

cosmodrome rocketry

# 1:6 BLACK BRANT VC

## Parts List

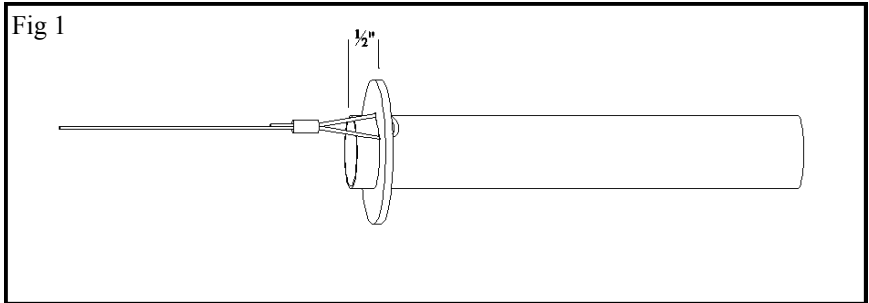
A	1	Nose cone
B	1	Payload body tube
C	1	Payload coupler
D	1	Bulkhead
E	1	Eye bolt
F	2	Large washers
G	2	Large nuts
H	4	Bushings
I	4	Shafts
J	4	Small nuts
K	4	Vanes
L	4	Vane mounts
M	1	3" piece of shrink tubing
N	1	Main body tube
O	2	Boat tail couplers
P	1	Boat tail tube
Q	1	29mm MMT
R	1	Forward centering ring
S	1	Aft centering ring
T	4	Fins
U	1	Fin detail stock
V	1	Shock cord mount
W	1	Quick link
X	1	24" parachute (not shown)
Y	1	Shock cord (not shown)
Z	1	Engine retainer stand off
AA	1	Engine retainer
AB	1	Medium washer
AC	2	Launch lugs
AD	2	Detail lugs
AE	1	Small piece of tube

This kit is capable of use with high thrust motors. It is therefore strongly recommended that epoxy be used throughout the construction of this kit.

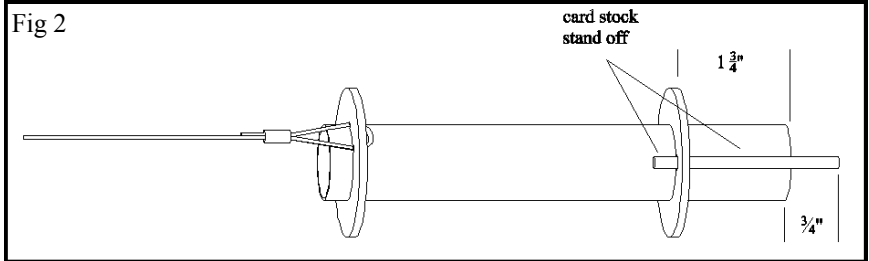
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Cosmodrome Rocketry  
275 West St.  
Randolph, MA 02368  
(781) 961-1051  
www.cosmodromerocketry.com  
j9andmike@earthlink.net

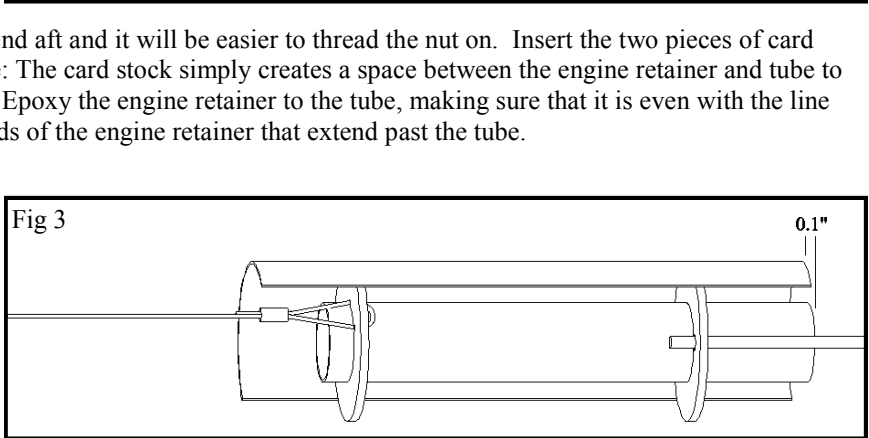
1. Draw a line down the side of the 29mm motor mount tube and mark the line 1/2" from one end and 1 3/4" from the other. Insert one end of the shock cord mount into the two holes in the forward centering ring. Slide the centering ring onto the motor mount tube. Position the centering ring onto the 1/2" mark on the tube as shown in figure 1. Epoxy the centering ring and shock cord mount to the tube.



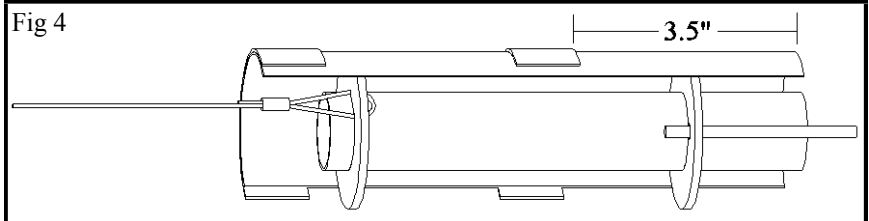
2. Slide the aft centering ring onto the tube until it is on the 1 3/4" mark, such that the hole in the centering ring is lined up with the line on the motor mount tube. Without getting epoxy near the hole, epoxy the centering ring into place. Cut out two pieces of card stock, 1/8" x 1 3/4" and 1/8" x 1/2". Slide the engine retainer through the hole in the centering ring so that 3/4" extends past the end of the tube. Note: One end of the engine retainer is cut (painted), one is not (unpainted), position the uncut end aft and it will be easier to thread the nut on. Insert the two pieces of card stock between the tube and the engine retainer. Note: The card stock simply creates a space between the engine retainer and tube to allow for some reload cases enough clearance to fit. Epoxy the engine retainer to the tube, making sure that it is even with the line on the tube. Be careful not to get epoxy on the threads of the engine retainer that extend past the tube.



3. Slide the boat tail tube over the motor mount assembly so that the motor mount tube extends 0.1" past the aft end of the tube. Epoxy the tube to the centering rings.

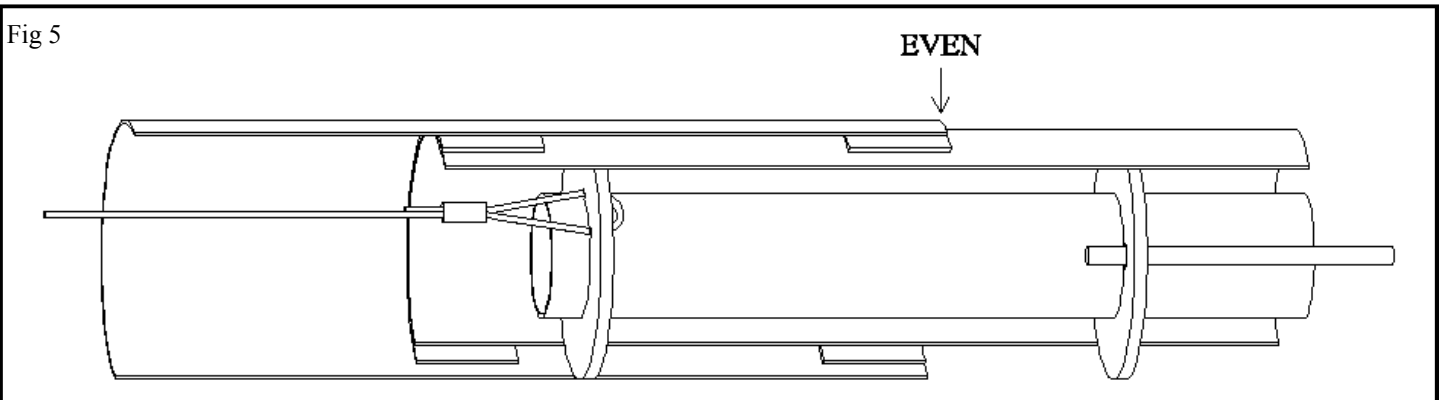


4. Epoxy the 1.0" long coupler tubes to the boat tail tube. One flush with the forward end of the boat tail tube. The aft end of the other 3.5" from the aft end of the boat tail tube.

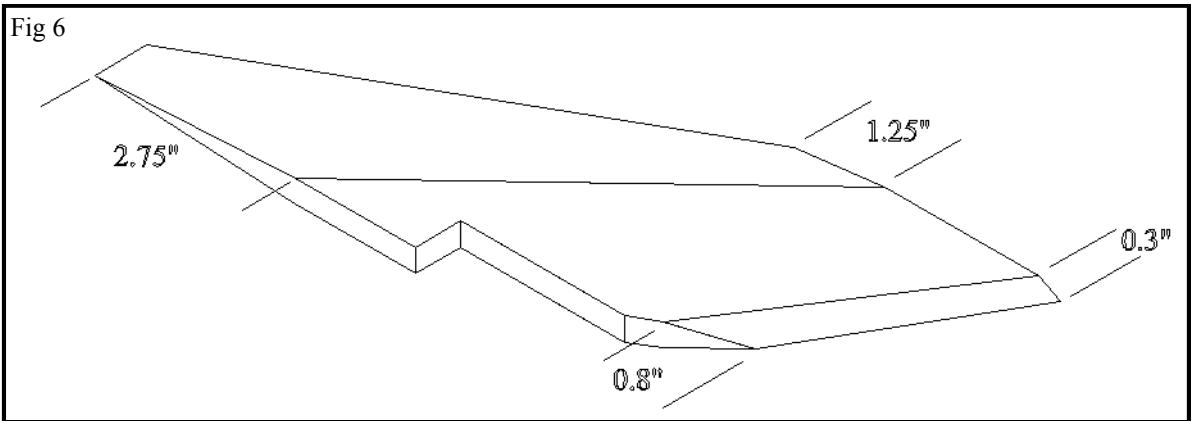


*Note: The coupler tubes supplied with the beta test kits are not perfect fits. The glassine and white outer wraps of the tubes will have to be removed so that the main body tube will fit. Also, a few wraps of masking tape will have to be applied to the boat tail tube to have the coupler tubes fit snugly. This will be corrected in the released version of the kit.*

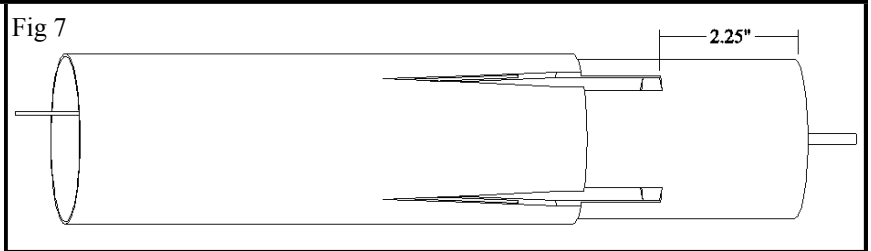
5. Apply a ring of epoxy 3" - 4" inside one end of the main body tube. Insert the motor mount assembly into the tube. Before inserting it all the way, add another ring of epoxy to the inside of the main body tube. Continue inserting the motor mount assembly until the aft end of the rear ring is even with the aft end of the tube.



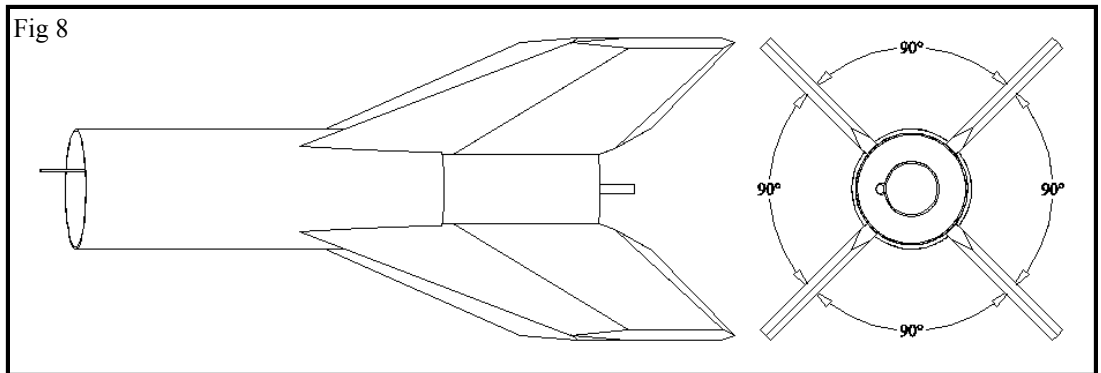
6. Draw two lines on each side of each fin as outlined in the figure. Apply two layers of masking tape to the middle section of each fin. This will help prevent this section from getting sanded. Sand the leading and trailing edges of the fins to a knife edge.



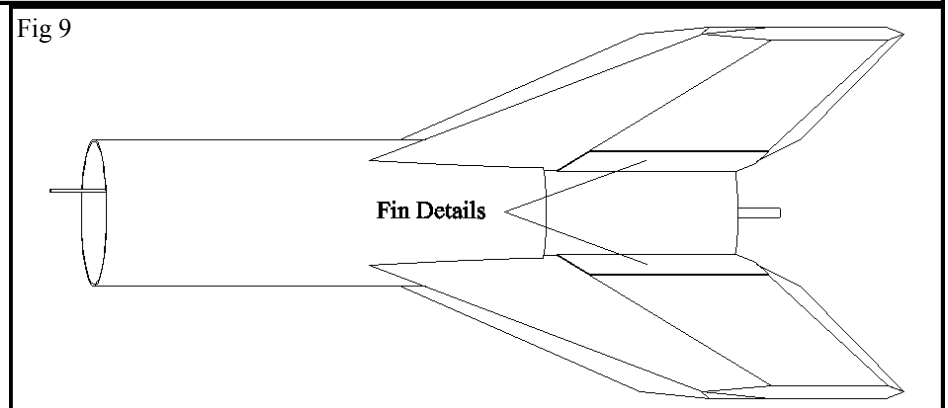
7. Cut out the boat tail body tube marking guide and wrap it around the boat tail body tube, Line up the 'Retainer' line with the engine retainer. Mark the body tube at the 'Fin' 'Shoe' and 'Lug' lines. Extend the fin lines up the tube and 3" onto the main body tube. Extend the shoe line the length of the boat tail tube. Extend the lug line the length of the main body tube. Mark the fin lines 2.25" from the aft end of the boat tail tube. Place a fin on the tube so that the aft end of the fin tab is centered on a fin line and even with the 2.25" mark. Make sure that the forward end of the fin tab is centered on the fin line. Draw a line completely around the fin tab. Using an X-acto knife, cut out a slot for the fin tab by cutting on the inside of the outline. Carefully enlarge the slot, if necessary, until the fin tab fits snugly. Repeat for the other fins.



8. Apply epoxy to the motor mount tube through one of the fin slots. Also apply epoxy to the root edge of one fin. Insert the fin into the slot. Make sure that the fin is perpendicular to the body tube. Let the epoxy cure. Repeat for the other three fins. Do not fillet the fins at this time.

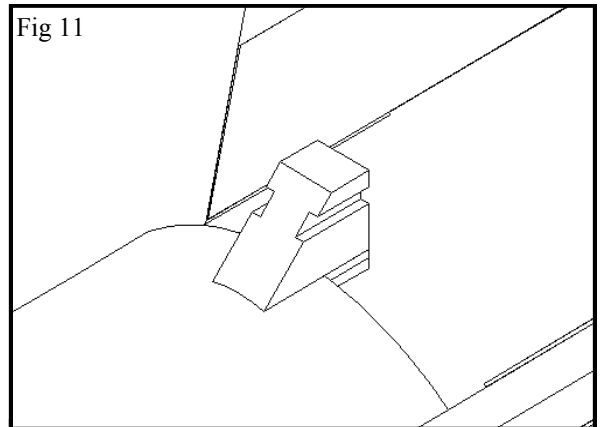


9. Cut out the fin detail template. Trace 8 times on the card stock. Cut out the 8 fin details. Epoxy the fin details to the fins, one on each side. Position the detail so that the aft end is even with the bottom edge of the fin. Note: Use epoxy to glue the details to the fins as the fillets will cover part of the details. Coat the details with thin CA. This is to give the fillets something strong to adhere to. Sand the details until they are smooth. Fillet each fin.

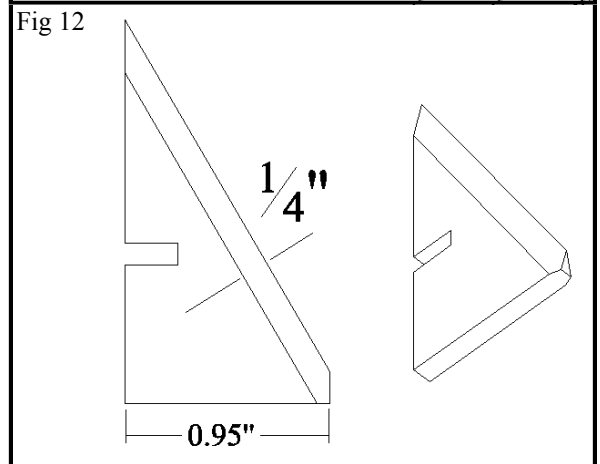


10. Launch Lugs

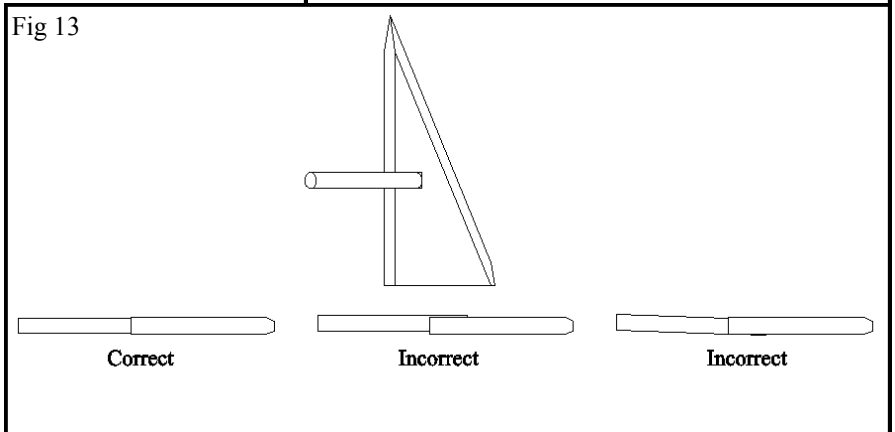
11. Using the small piece of coupler, cut out 2 pieces 1/4" x 1/4". Round the bottom of the shoes so that they match the contour of the main body tube. Epoxy one piece of coupler to the boat tail tube, even with the aft end of the main tube, on the shoe line. Epoxy the other piece on top of the first piece. Epoxy one of the shoes on top of these two pieces.



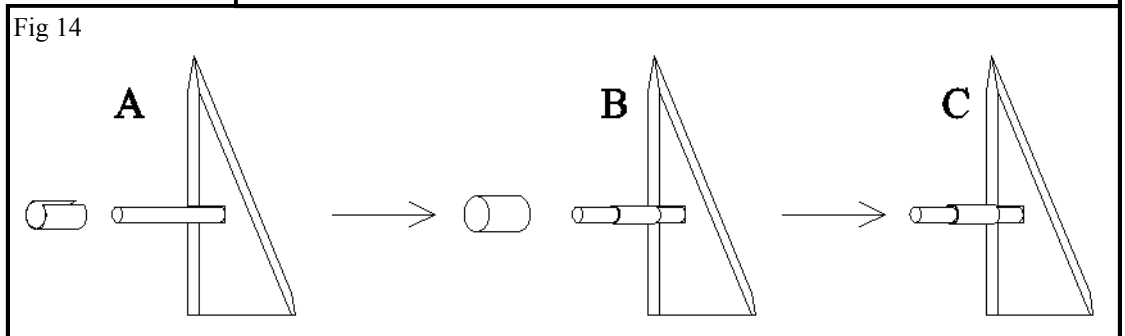
12. Draw a line 1/4" from the leading edge of the vanes. Sand the leading lead to a knife edge. Sand off the tip of the vane. Repeat for the other three vanes.



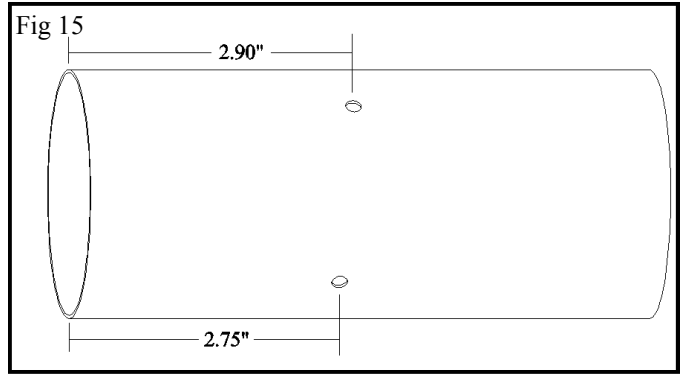
13. Insert one end of a vane shaft (small threaded rod) into the cut out in a vane. Note: One end of the threaded rod is cut (painted end), insert this end so that is easier to thread the nut on the other end. Make sure that the shaft is parallel with the vane and centered. Add a small drop of epoxy to one side of the shaft to tack it into place. Let cure. Turn the vane over and epoxy the other side. The epoxy should completely fill in the space between the shaft and the vane. If too much epoxy is used it can be cut down or sanded flat with the surface later. Let cure. Turn over again and fill in the other side with epoxy. Let cure. Sand the epoxy even with the surface of the vane.



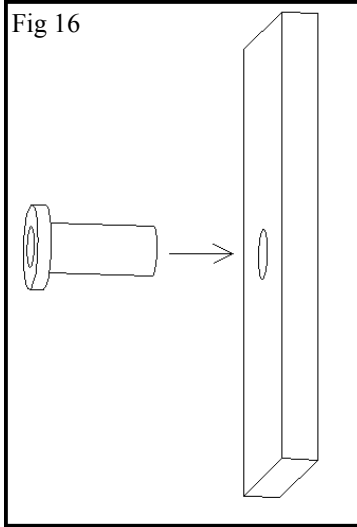
14. This step will build up a bearing surface on the shaft. First, using 1/2" or 3/4" masking tape, wrap a single layer of tape around the shaft keeping one edge of the tape even with the side of the vane. Next, cut off a 0.35" piece of shrink tubing. Slide the tubing over the masking tape, all the way to the vane. Use a heat gun or hair dryer on low heat to shrink the tubing over the tape. Let cool. Due to the difference in thickness of masking tapes it will be necessary to test the fit into the bearing. The fit should be tight enough so that the vane does not wobble in the bearing (with a good fit there will be just a little wobble), but not so tight that the vane does not turn. If the fit is too loose, cut off the shrink tubing, remove the masking tape, use a slightly longer piece of masking tape and fit on a new piece of shrink tubing. If the fit is too tight, do the same with a smaller piece of masking tape. Once the correct fit is found, trim the masking tape so that is even with the shrink tubing. Note: one the bearing is installed on the shaft the tape and shrink tubing should not extend past the bearing. Repeat for the other three vanes.



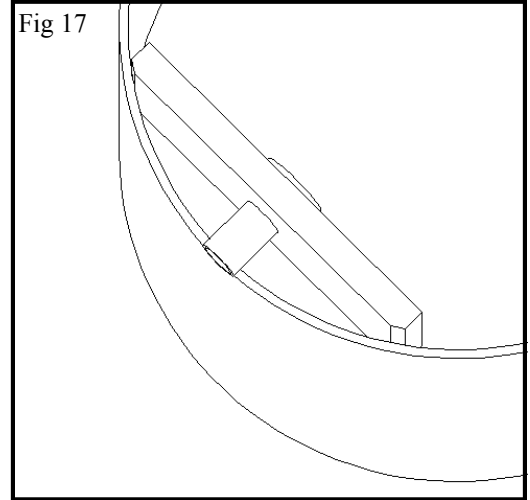
15. Identify the bottom of the payload tube by measuring the distance to the drilled holes. The bottom is 2.75" and 2.90" from the holes. Mark the bottom with an identification mark. Add a drop of thin CA to the outside and inside of all four holes. This will stiffen up the paper and make it easier to sand. Sand the outside of all four holes until they are smooth and even with the rest of the tube. Sand the inside of the holes. Note: It is not critical that the inside be smooth, but a light sanding will help with the installation of the bearings. Clean out the holes so that the bearings will fit snugly. If needed, use an 11/64" drill bit to ream out the holes. If bearing is still to tight a fit, a #17 drill bit can be used to ream the hole.



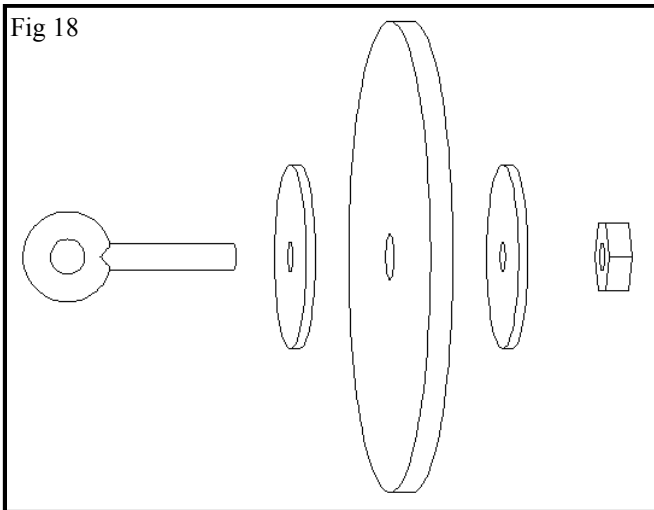
16. Insert a bearing into the hole in a vane mount. Epoxy into place, be careful not to get epoxy in the center of the bearing or on the flat surface. Repeat for the other three mounts.



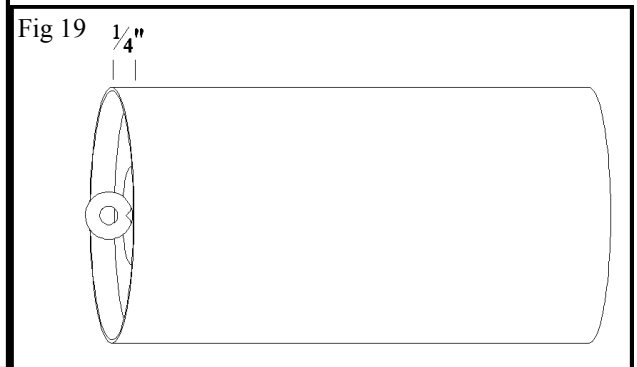
17. From the inside of the payload tube, push a bearing into a hole in the body tube. The end of the bearing should be even with the outside of the tube. It may be necessary to sand the edges of the mount to bring the bearing further out OR place masking tape strips on the inside of the body tube to bring the bearing further in. Make sure to sand / apply tape equally to both ends of the mount or the vane with not be perpendicular to the body tube. Once the end of the bearing is even with the outside of the tube test fit a vane assembly into the bearing. Make sure that the vane is perpendicular to the body tube. If it is not, adjust the vane mount accordingly. Epoxy the mount in place. Epoxy the bearing to the inside of the



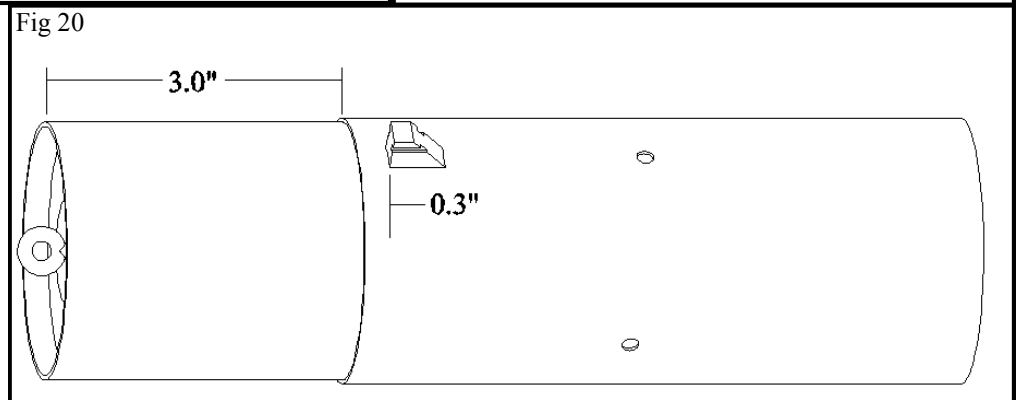
18. Assemble the bulkhead assembly using the screw eye, 2 washers, nut and bulkhead ring. Epoxy the nut into place.



19. Insert the bulkhead assembly into the remaining coupler. Position it so that it is 1/4" inside the coupler. Epoxy both sides of the bulkhead to the coupler.

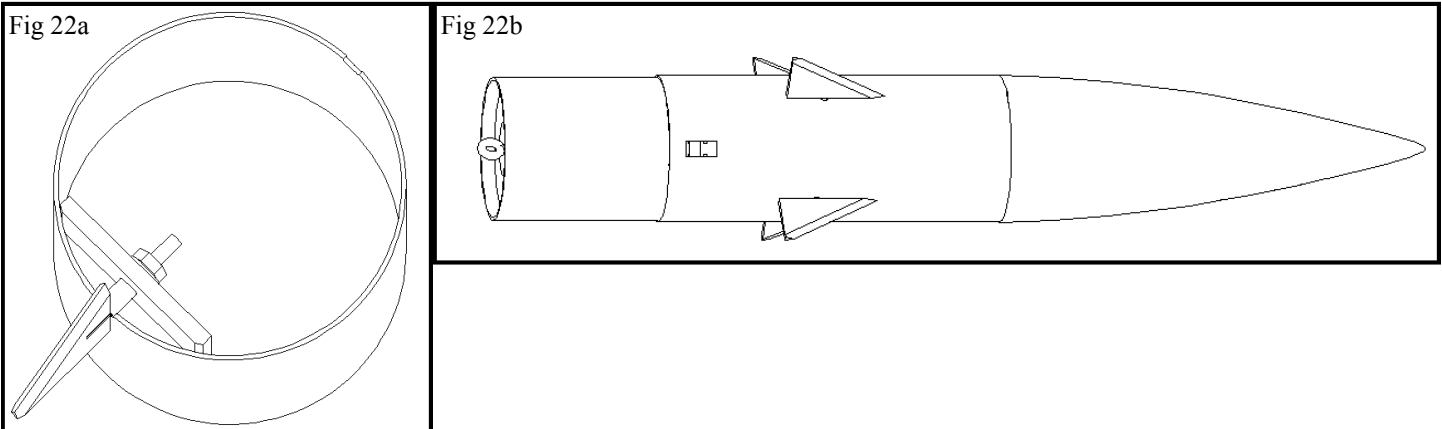


20. Epoxy the bulkhead assembly into the payload tube so that 3.0" of coupler extends from the payload tube. Epoxy the remaining detail lug between two of the holes in the payload tube, 0.3" from the aft end.

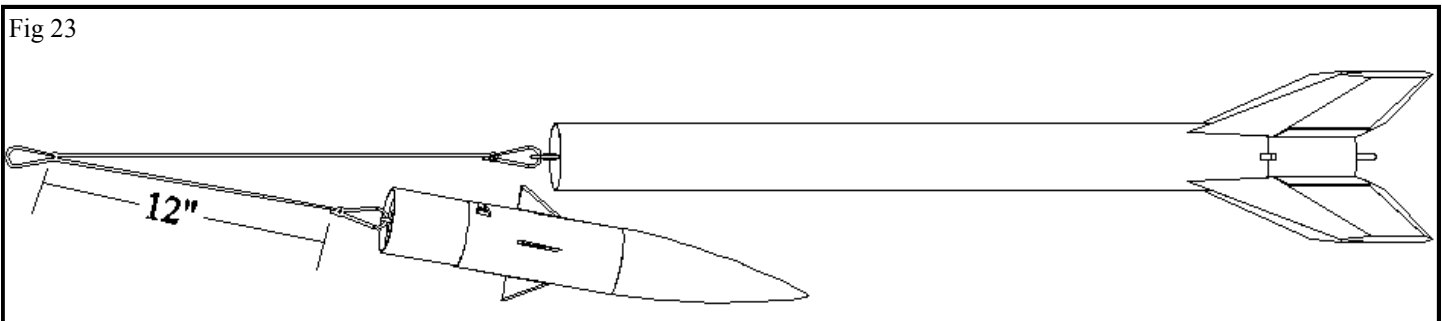


21. It is best to paint the model before attaching the vanes. This will prevent the paint from gluing the vanes in place.

22. Insert a vane into a hole in the payload tube. Thread a small nut onto the end of the shaft that extends past the bearing. Tighten the nut such that the vane can move, but is not loose enough to wobble side to side. One way to do this is to place a piece of paper between the body tube and vane, tighten the nut and remove the paper. Be careful as you rotate the vane to check the fit as the nut can move on the shaft. Once the fit is just right, apply a SMALL drop of hot melt glue to the nut/shaft joint to lock it in place. Re-check the fit. If it is still good, add more hot-melt glue to the joint. If at any time the vane becomes too loose or too tight, simply remove the hot melt glue and re-adjust. Once all the vanes are in place install the nose cone. Do not glue the nose cone in place or you will not be able to re-adjust the vanes in the future. Add masking tape the shoulder of the nose cone until it is a tight fit into the payload tube.

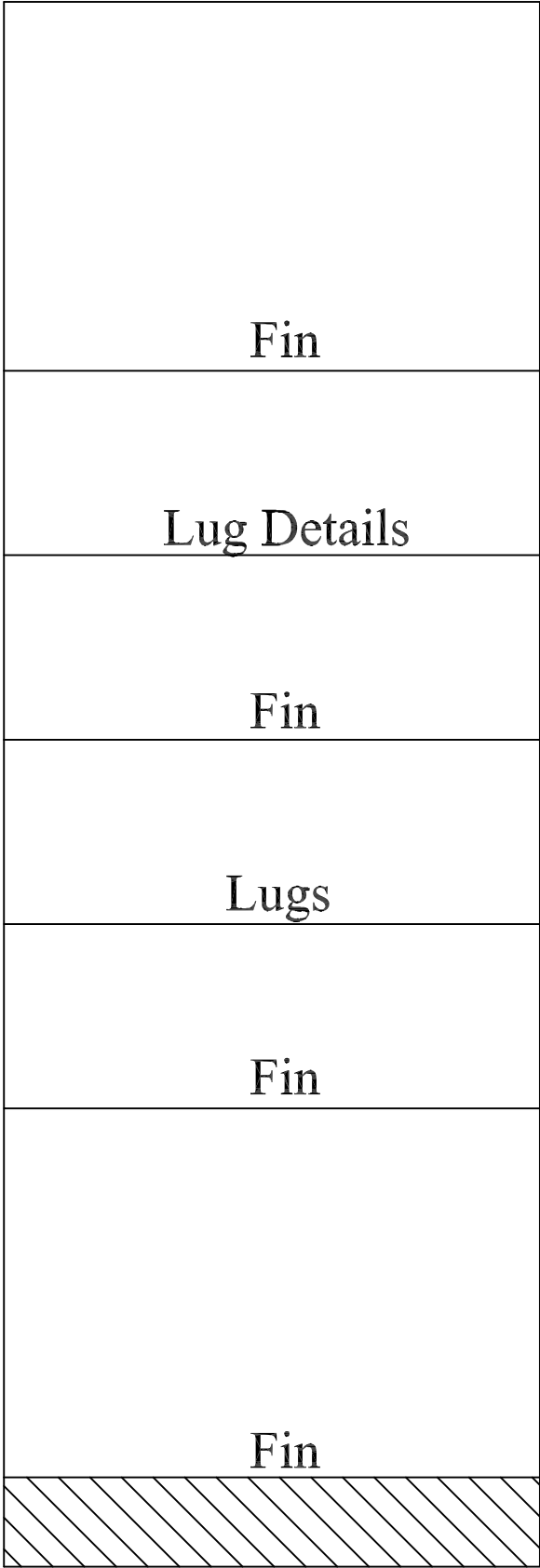


23. Feed one end of the shock cord through the eye bolt and tie it to itself, forming a loop. Tie a loop in the shock cord one foot away from the payload section, this is where the parachute is attached. Tie a loop in the other end of the shock cord. The quick link will go through this loop and attach to the shock cord mount.

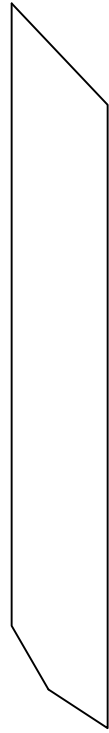


24. Flying.

1. Insert recovery wadding and loosely pack the parachute. Install the payload bay.
2. Select a motor according to the most up-to-date recommended motor list available at <http://www.cosmodromerocketry.com>
3. Disposable motors:
  - a. Build up a thrust ring on the aft end of the motor using 1/2" masking tape. Wrap tape around the motor until it is at least as thick as the motor mount tube.
4. Reloadable motors:
  - a. Assemble the motor according to the manufacturer's instructions.
  - b. The thrust ring is built into the aft closure of the motor. No tape ring is needed.
5. Install the motor into the motor mount tube.
6. Slide the washer over the engine retainer.
7. Thread the nut on the engine retainer and tighten against the motor.
8. Install the igniter according to the manufacturer's instructions.



Body Tube Template



Fin Detail Template