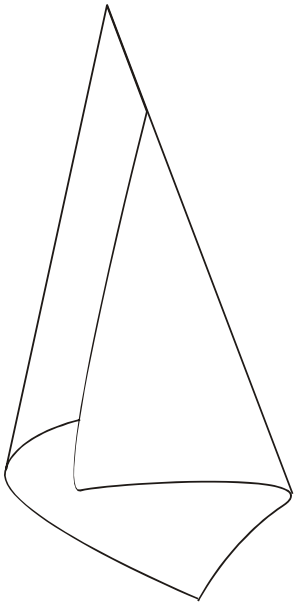
19. Take the other 8 ½" x 11" piece of paper and cut it in half just like the first one.

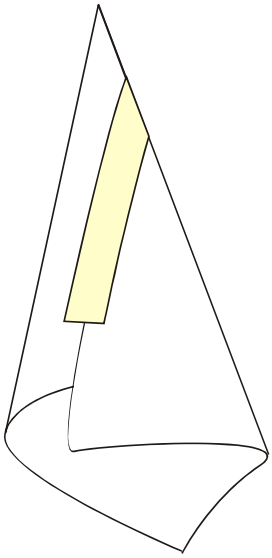


20. Roll one of the pieces into a cone shape. This will become the nosecone of the rocket. Make sure that the top of the cone comes to a point. In other words make sure that there is not a hole in the pointed end.



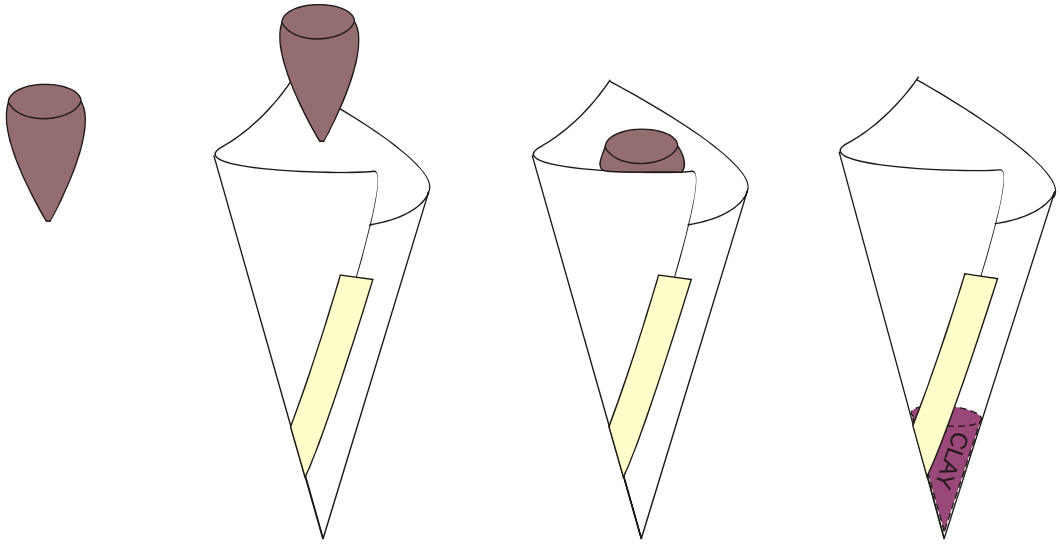
Finished cone



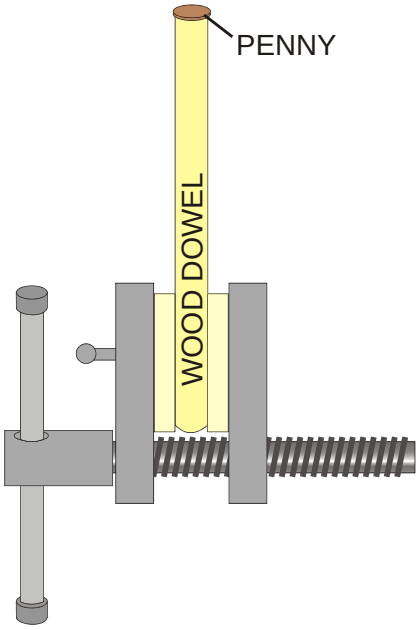


21. Use a piece of thin masking tape to hold the cone in place.

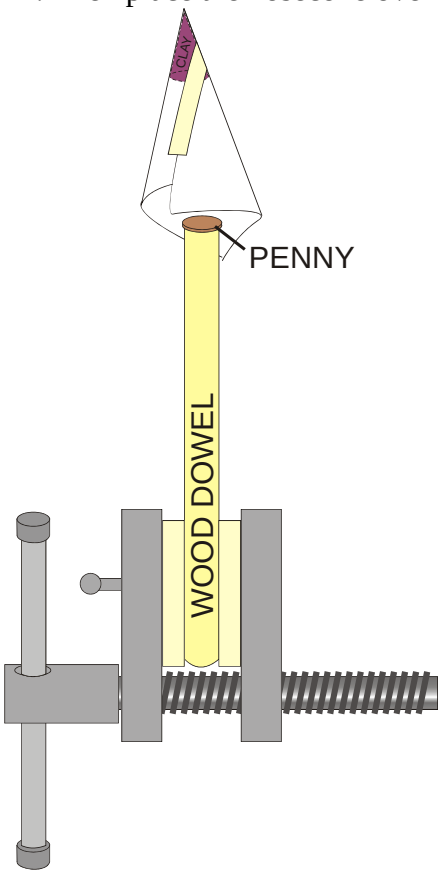
22. Roll the 3 grams of clay into a cone shape and push it to the pointed end of the nosecone with a eraser end of a pencil as shown below.

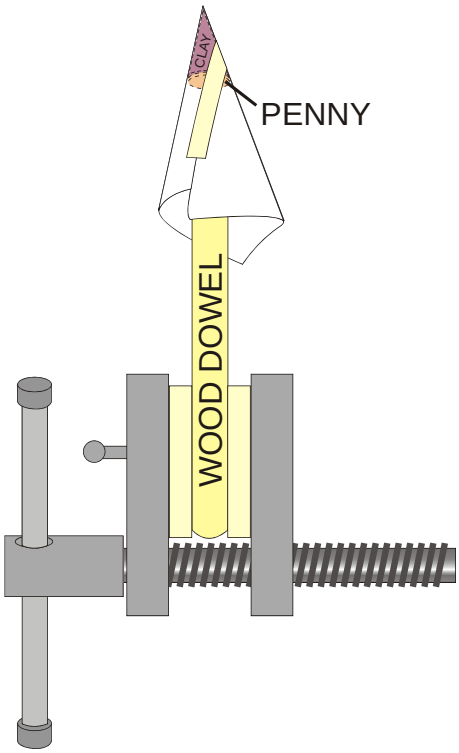


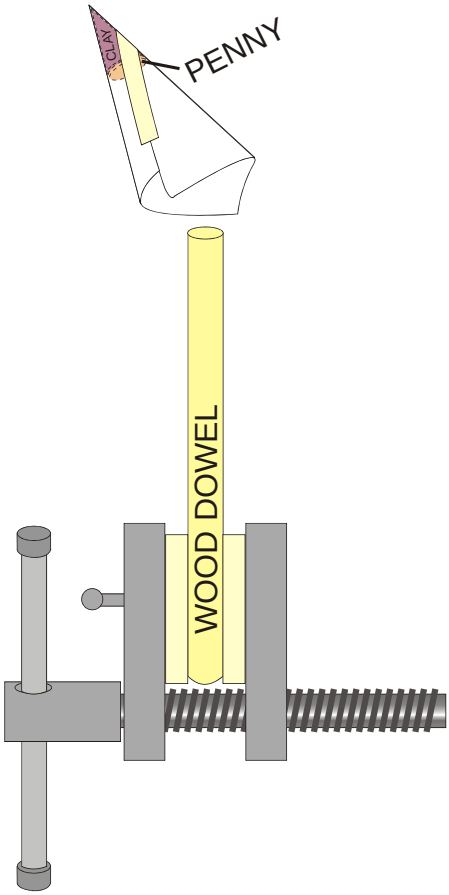
23. The Penny goes in the nosecone directly under the clay. The easiest way I have found to get it in there is to put the ¾" wood dowel in a vice with the penny on top as show below.



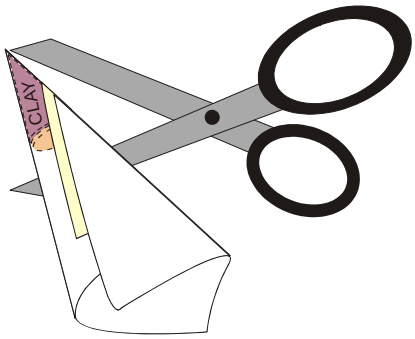
24. Then place the nosecone over the dowel and penny.

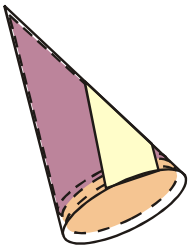



CLAY
PENNY
WOOD DOWEL

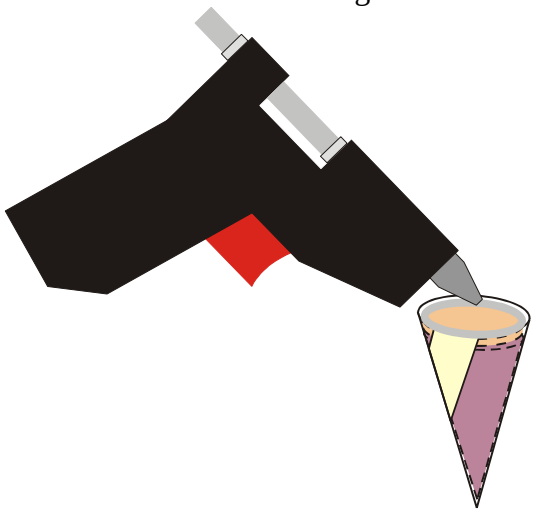

CLAY
PENNY
WOOD DOWEL

25. Cut the nose cone down to approximately 1/8” away from the penny.

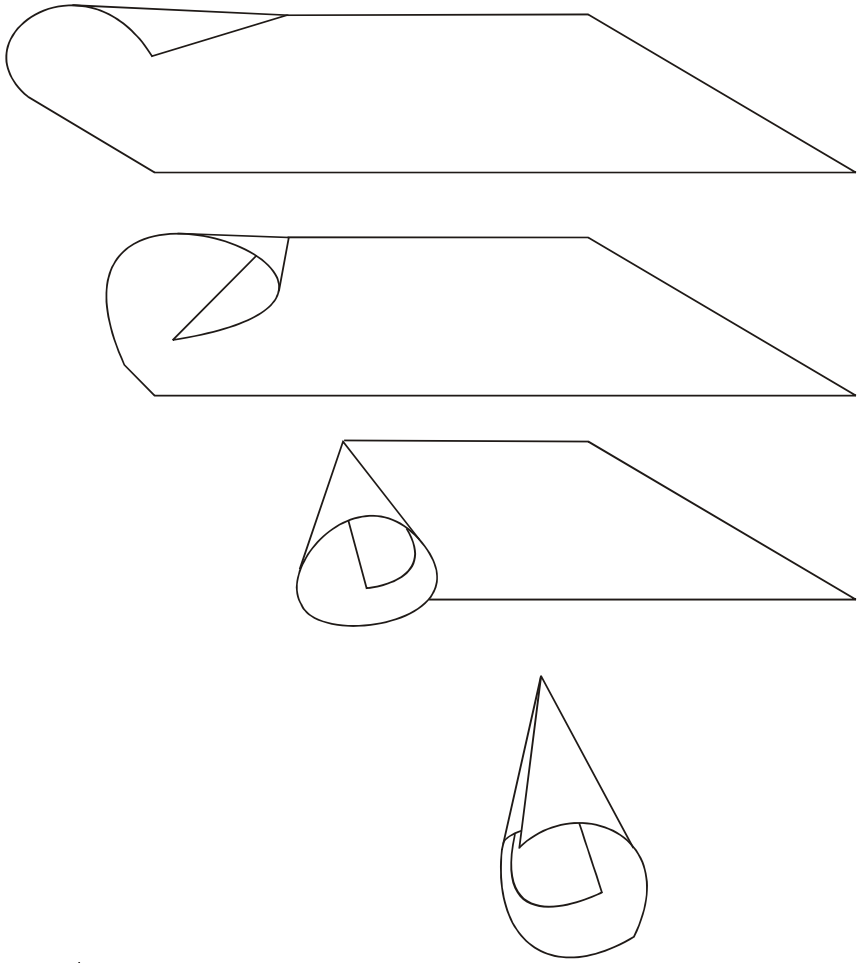


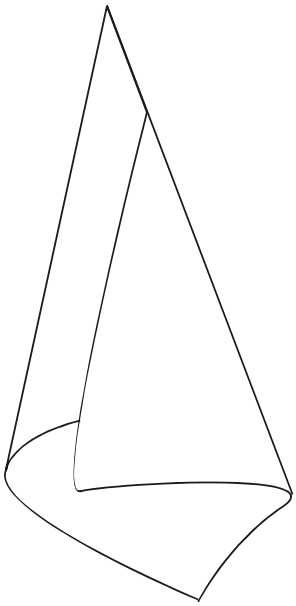


26. Put a small bead of hot glue to hold in the penny.



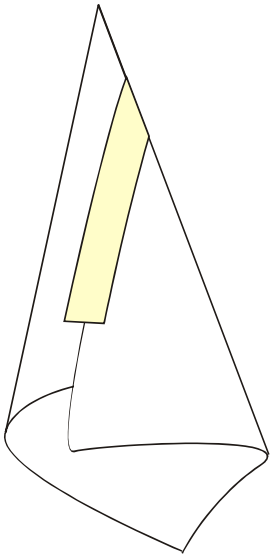
27. Roll the other ½ of the paper into a cone shape. This will become the bottom half of the nosecone of the rocket.



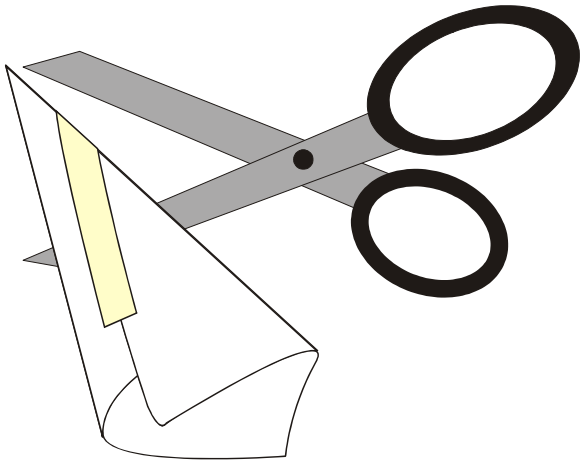


Finished cone

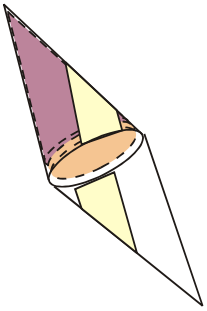
28. Use a piece of thin masking tape to hold the cone in place.



29. Cut off this second cone in approximately the same place as the first cone.



30. Tape the second cone to the bottom of the other cone with the clay.



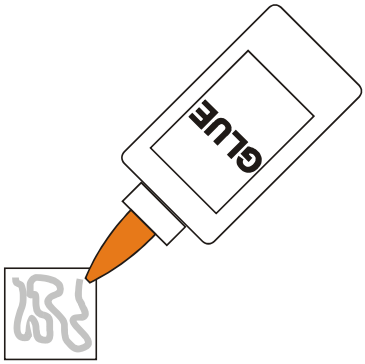
Note: The cone with the clay in it will be the top of your rocket. The empty cone will fit inside your rocket.

31. You now have to connect the bottom part of the nosecone to the inside of the rocket. This must be done so that the nosecone can come off of the body tube of the rocket without losing it during flight. This can be accomplished by attaching one end of a string to the bottom of the nosecone and the other end to the inside of the rocket.

To do this follow these steps.

Cut a piece of paper 1 ½" x 1 ½" and a piece of sting 12" long.

Cover one side of the paper with white glue.

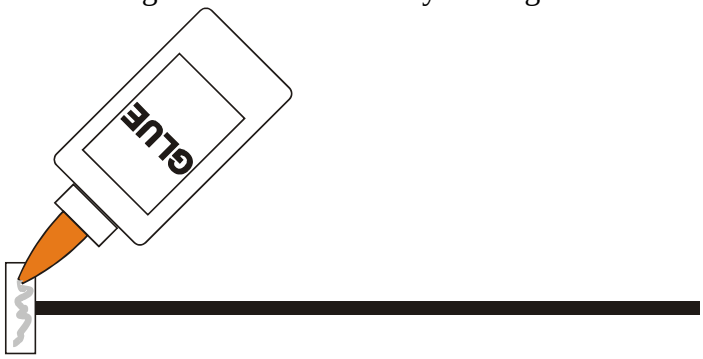


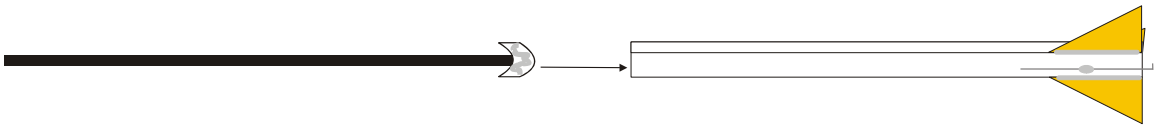
Place the string on the paper so it covers 2/3 of the paper.

Then fold over the paper on top of the string to make a "pocket".

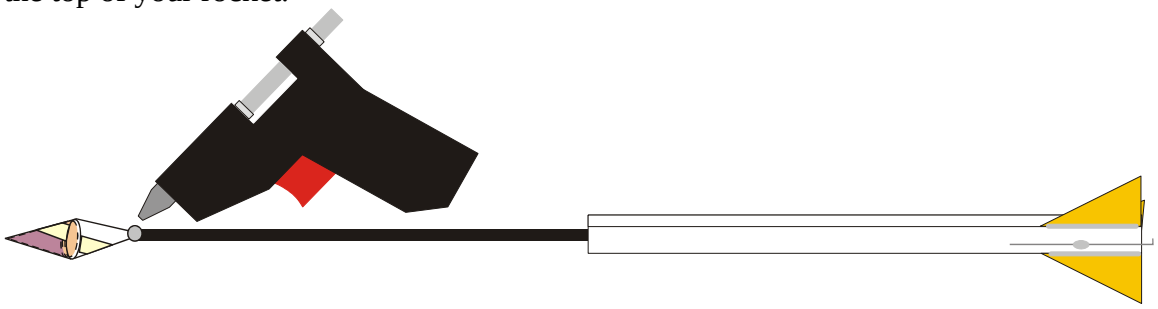
Then fold the paper over again. This will "lock" the string inside the paper securely.

32. Now cover one side of the paper with glue and attach it to the inside of the rocket. Be sure to glue it as far down as your finger will reach.

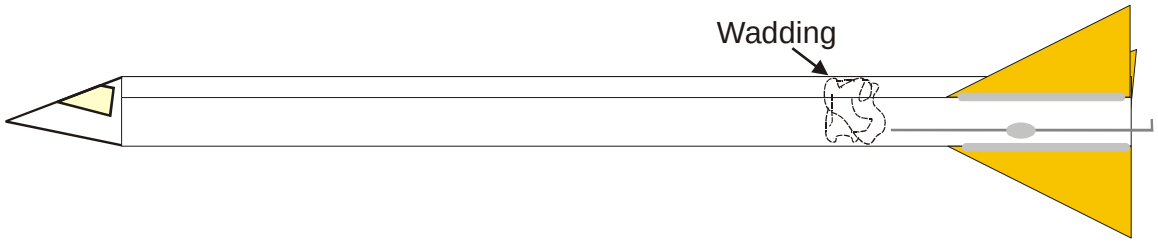




Then hot glue the nosecone to the other end of the string. Make sure you have the clay at the top of your rocket.



Now stuff some wadding in the top of the rocket and push the nosecone into place. You are now ready to fly your rocket.



These instructions should be used under the guidance a trained adult. Never allow minors to use model rockets unsupervised. This rocket design has been used in a middle school classroom for many years but is not guaranteed in any way. The author of this document is not responsible for any damages or injury that occurs from building or flying this model rocket. Please work responsibly.