

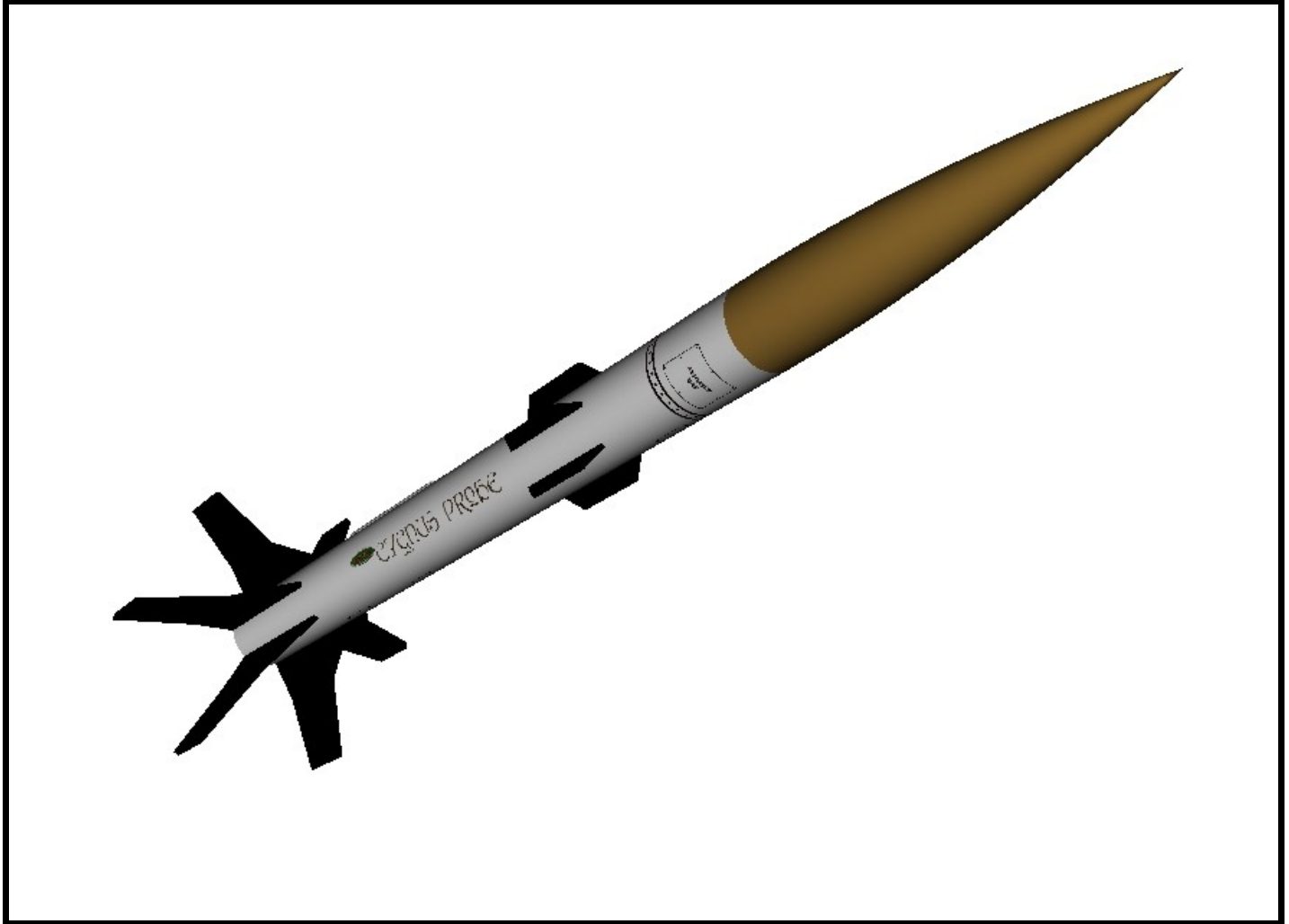


Skill Level 1

EGYGNUS PROBE

Created By C. P. McGraw

Revision Date: Jul 4, 2005



PARTS LIST

Length	17.2"
Diameter	1.040"
Weight	1.7 oz
Fin Span	4.54"
A8-3 Stability	1.84 cal
B6-4 Stability	1.74 cal
C6-5 Stability	1.49 cal

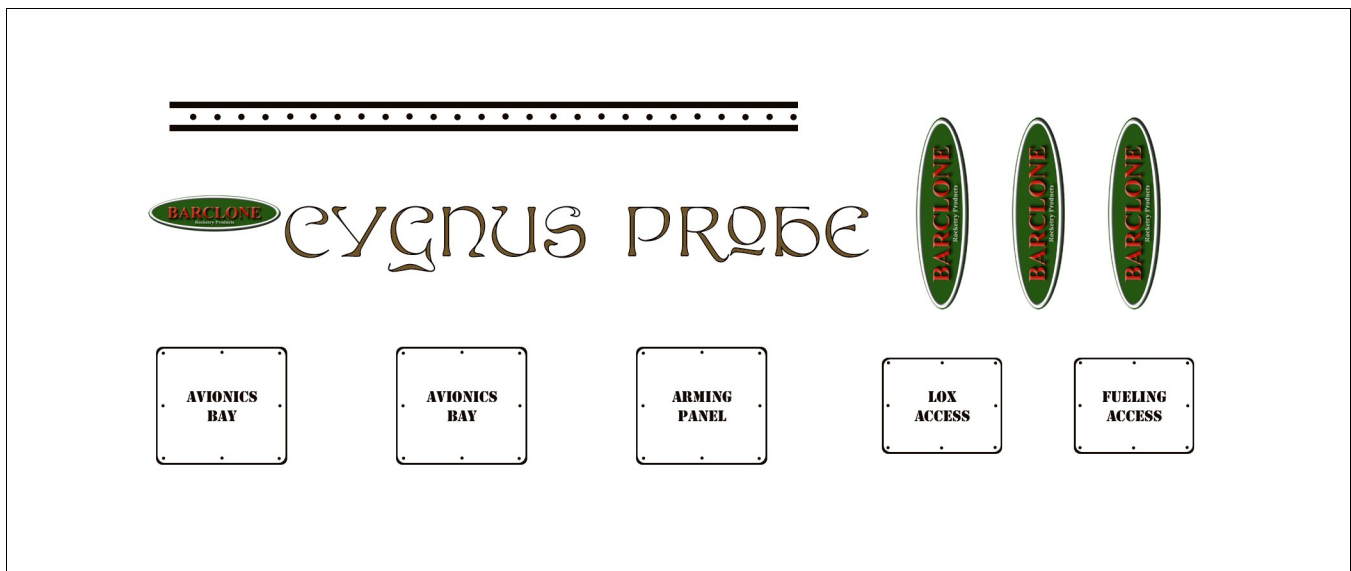
Nose Cone.....	BC-1052
Body Tube.....	ST-10120
Motor Mount.....	EM-710
Parachute.....	CPK-12
Launch Lug.....	LL-122
Shock Chord Mount.....	SCK-24
Shock Chord.....	SC-24
Screw Eye.....	SE-1
Snap Links.....	(2) #10
Balsa Sheet.....	3/32" x 3" x 12"
Balsa Sheet.....	1/16" x 3" x 6"

General Instructions

All major components of this model, such as the nose cone and the body tube, and the Kevlar thread, can be purchased directly from Semroc Astronautics Corporation. The sheet balsa is readily available through your local hobby shop or craft store, and the fishing sinkers can be found at any well-stocked sporting goods store or department.

To assemble this model, you will also need a small bottle of yellow carpenter's glue for general assembly, a small quantity of epoxy to attach the sinkers, soft artist's paint brushes, a pencil, a steel (or steel-edged) ruler, a lightweight wood-grain filler, sprayable primer, paint, and acrylic gloss clearcoat, 220-, 400-, and 600-grit sandpaper and some sanding twigs, a tack rag, small clamps or other holding fixtures to keep the fins in place while the glue dries, and a sharp hobby knife. One optional tool that you might find handy is a Dremel MotoTool.

You should also have a copy of **The Model Rocketry Handbook** by G. Harry Stine and Bill Stine [Seventh Edition] nearby. Read and understand the **Construction Tips** chapter thoroughly before starting this model, especially the text on the double-glue method of attaching fins to body tubes. There is also a section on making some special assembly tools that will prove very helpful in the construction of any model rocket.



Decal Sheet Image

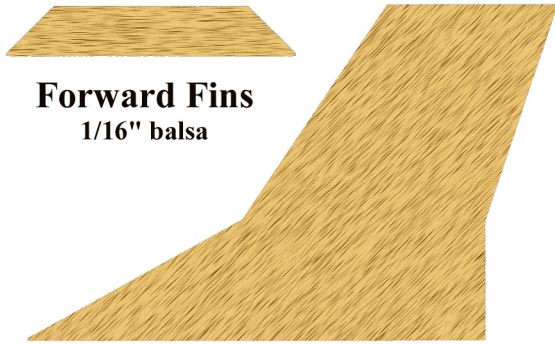


*Decal Location Guide
(See instructions for placement)*

Pattern Page

Fins

Forward Fin Alignment Guide

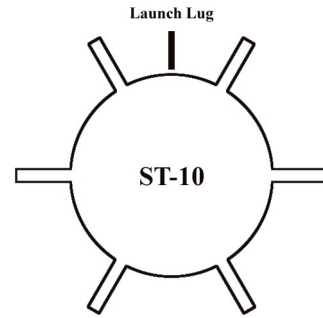


Forward Fins

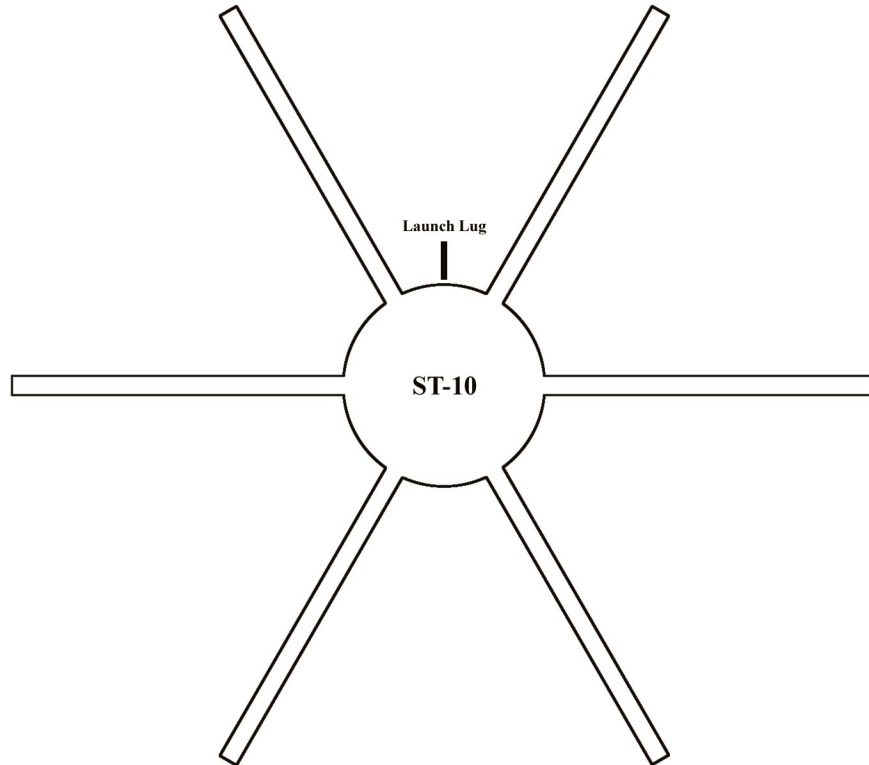
1/16" balsa

Main Fins

3/32" balsa



Main Fin Alignment Guide



Main Construction Steps

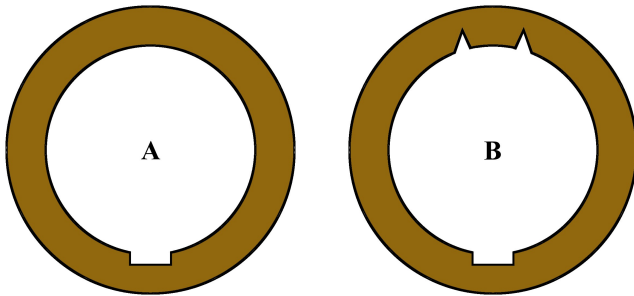


Figure 1

- **Step 1** Modify both of the CR-710 centering rings from the EM-710 package as shown in Fig.1A. Modify one of the two rings as shown in Fig. 1B. Make the “V” notches large enough to allow the Kevlar thread to pass through without binding.

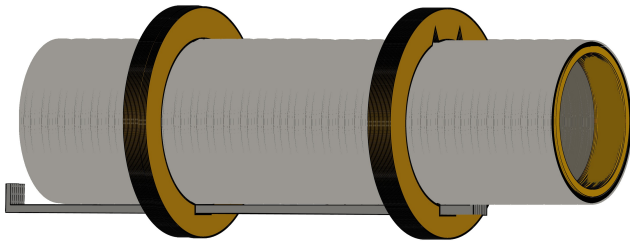


Figure 2

- **Step 2** Assemble the EM-710 following the Semroc assembly sheet but without glue, using the “V”-notched ring as the forward ring. The flat notches should align over the motor hook. See Fig. 2.

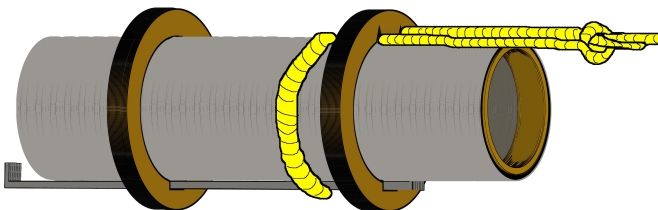


Figure 3

- **Step 3** Tie a knot about 5” from one end of the Kevlar thread. From the front of the forward ring, as shown in Fig. 3, push the short end of the thread through one of the “V” notches. Loop the thread around the mount, and push the tip of the thread through the other “V” notch from the back.

Tie a slip knot with the short end of the thread around the long end, forward of the first knot, then pull the knots together to form a double-leg harness. Push the loop up against the back of the forward ring. Make sure all of the mount pieces are in their proper places, then apply glue to all of the joints, including the thread on the back of the forward ring. Apply thinned glue to the knots in the thread, to keep them from coming apart. Set this subassembly aside to dry completely.

- **Step 4** Give the entire body tube a light sanding with 220-grit paper to remove the shine from the surface. Do not sand through the outer layer of paper.
- **Step 5** Using the Forward Fin Alignment Guide, mark the body tube for six fins and a launch lug.

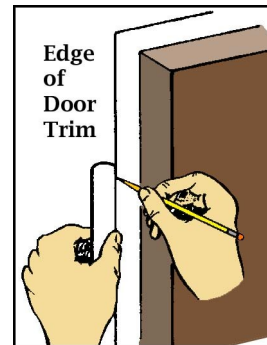


Figure 4

- **Step 6** Extend the fin lines the full length of the body tube, and extend the lug line up from the bottom of the tube to a distance of 6". Use the straight edge of a door trim as a guide, as shown in Fig. 4. Mark the six fin lines at locations 2.375", 8", and 9.5" from the bottom of the tube. Mark the lug line 3" and 5" from the bottom of the tube.
- **Step 7** Using an artist’s brush, apply a layer of thinned glue to the alignment lines as follows: [1] Along the fin lines, from the bottom of the tube up to the 2.375" marks; [2] Along the fin lines, from the 8" marks up to the 9.5" marks; [3] Along the lug line, from the 3" mark to the 5" mark. Allow to dry.

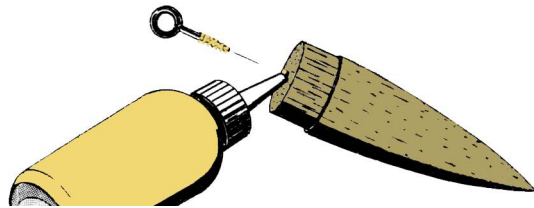


Figure 5

- **Step 8** As shown in Fig. 5, thread the screw eye into the center of the base of the nose cone, then remove the screw eye. Apply construction glue into the screw eye hole, and onto the screw eye threads. Reinsert the screw eye into the hole, but do not wipe away the excess glue. Allow to dry.
- **Step 9** Cut six (6) main fins from 3/32" sheet stock, and six (6) forward fins from 1/16" sheet stock. Give only the surfaces a gentle sanding with 220-grit paper.

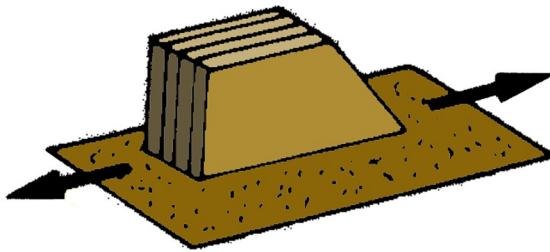


Figure 6

- **Step 10** Gently round over the leading and trailing edges of all fins; do not round over the root edges or the tip edges. Square up the root edges so that they will be flat to the body tube when attached. See Fig. 6.
- **Step 11** Apply a layer of thinned glue to the root edges of the fins, and along the full length of the launch lug, using the artist's brush. Allow these to dry.
- **Step 12** Copy the two (2) Fin Alignment Guides to a piece of cardstock, or a piece of cardboard, then remove the area inside the lines. Separate the guides into individual pieces. Trim off the points at the base of each fin to prevent glue from attaching to the guide later.

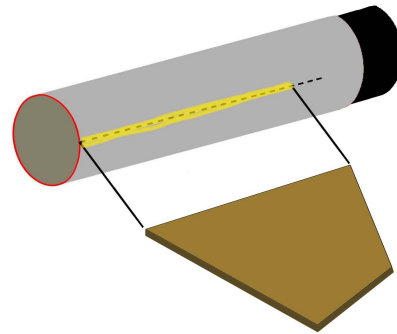


Figure 7
(Not actual model shown.)

- **Step 13** Apply a bead of full-strength glue to one of the fin alignment lines, between the bottom of the tube and the 2.375" mark, and a similar bead to the root edge of a fin. Attach the fin to the body as shown in Fig. 7. With the artist's brush slightly wet, smooth down the glue that has squeezed out from the joint to form a small fillet. Do not over-wet this area! Slide the alignment guide down over the tube, and carefully insert the fin through one of the slots. The guide will hold the fin in its correct position while the glue dries. When dry, remove the guide and repeat this step for each of the other main fins.
- **Step 14** Using the same procedure in step 14, attach the small canard sub-fins to the body tube between the 8" and 9.5" marks on the fin alignment lines.
- **Step 15** Attach the launch lug to the body tube in the same manner as the fins, along the lug alignment line, between the 3" and 5" marks.
- **Step 16** After all of the glue from steps 13-15 has dried for at least a day, apply a fillet of full-strength glue along the root edges of each fin, both sides, and along both sides of the launch lug where it contacts the body tube. This will reinforce the most critical joints on the model and reduce the chances for losing something during launch or landing.

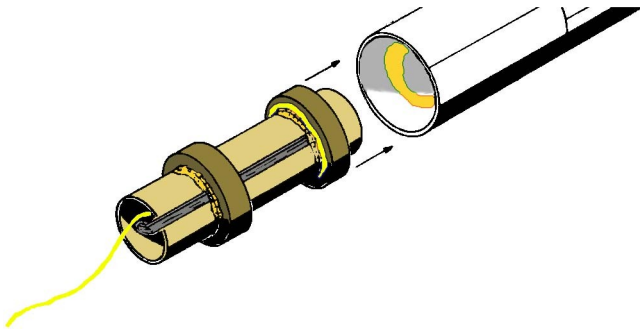


Figure 8

- **Step 17** Push the Kevlar thread down through the center of the EM-710 mount from the front and pull tight. Apply a bead of full-strength glue inside the body tube at the rear, about 1.5" up, as shown in Fig. 8. Insert the front end of the mount into the bottom of the body tube and push forward with a smooth, continuous motion until the bottom of the motor tube is even with the bottom of the body tube. Do not stop during this process, or the mount will 'freeze' in the wrong place. Allow to dry.

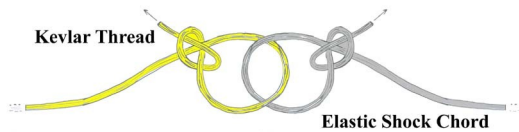


Figure 9

- **Step 18** Loosen the free end of the Kevlar thread and push the thread back through the motor mount, through the body tube, and out the top end. Tie a slip-knot loop in the free end, as close to the end of the thread as possible. Push one end of the elastic shock chord through this loop, as shown, and tie a slip-knot loop in it. See Fig. 9. Pull the two knots tightly together, and coat the knots with thinned glue. Allow to dry.
- **Step 19** Attach one of the snap links to the free end of the elastic shock chord. Assemble the parachute according to the Semroc instruction sheet, except attach the shroud lines to the other snap-swivel instead of to the screw eye in the base of the nose cone. Attach the shock chord snap-link on the shock chord to the nose cone screw eye, but do not attach the parachute at this time.

- **Step 20** Fill the grain of the balsa nose cone and fins with a surfacing treatment of your choice. We currently recommend Elmer's Fill-N-Finish, thinned to a cream-soup consistency and brushed into the grain of the wood. Remember to coat both sides of each fin when using this product, as the water content will tend to warp the wood if only applied to one side. Allow this to dry for 24 hours before sanding with 220-grit paper, and do not sand into the wood. If deep gouges are present in the wood, a second application may be needed. Finish this sanding with a dry 400-grit paper.
- **Step 21** Using both 220-grit and 400-grit paper, give the entire model a gentle final sanding, then use a tack rag to remove the dust in preparation for priming.
- **Step 22** Use a good sprayed primer over the entire model. We currently recommend Rust-O-Leum Clean Metal Primer in white, applied with an airbrush or spray gun. Do not over-thin this product. After allowing at least 24 hours for this to dry, examine the primed surface for voids or other imperfections such as the tube spiral. If found, give the model additional applications of primer before starting to sand with 400-grit paper. Tack rag the model after sanding and examine again. Repeat this prime-and-sand process until all imperfections are hidden and you have a glass-smooth surface. Do a final spray-and-sand using 600-grit paper to polish the surface in preparation for color coats.
- **Step 23** The choice of paint scheme is left up to you, but we recommend a white body, gloss black for the fins, and metallic copper for the nose cone. The decals will provide the remaining trim colors. Spray the model in a consistent manner, as shown in Fig. 10 below, always in the same direction, top to bottom. Give the entire model a coat of white as a base color. When applying trim colors, spray the nose cone separately, but use the same method. Do not use heavy coats, but multiple light coats, building up

layers of color. Give the main color at least 48 hours to cure before attempting to mask off for the trim.

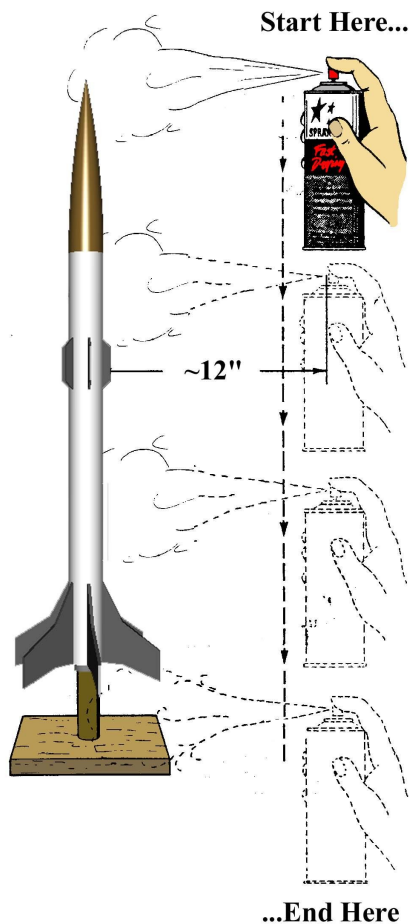


Figure 10

- **Step 24** After the final color coat has dried for several days, spray a clear gloss acrylic coat over the entire model in the same manner as shown in Fig. 10. Give this a day to fully cure, then apply the decals shown at the front of these instructions.
- **Step 25** Referring to the Decal placement guide on page 2, apply the decals in the following order and positions:

On an invisible line 180 degrees opposite to the launch lug, center the Arming Decal 3" from the bottom edge of the body tube. Center the LOX panel decal 4.75" from the bottom edge. Center the Fueling Panel decal 10.25" from the bottom

edge.

On an invisible line 1" to the left of the first decal line, center the Name decal 6" from the bottom edge of the tube.

Apply the center of the separator line around the body tube 1.25" down from the top edge of the body tube.

On an invisible line drawn around the body tube 0.75" from the top edge of the tube, at locations 180 degrees apart, and 90 degrees to either side of the first invisible line drawn for the panel decals, apply the centers of the Avionics panel decals.

There is no specific placement for the logo decals. Use these as you wish.

When the decals have dried completely, give the model another coat of the acrylic clearcoat to seal the decals and protect them from flight hazards.

Pre-Flight Assembly Steps

- **Step 26** Attach the parachute snap link to the nose cone screw eye only when you are ready to fly. Never store a parachute inside the body tube.

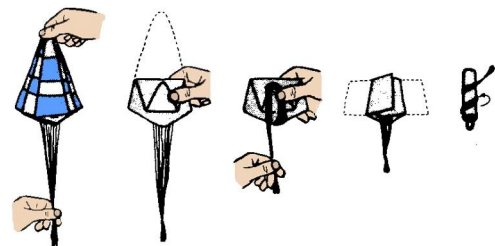


Figure 11

- **Step 27** Use the illustration in Fig. 11 to correctly fold the parachute prior to each flight. In cold climates, or during winter months, lightly dusting the parachute with fine talcum powder will help the chute open.

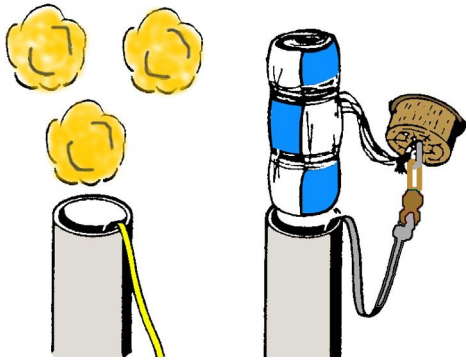


Figure 12

Developed for BARCLONE Rocketry
by C. P. McGraw

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by C. P. McGraw

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- **Step 28** As shown in Fig. 12, insert about 2” of your preferred flameproof recovery material into the top of the body tube, pushing with a pencil or a wood dowel until it is just above the motor mount. We prefer shredded cellulose insulation over the more traditional wadding sheets. **DO NOT PACK THIS MATERIAL TIGHTLY!** This material has to blow out with the parachute and the shock chord to ensure complete deployment. It is meant to provide a protective gas seal between the motor and the parachute. If it is too tight in the tube, you will suffer recovery failure and likely a damaged model.

- **Step 29** For the first flight, we recommend the venerable A8-3. This is a workhorse of an engine, and you will probably use it more often for general flying than any other motor. While it will not give you the highest altitude with this model, you will likely get the model back every time when you fly with it. Wrap a layer of masking tape around the middle of the motor before inserting it into the motor mount. This will reduce the chances of recovery system failure.

Recommended engines:

A8-3 (First flights)

B4-4

C6-5

- **Step 30** Review the Model Rocketry Safety Code, and then go enjoy your new model!

Model Rocket Safety Code

Materials: I will use only lightweight, non-metal parts for the nose cone, body, and fins of my rockets.

Motors: I will use only certified, commercially-made model rocket motors, and will not tamper with these motors or use them for any purposes except those recommended by the manufacturer.

Ignition System: I will launch my rockets with an electrical launch system and electrical motor ignitors. My launch system will have a safety interlock in series with the launch switch, and will use a launch switch that returns to the "off" position when released.

Misfires: If my rocket does not launch when I press the button of my electrical launch system, I will remove the launcher's safety interlock, or disconnect its battery, and will wait 60 seconds after the last launch attempt before allowing anyone to approach the rocket.

Launch Safety: I will use a countdown before launch, and will ensure that everyone is paying attention and is a safe distance of at least 15 feet away when I launch rockets with "D" motors or smaller, and 30 feet when I launch larger rockets. If I am uncertain about the safety or stability of an untested rocket, I will check the stability before flight and will fly it only after warning spectators and clearing them to a safe distance.

Launcher: I will launch my rockets from a launch rod, tower, or rail that is pointed to within 30 degrees of the vertical to ensure that the rocket flies nearly straight up, and I will use a blast deflector to prevent the motor's exhaust from hitting the ground. To prevent accidental eye injury, I will place launchers so that the end of the launch rod is above eye level or I will cap the end of the rod when it is not in use.

Size: My model rocket will not weigh more than 1,500 grams (53 oz) at liftoff, and will not contain more than 125 grams (4.4 oz) of propellant or 320 N-sec (71.9 lb-sec) of total impulse. If my model weighs more than one pound (453 grams) at liftoff, or has more than four ounces (113 grams) of propellant, I will check and comply with Federal Aviation Administration (FAA) regulations before flying.

Flight Safety: I will not launch my rockets at targets, into clouds, or near airplanes, and will not put any flammable or explosive payload into my rockets.

Launch Site: I will launch my rockets outdoors, in an open area at least as large as shown below, and in safe weather conditions with winds speeds no greater than 20 MPH. I will ensure that there is no dry grass close to the launch pad, and that the launch site does not present risk of grass fires.

LAUNCH SITE DIMENSIONS

Total Impulse (nSec)	Motor Size	Minimum Field Size
<i>0.00 – 1.25</i>	<i>1/4A – 1/2A</i>	<i>50'</i>
<i>1.26 – 2.50</i>	<i>A</i>	<i>100'</i>
<i>2.51 – 5.00</i>	<i>B</i>	<i>200'</i>
<i>5.01 – 10.00</i>	<i>C</i>	<i>400'</i>
<i>10.01 – 20.00</i>	<i>D</i>	<i>500'</i>
<i>20.01 – 160.00</i>	<i>E, F, G</i>	<i>1000'</i>
<i>160.01 – 320.00</i>	<i>2G</i>	<i>1500'</i>

Recovery System: I will use a recovery system, such as a streamer or parachute, in my rockets so that they return safely and undamaged and can be flown again, and I will use only flame-resistant or fireproof recovery system wadding in my rockets.

Recovery Safety: I will not attempt to recover my rocket from power lines, tall trees, or other dangerous places.

Model Rocket Safety Code
developed by the
National Association of Rocketry
Revised Code November, 2004