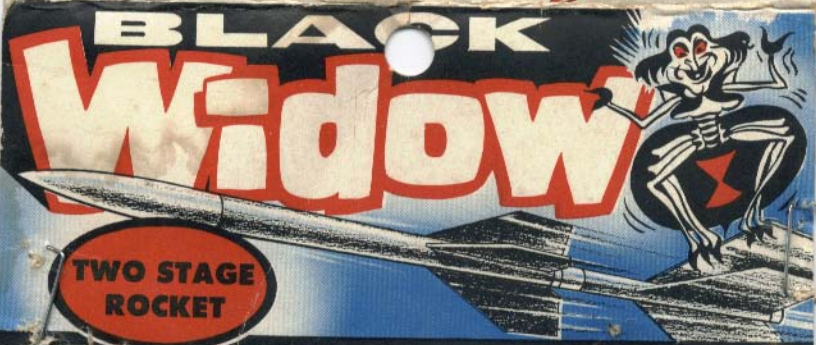


USE Centuri safety approved rocket engine only with this rocket kit

- Single Stage Kits
- Multi-Stage Kits
- Booster Kits
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Model Rocket Engines

QUALITY MODEL
ROCKETRY PRODUCTS



**TWO STAGE
ROCKET**

KB - 6:200

Centuri ENGINEERING CO.
PHOENIX, ARIZONA

Black Widow Kit

BOOSTER ASSEMBLY INSTRUCTIONS

The Gliding Booster recovery system uses no moveable surfaces, but instead depends on a delicate weight balance. Follow these instructions carefully and be as exacting as possible.

To assemble the booster stage, the following parts are needed:

PART NO.	PART NAME
11	Booster Body Tube
12	Bulkhead
13	Balsa Fin Mat ¹
14	Trimming Bulkheads

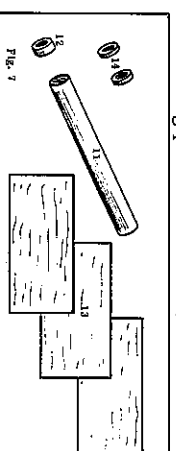


Fig. 7

POSITIONING BULKHEAD
Insert bulkhead into one end of the booster body tube. With the engine spacing tube, position bulkhead so that exactly 1/2" of the spacing tube extends beyond the end of the body tube. See Fig. 8. This positioning must be very exact as it determines the delicate balance which permits a smooth glide. Glue bulkhead in place as before, by dripping several drops of glue into the top of body tube, aiming at the joint between bulkhead and body tube. Again, be careful not to glue the engine spacing tube in the body tube. Allow the glue to dry before proceeding.

SETTING THE STABILIZER FINS

The Gliding Booster uses three stabilizing fins which are identical in shape. For purposes of discussion, we shall refer to them as the "wing" fins and the "rudder" fin.

Place the engine end of the body tube in the center of the circle of Fig. 9. Just as before, mark the fin locations with a pencil.

Next, cut out 3 fins from the 1/16" balsa stock using the pattern in Fig. 10. Again, make sure that the balsa grain is running in the direction shown. Do not sand the fin edges.

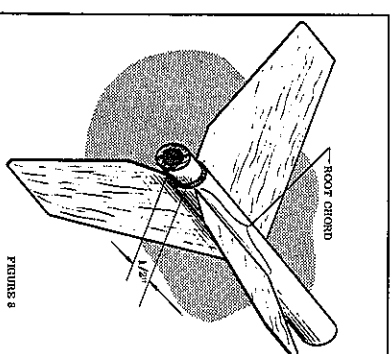


FIGURE 9

Apply fast drying model cement or glue to each fin root chord edge, one at a time, and also along the body tube where the fin is to be attached. When the cement has just begun to set, place the fin in position along body tube. Repeat for all three fins. Before glue has set, adjust the fins so that they are angled according to the diagram in Fig. 9. Make sure that the root chord is aligned with the long axis of the body tube. As glue is setting, check occasionally to see that the angles between the fins remain the same as in Fig. 9. When the initial glueing has thoroughly dried, run a bead of glue along all fin-body joints.

TRIMMING THE GLIDE

It is possible to check the gliding characteristics before actual flight using the following procedure:

- 1) Insert an expanded B. 8-0, B. 8-4, or B. 8-6 engine casing with nozzle into the booster vehicle so that it contacts the bulkhead.
- 2) Hold the rudder fin as shown in Fig. 11, with finger on engine nozzle, and give a straight forward push, releasing it at arms length. Try this several times, preferably from a high place such as a porch or roof top. The Booster should glide level if properly balanced.
- 3) If the vehicle appears nose heavy, pull the expanded engine casing and insert one trimming bulkhead. Replace the engine casing and repeat step 2 above. You may find it necessary to insert a second trimming bulkhead.
- 4) Should the vehicle appear tail heavy or have no stability at all, try glueing one or two BB shot to the inside of the forward end of the body tube.

Remember, that the glide depends on balance, and a smooth glide can be attained by shifting weight forward or rearward.

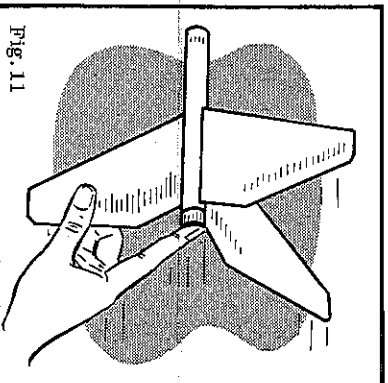


Fig. 11

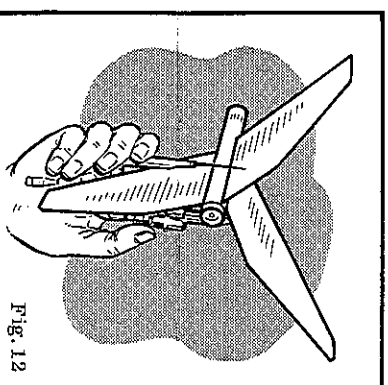


Fig. 12

BOOSTER-SUSTAINER STAGING

Insert the second stage engine into the sustainer tube. This fit should be tight, so as to prevent rearward jettisoning of engine when the engine ejection ignites. See engine operating instructions for complete mounting instructions.

Slip forward end of the booster body over the second stage engine. This slip connection should be just loose enough so that the engine will slip out without binding.

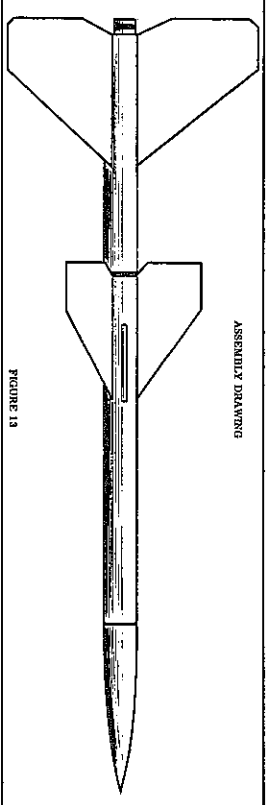


FIGURE 13

LAUNCHING

The Gliding Booster is designed for use with the B. 8-0 model rocket engine. Do not use the B3-0 engine as it will strip the booster fins off clean upon take-off. The booster engine should fit tight enough so that it does not slip out during the powered or glide phase of flight. To assure a proper glide, the booster engine must be retained.

The Black Widow sustainer may be operated with any of the following engines:

1/2A. 8-4	A. 8-4	B. 8-6	B3-5
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Maximum altitude is achieved using the B. 8-6 engine.

Launch the Black Widow from a 1/8" diameter x 36" long launching rod and ignite the booster engine electrically, as described in the Engine Operating Instructions. The second stage engine will auto-ignite from the hot burn-out gases from the booster engine.

After the first flight, you may wish to re-trim the booster for a better glide. Observe the initial glide angle and adjust accordingly.

For further information concerning rocket engines, kits, firing panels, or launching apparatus, write to:
Centuri Engineering Co.

INTRODUCTION

The Black Widow model rocket was designed to demonstrate the basic fundamentals of two stage sounding rockets. When properly assembled, the Black Widow is capable of reaching altitudes in excess of 1500 feet. The second stage vehicle uses parachute recovery, while the booster section features a unique glide recovery system which allows it to soar like a bird back to earth. The Black Widow second stage works equally well as a single stage by itself. Read the instructions through carefully before starting to assemble the parts.

SECOND STAGE ASSEMBLY INSTRUCTIONS

To assemble the sustainer or second stage, the following parts are needed:

PART NO.	PART NAME
1	8" Body Tube
2	Nose Cone
3	Bulkhead
4	Fin Material
5	Plastic Chute Mat ¹
6	Shroud Line
7	Rubber Shock Cord
8	Tape Discs
9	Launching Lug
10	Engine Spacing Tube

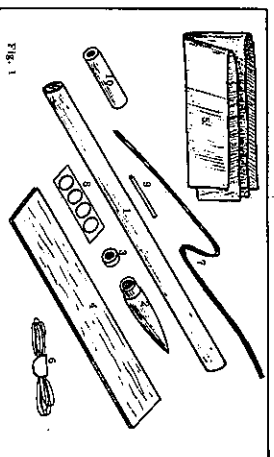


Fig. 1

In addition to the above parts, the following materials will be needed to assemble the Black Widow:

Modeling knife or single edge razor blade	Pencil
Strong, fast drying model cement or glue	Scissors
Paint for finishing -preferably spray type	Fine Sandpaper

POSITIONING BULKHEAD

Insert the engine bulkhead into the base of the body tube and position according to Fig. 2a. When the bulkhead is correctly positioned, the engine spacing tube will extend 3/8" beyond the end of the body tube as shown in Fig. 2b.

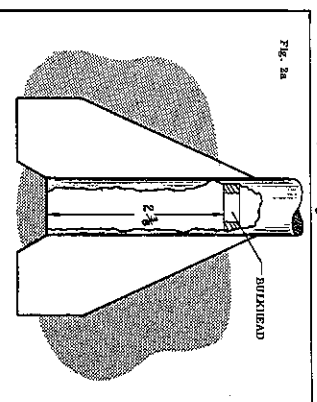


Fig. 2a

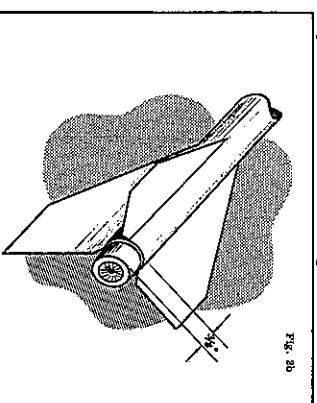


Fig. 2b

Glue the bulkhead firmly in place by dripping several drops of Wilhold or similar white glue into top of the body tube, aiming at joint between bulkhead and body tube. Use the engine spacing tube to hold the bulkhead in place while drying. Be careful not to glue the engine spacing tube in the body tube. Allow the glue to set before proceeding to the next step.

SETTING THE STABILIZER FINS

Now, set the body tube on end and place in the center of the circle in Fig. 3. With a pencil, mark the fin locations on the tube.

Next, cut out 3 stabilizer fins from the 3/32" balsa stock using the pattern in Fig. 5, on the pattern sheet. Make sure that the balsa grain is running in the direction shown. This gives maximum strength in flight. Sand each fin as shown in Fig. 4. Round the leading edge and taper the trailing edge.

Insert the engine spacing tube into the base of the body tube. This helps to keep the body tube round while glueing on the fins. Glue each fin, one at a time to the body tube as shown in Fig. 3. Greatest strength is obtained by running a bead of glue along the tube-fin joint after the initial glueing has completely dried. Make sure that the root chord of each fin is lined up parallel with the long axis of the body tube. The base of each fin (trailing edge) should extend 3/8" below the end of the body tube.

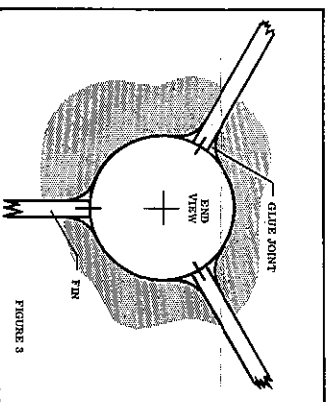


FIGURE 3

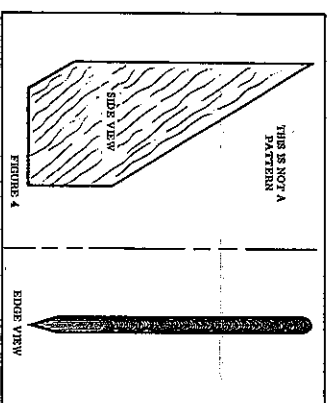


FIGURE 4

RIGGING PARACHUTE & SHOCK CORD

Cut four 10" lengths of shroud material. Lay chute plastic flat and attach one shroud to each corner with a tape disc. Draw up the other shroud ends even and the tightly together.

Attach shock cord to body tube and nose cone as shown in Fig. 6. The loose shroud ends to shock cord.

LAUNCHING LUG

With fine sandpaper, sand one side of the launching lug to roughen surface. Glue the lug to the body tube in the position shown in Fig. 6.

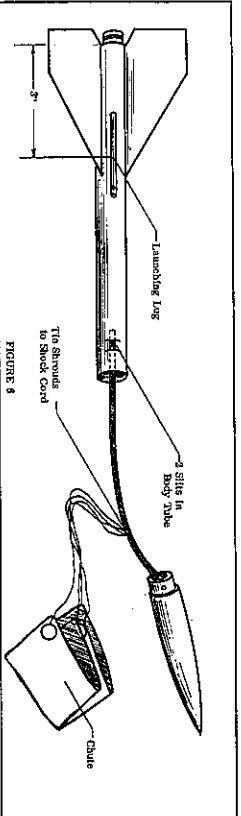


FIGURE 6

FINISHING

Fold the chute temporarily and insert into top of body tube. Complete chute folding instructions are included with the Centuri rocket engines. Place the nose cone on the body tube end and the rocket is now ready for finishing. A spray can type laquer gives the best finish and dries rapidly. Balsa fins and hardwood cone will require more than one coat of paint for a glossy finish, which is necessary for maximum altitude flights. Use bright colors such as white, yellow, orange, or red. Black is also good for high visibility against a blue sky.

SINGLE STAGE CAPABILITIES

The Black Widow sustainer (second stage) makes an excellent single stage rocket by itself. Complete engine mounting and ignition instructions are outlined in the Engine Operating Instructions which are supplied with all Centuri model rocket engines.

You are now ready to proceed to the booster or first stage assembly.

BLACK WIDOW KIT

Modification Instructions

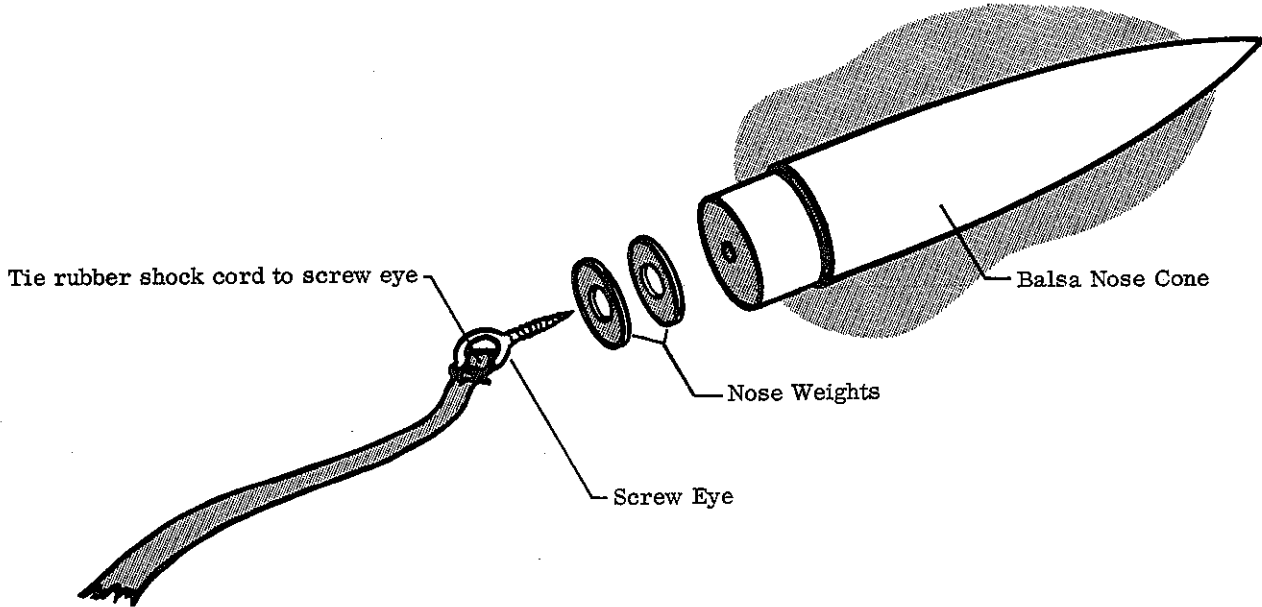
In our constant effort to improve all Centuri models, the Black Widow two-stage model rocket kit has recently been modified to give higher altitude flights. Also, a recent change in Centuri's engine nozzle design now requires that an additional step be taken in the engine preparation to assure reliable second stage ignition.

A) First, the change from a hardwood nose cone to a balsa wood cone has resulted in a 15% increase in possible flight altitude. In addition to the balsa cone, two additional parts have been added to the kit:

1) Screw Eye

2) Set of 2 Nose Weights

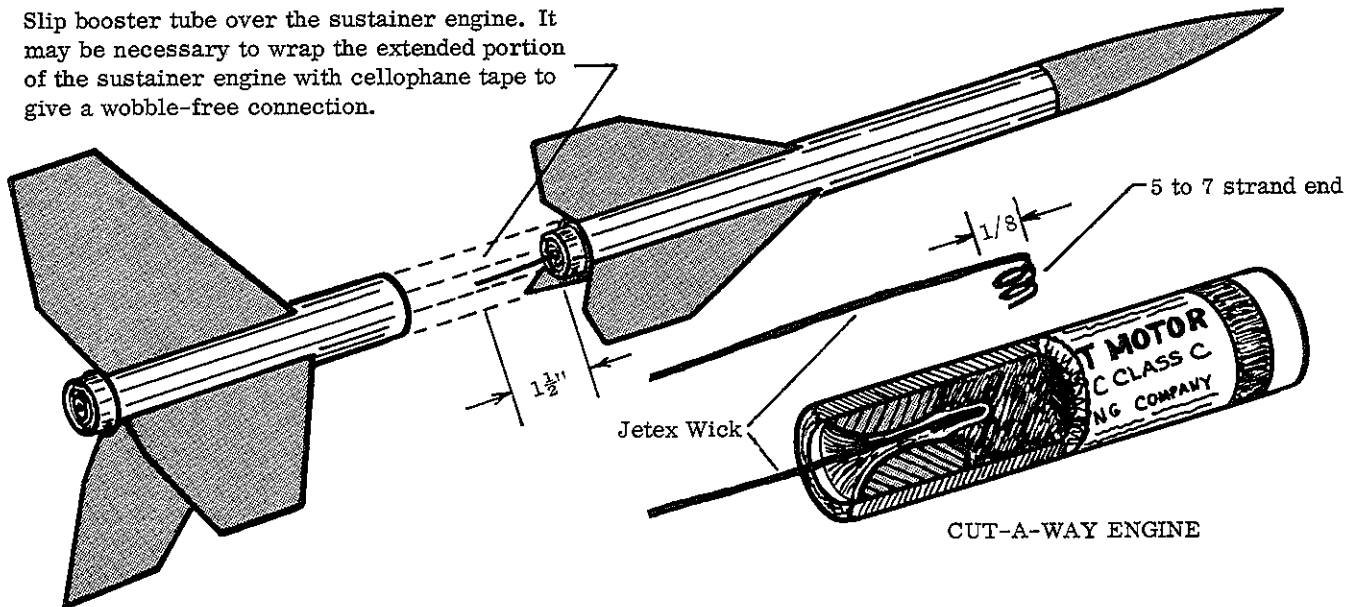
The method for attaching the screw eye and stabilizing nose weights to the nose cone is shown in the drawing below:



First, thread the screw eye into the cone base. Unthread the eye from the cone and place a drop of white glue in the resulting hole. Place the two nose weights over the screw eye and thread the eye back into the cone base. After the glue has dried, tie one end of the shock cord to the screw eye. Trim off any loose end. Attach the other end to the body tube as shown in Figure 6. Cut two slits in the body tube about 3/4" from the top end. Insert the cord end into the body tube from the top end. Bring the cord end out through the first slit and back into the body tube through the second slit. Apply white glue to this connection to form a good bond.

B) To assure reliable ignition of the second stage engine, it is necessary to insert a short length of Jetex wick into the second stage engine nozzle. Using the method outlined in Centuri's Engine Operating Instructions, take a piece of wick about 2 1/2" long and fold one end so that a 5 to 7 strand end is formed. Insert this folded end into the engine nozzle. Push in as far as possible and secure by pushing a pencil or ball point into the folded end. Make sure that the wick will not fall out of the nozzle under acceleration. The extended portion of the wick should measure about 1 1/2" long.

Slip booster tube over the sustainer engine. It may be necessary to wrap the extended portion of the sustainer engine with cellophane tape to give a wobble-free connection.



PARACHUTE ASSEMBLY DIRECTIONS

ATTACH SHROUD LINES SQUARE CHUTE

Cut two 20" lengths shroud line. Attach each end to a corner of the plastic canopy with tape disc, as shown in figure 1.

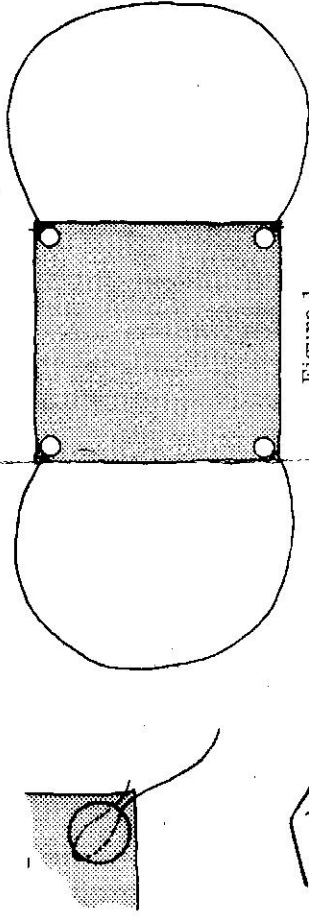


Figure 1

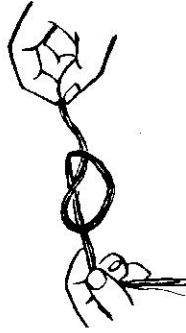
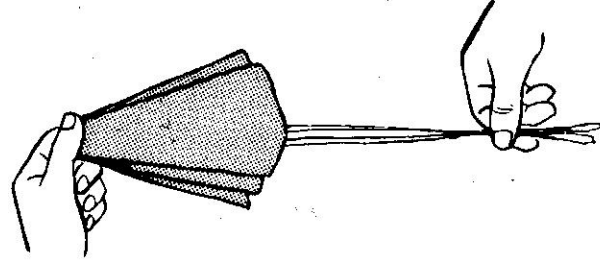


Figure 2

Hold the canopy at the center, draw shroud lines together, and tie together near free ends as shown in figure 2.

To form a hexagonal canopy, fold and cut the material as shown in figure 3. Cut three 18" lengths of shroud line. Attach each end to a corner of the canopy with tape disc, as shown in figures 1 and 3.

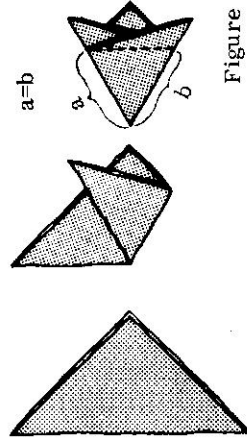
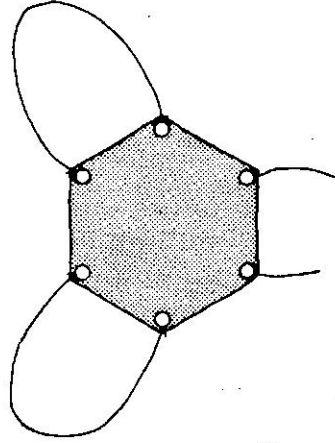


Figure 3



ATTACH CHUTE TO ROCKET

Tie shroud lines to nose cone screw eye as shown in figure 4.

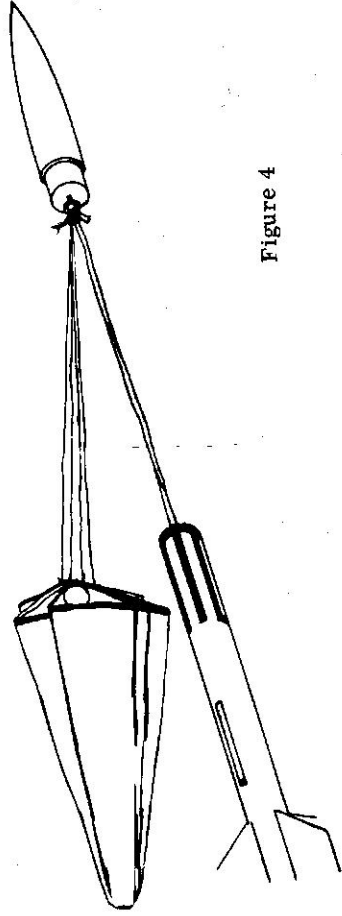


Figure 4

FOLDING THE PARACHUTE

Hold chute at apex and fold pleats to one side; stretching shroud lines tight. Fold and roll up chute as shown.

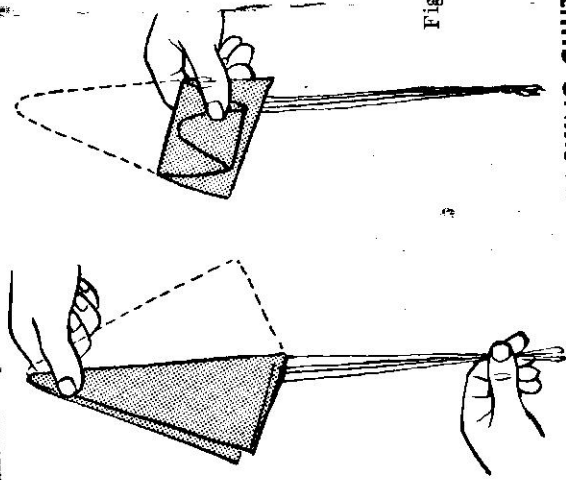


Figure 5

PACKING CHUTE IN ROCKET

Just before launching, fold up the chute and wrap in paper chute protector. Insert chute into body tube, with shock cord and place nose cone in position. If paper chute protector is not available, insert flameproof cotton or wadding into body tube, before inserting chute. This will prevent the hot ejection gases from burning or melting the parachute.

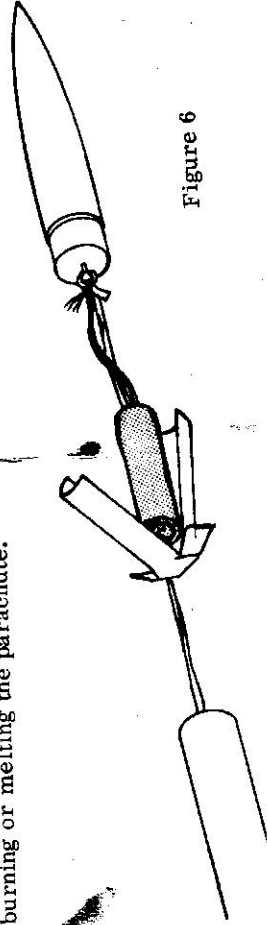


Figure 6

PATTERN SHEET

