

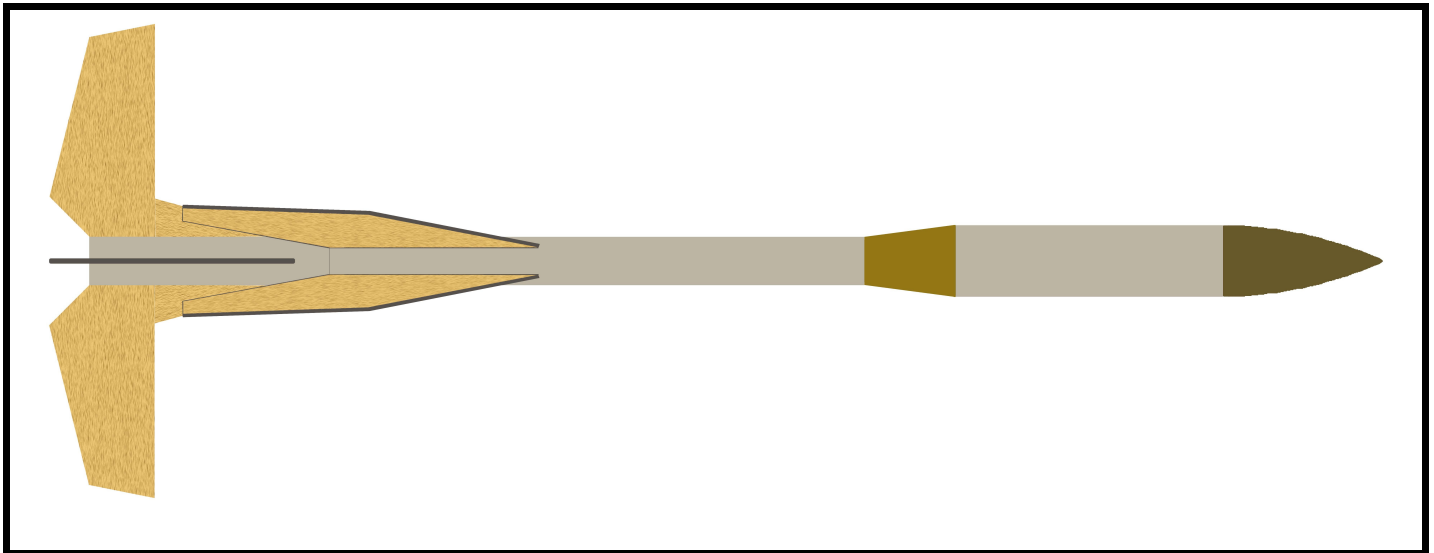


Skill Level 2

Centuri Probe

Created By C. P. McGraw

Revision Date: Mar 10, 2005



Length	24.95"
Diameter	1.340"
Fin Span	8.908"
Weight	2.0 oz

Parts List

Nose Cone.....	BC-1330
Booster Body Tube.....	ST-845
Sustainer Body Tube.....	ST-8100
Payload Body Tube.....	ST-1380
Coupler.....	HTC-8
Engine Mount.....	(2) EM-78
Fin Stock.....	1/8" Balsa Sheet
Launch Lug.....	1/8" x 2.25"
Parachute.....	(2) CPK-12
Shock Chord.....	SC-24
Shock Chord Mount.....	SCK-24
Screw Eye.....	.1"
Snap Links.....	(3) #12

Additional Items Required

Small bottle of yellow carpenter's glue; sharp hobby knife; 0.05mm pencil; steel ruler; sheets of 220-, 400-, and 600-grit sanding papers; lightweight filler compound; tack rag; sprayable primers, paints, and Acrylic gloss clear coat; small, soft-bristle hobby brushes; various clamps and weights; one expended motor casing.

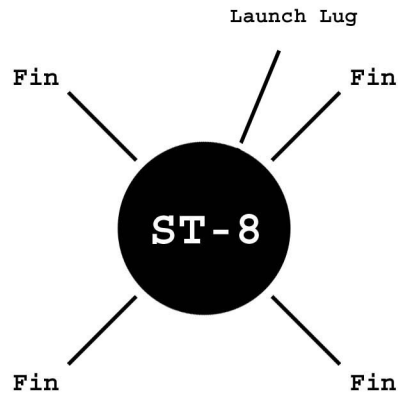
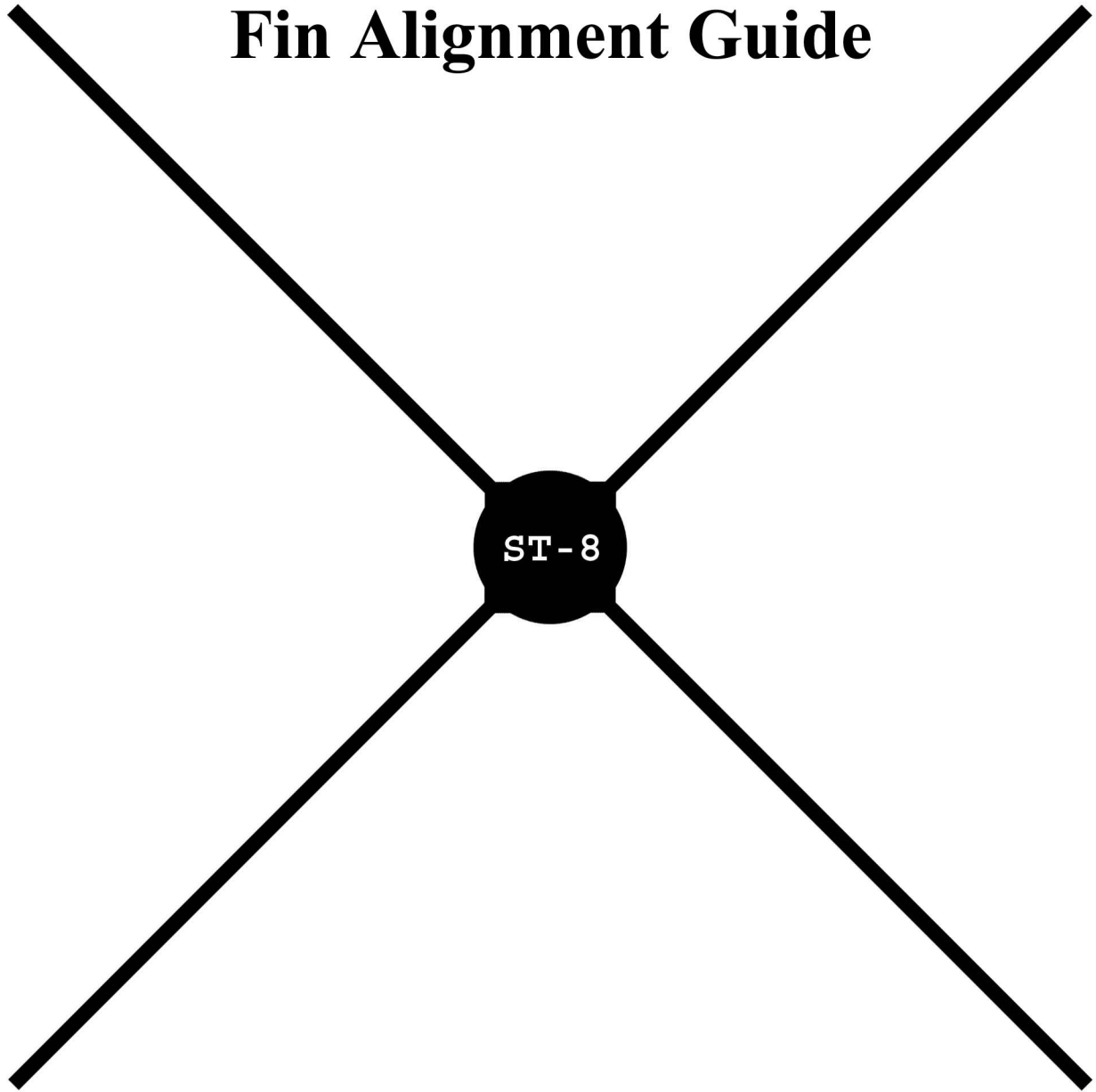
It is also recommended that you have a personal copy of **The Model Rocketry Handbook, Seventh Edition**, by G. Harry Stine and Bill Stine. Read and understand the sections on Construction, Recovery, and Safety.



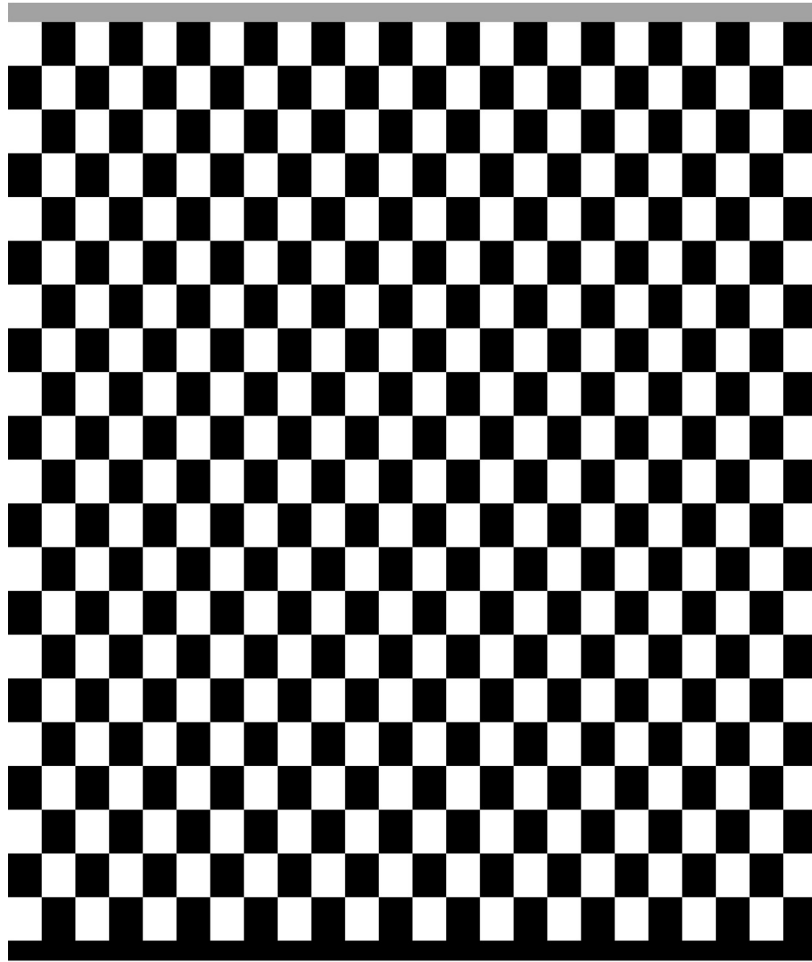
Launch Lug Standoff

Full Size Fin Patterns
Make 4 each from 1/8" balsa sheet

Fin Alignment Guide



Fin & Launch Lug Locater Guide



Centuri Probe
Centuri Probe

Full Size Decal Images

Print on clear or white decal paper

----- **Assembly Instructions** -----

- **Step 1** Print out the alignment guides and the fin templates onto cardstock. The patterns are full-size, and require no tweaking to be usable. Attach the alignment guides to pieces of shirt cardboard using 3M 77 Spray Adhesive, as the size of the guides may require additional stiffness. Cut out the solid black areas of the alignment guides using a fresh hobby knife and a steel ruler.
- **Step 2** Cut the ST-1380 payload body tube down to 5", and square up the cut edge. Give all of the body tubes a gentle sanding with 220-grit paper to completely remove the shine from the surfaces. Do not sand through the outer layer of paper. Also, sand the main body of the nose cone and the transition to remove the fuzziness caused by humidity- and temperature-swelling of the grain. Do not try to re-shape the nose cone or the transition. Check the fit if the shoulders in their respective body tubes, and if the fit is too tight, reduce the diameters **carefully** by compressing them between a heavy block and the work surface, rolling the part slowly, until the whole diameter is reduced. If the fit is too loose, use strips of self-adhesive label material to build up the diameter.

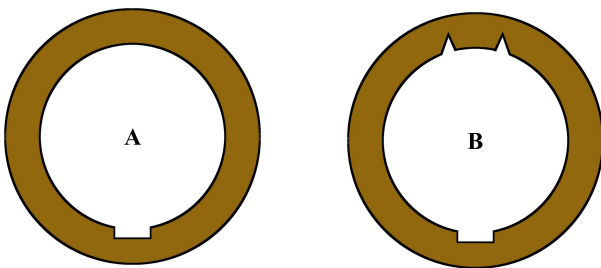


Figure 1

- **Step 3** Modify all four of the CR-78 centering rings as shown in Fig. 1A. Take one of these rings and modify it as shown in Fig. 1B. The "V" notches should be large enough to allow the Kevlar thread to pass

through during assembly of the mounts.

- **Step 4** Transfer the outlines of the fin pieces to 1/8" sheet balsa. Cut these out using the knife and the steel ruler. Square up the booster fins and the leading edge strakes at the locations where they will be joined, but do not round the other edges at this time. Assemble the booster fin pieces as shown in Fig. 2, using clamps and weights to keep the pieces aligned while the glue dries. Note the grain direction of the launch lug standoff. Round over **only** the leading and trailing edges of the standoff; square up the root edges (the edges that attach to the body tube and to the lug).

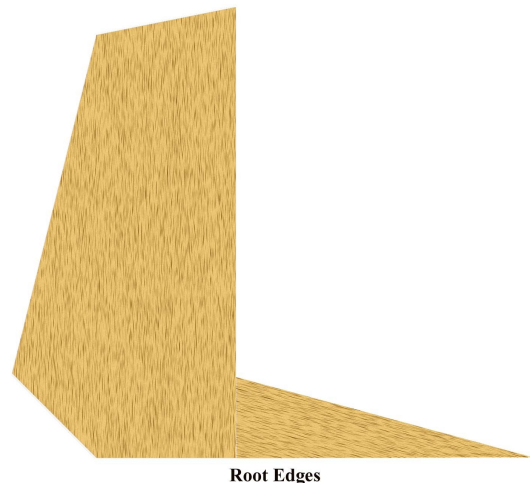


Figure 2

- **Step 5** Dry-assemble the two EM-78 engine mount kits as shown on the SEMROC instruction sheets. Use the ring with the two "V" notches as the forward ring of the sustainer mount. The flat notches slide over the engine hooks to prevent the motor tube from being offset from the centerline. See Fig. 3.

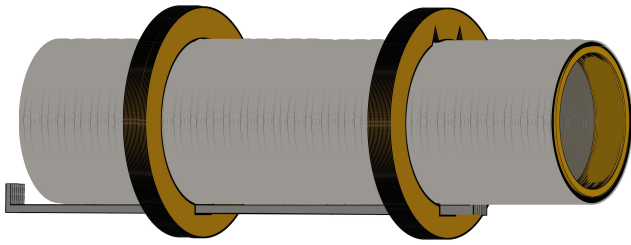


Figure 3

- Step 6** Tie a knot about 5" from one end of the Kevlar thread. As shown in Fig. 4, push the short end of the line through one of the "V" notches from the front, wrap the line around the middle of the mount, and push it through the other "V" notch from the back. Tie the short end of the thread around itself on the long side of the knot. Pull the slack out of the loop, pushing the loop against the back of the forward ring, and even out the two lengths of line on the short side of the knot, so that there is even tension when the parachute is deployed. Finish the assembly of both mounts with glue at this time and set aside to dry.

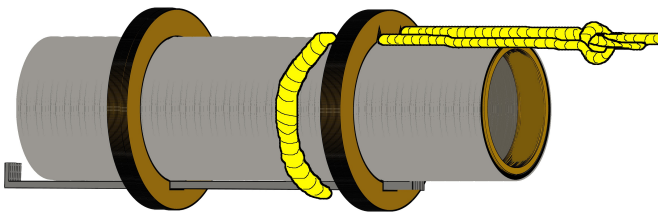


Figure 4

- Step 7** Round over all of the **outer edges** of the fins, except for their root edges. Stack each set of fins together and square up the root edges, as shown in Fig. 5.

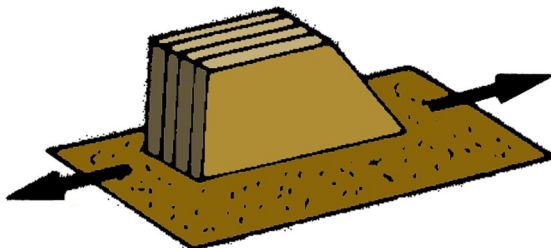


Figure 5

- Step 8** Apply a thinned layer of glue to the root edges of all fins and the launch lug standoff, and set aside to dry.

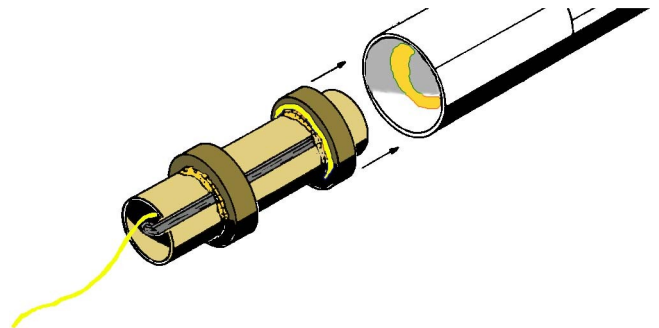


Figure 6

- Step 9** Apply a generous bead of glue around the inside of the ST-845 booster body tube, about 1" up from the bottom edge. Spread this around with a soft-bristled hobby brush. Insert the booster engine mount (the one without the Kevlar thread) into the tube from this end, in the manner shown in Fig. 6, and push with one continuous motion until the bottom of the motor tube is even with the bottom of the booster body. Do not stop pushing until the tubes are level, otherwise the glue will "freeze" the mount in the wrong place. Set this aside to dry in a vertical attitude, top-edge-up.

- Step 10** Likewise with the sustainer engine mount (the one **with** the Kevlar thread), apply glue about 1" up inside the bottom of the sustainer body tube, and spread the glue around with the brush. Run the Kevlar thread down through the center of the mount, and insert the mount as shown into the bottom of the sustainer body, pushing with one motion until the bottoms of the tubes are even. Allow to dry.

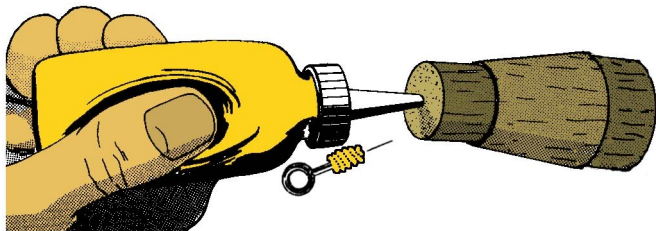


Figure 7

- **Step 11** Use the threads on the screw eye to cut a matching hole in the small shoulder end of the BTR-813. As shown in Fig. 7, force glue into the hole and coat the threads of the screw eye, then rethread the screw eye into the hole. Do not wipe away the excess glue. Allow the blob of glue about two hours to fully cure, with the transition in a vertical attitude, small end up.

- **Step 12** Mark the booster body tube for four fins, and mark the sustainer body tube for four fins and the launch lug, using the Fin & Launch Lug Locator Guide. Carefully note the offset position of the launch lug, to allow clear passage of the launch rod between the sustainer and booster fins. Draw a line around the top end of the booster tube, about 0.75" from the edge. Locate two points on this line 180 degrees apart, halfway between two fin alignment lines. Use a 0.25" diameter hole punch to cut a hole in the booster body at each of these locations. Refer to the [Handbook](#) in the chapter covering Multi Staged models for a complete explanation of this procedure.

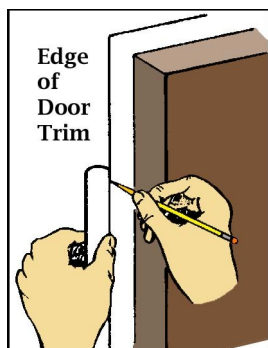


Figure 8

- **Step 13** Using the trim around a door as shown in Fig. 8, or a length of brass angle stock, extend the marks from Step 12 to create the alignment lines. The booster fins should extend 4" from the rear edge of the booster tube. The sustainer fins should extend 4" from the rear of the sustainer tube. The bottom of the launch lug standoff should be located 3" from the bottom edge of the sustainer tube, with the top of the lug 5.25" from the bottom edge. Apply a layer of thinned glue along these lines and set both tubes aside to dry.

- **Step 14** Assemble the two parachutes according to the SEMROC instructions, then attach the shroud lines of each parachute to the barrel end of one of the three snap links (one link to each parachute).

Bead of glue 1/4" down, inside top of booster body

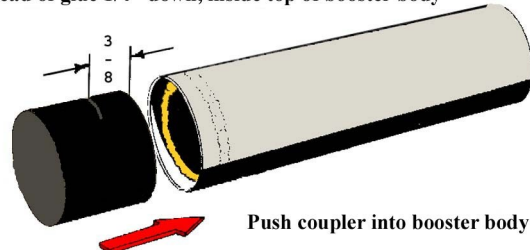


Figure 9

- **Step 15** Mark the HTC-8 coupler 3/8" from one edge, as shown in Fig. 9. Apply a 1/4" wide bead of glue around the inside of the top end of the booster tube, and insert the short side of the coupler into the top of the tube. Make sure the coupler is aligned in the tube straight, and not with any angle off-center.

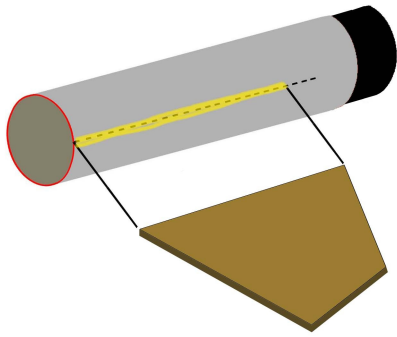


Figure 10
(Not the Centuri Probe shown)

- **Step 16** Apply a bead of full-strength glue to the root edge of a booster fin, and to the booster body tube along one of the alignment lines. As shown in Fig. 10, press the fin against the tube, with the trailing edge touching the tube edge, and hold the fin in place for about 12 seconds before releasing. Use a moist, soft-bristled hobby brush to smooth out the glue that squeezes out from the joint and to form the initial fillet. Slide two booster fin alignment guides over the tube, and adjust the fin gently to fit into one of the slots. Separate the guides about 1.5" apart, and allow the fin 20 minutes to dry before removing them. Repeat this sequence for each of the remaining three booster fins.

- **Step 17** Similar to the method used in Step 16, apply a bead of full-strength glue to the root edge of a sustainer fin, and to the sustainer body tube along one of the alignment lines. As shown in Fig. 11, press the fin against the tube, with the trailing edge touching the tube edge, and hold the fin in place for about 12 seconds before releasing. Use a moist, soft-bristled hobby brush to smooth out the glue that squeezes out from the joint and to form the initial fillet. Slide two sustainer fin alignment guides over the tube, and adjust the fin gently to fit into one of the slots. Separate the guides about 2" apart, and allow the fin 20 minutes to dry before removing them. Repeat this sequence for each of the remaining three sustainer fins. Finally,

attach the launch lug standoff and launch lug to the sustainer body tube between the marks on the launch lug alignment line.

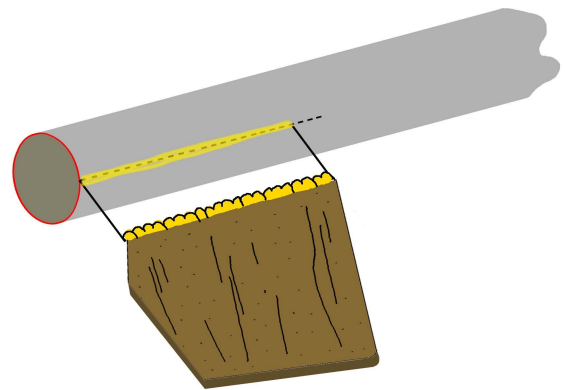


Figure 11
(Not the Centuri Probe shown)

- **Step 18** As shown in Fig. 12, tie a slip knot loop in the free end of the Kevlar thread. Insert one end of the shock chord elastic through this loop, and tie a matching slip knot loop in it, trapping the Kevlar thread. Pull these two knots tightly against each other, and secure the knots with a layer of thinned glue. Allow to dry, then push all of the recovery line back through the engine mount, through the body tube, and out the top end. Tie the free end of the elastic chord to the barrel end of the remaining snap link. Push all of this back into the body tube in preparation for the final steps.

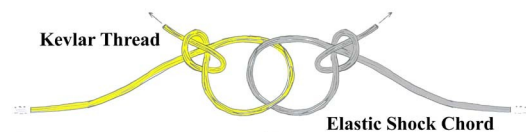


Figure 12

- **Step 19** When all of the glue has dried from the previous steps, give the model a careful sanding with 220-grit paper to remove any sharp imperfections in the surface. Tack-rag the model, then apply a bead of full-strength glue to both sides of each fin-to-body joint, and to both sides of the launch lug standoff-to-body joint,

smoothing the glue down with your finger to form the final fillet. Allow to dry.

- **Step 20** Apply a lightweight wood filler compound to the exposed grain of the fins, transition, and the nose cone. Our current preference for this filler is *Elmer's Fill-N-Finish*, thinned with water to a consistency of cream soup, and applied with a wide (1/4" to 3/8") hobby brush. Coat all of the body tube as well to fill the spiral groove, and allow a full day to dry before sanding with 220-grit paper. Inspect the model after sanding for any remaining exposed wood grain, and reapply filler to those areas, let dry, and sand again. Repeat this sequence as needed until all areas have been properly coated. Tack-rag the model after each sanding to remove any dust.
- **Step 21** The illustration in Fig. 13 shows the correct method for spraying your model, regardless of the equipment used. Keep the tip about 12" away from the model, and use a top-to-bottom spray pattern – **never** spray from side-to-side, or from bottom-to-top – to avoid runs in the spray. Use this technique for applying primer, paint, or the gloss coats.

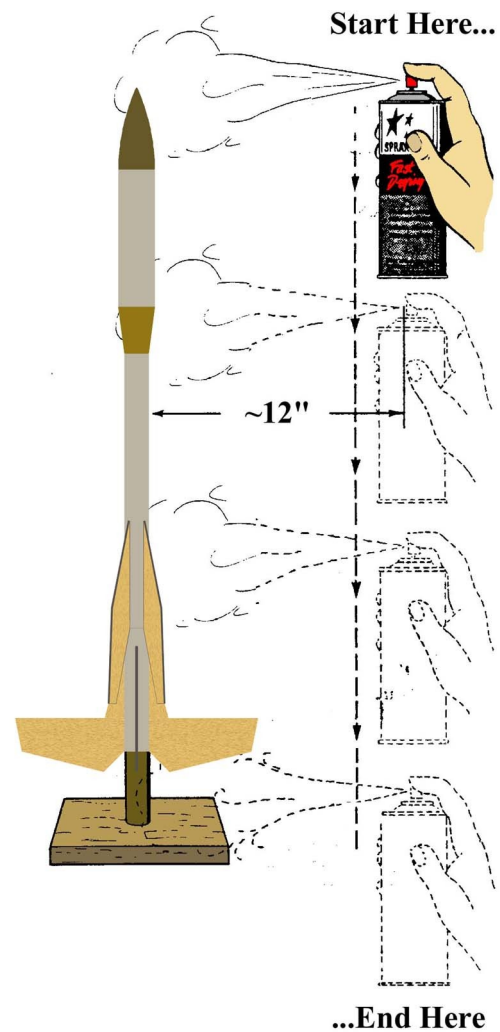


Figure 13

- **Step 22** Apply at least two complete coats of primer to the model, allowing time after each coat to fully dry, before sanding with 220-grit paper. Our preference of primers is *Rust-O-Leum White Clean Metal Primer*. Do not sand through the outer layer of the tubes. Continue applying primer, sanding between coats, until the surfaces are free of blemishes and scratch marks. Tack-rag the three pieces after each sanding to remove any residue.
- **Step 23** The suggested color scheme is a white overall with alternating red (or black) and white fins. The payload transition should be painted silver, and the nose cone should be painted red. We recommend

painting these separately, using scraps of body tubes to protect the shoulder areas from being hit with paint. Allow at least two days drying time for each layer of color before applying the next trim color.

- **Step 24** When the color coats have dried at least two days, or until there is no longer a smell of solvent (in the case of spirit-based enamels), spray the entire model with a coat of *gloss* clear Acrylic. We have used numerous brands of this product, from several manufacturers such as *Krylon* and *Valspar*. This will provide a smooth base to apply decals (if desired). Allow to dry completely (at least one full day).

- **Step 25** Print the decal patterns onto either clear or white decal paper, and apply **three** coats of the gloss clear Acrylic to build up the thickness. You will need this thickness to keep the decal from tearing when you apply it to the tube – it is a large decal. Apply these to the model according to the instructions provided by the decal paper manufacturer. The checkerboard decal has been sized to the diameter of the ST-13 payload tube, but you should print a test copy on plain paper to see how well the image matches. There should not be an excessive amount of overlap, but a little is OK. Use your own graphics program to enlarge or reduce the size [H or V] gradually until the image fits correctly. The silver (or gray, depending on your printer's capability) band goes at the top, and the black band goes at the bottom. The double band of silver goes at the top of the sustainer tube, about 1" down from the edge. The name decal should be located on the side of the tube roughly opposite from the launch lug, but aligned halfway between two fins, and about halfway down the length of the tube. When dry, gently wipe away any adhesive residue with a soft cloth. Finally, spray the model again with a coat of the gloss clear Acrylic to seal the decals and to protect the finish. Allow to dry completely.

----- Flight Preparations -----

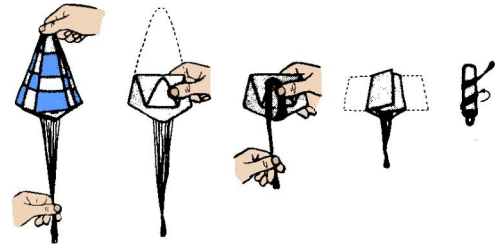


Figure 14

- **Step 26** Study the illustrations in Fig. 14 to see how to correctly fold the parachutes. Attach the snap links to the screw eye only when you are ready to fly. Do not store the parachutes in the body of the rocket between flights. In cold climates, or during winter months, you will find it helpful to give the parachutes a light dusting of talcum powder. This will help the parachutes open at deployment by keeping the plastic from sticking to each other, or to themselves.



Figure 15

- **Step 27** When packing the parachutes into the body tube, insert 4-6 crumpled sheets of Recovery Wadding, or at least 2" of shredded cellulose insulation, into the tube and lightly tamp it down until it is just above the motor tube. See Fig. 15. Do not pack this material tightly! The purpose is to provide a protective gas seal between the motor and the recovery device(s). Whichever material you choose, it must be able to come out at deployment, otherwise the recovery system will fail and the model

will crash.

- **Step 28** We recommend the A8-5 engine for the sustainer on your first two-stage flights, and the B6-0 for the booster. Unfortunately at this time, there are no “A” series boosters to work with. When you are comfortable with the flight profile of this configuration, you can begin using the B4-6 or B6-6 sustainer engine for higher altitudes.

*Developed for BARCLONE Rocketry
by C. P. McGraw*

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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 it’s 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