BARCLONE
Rocketry Products

Skill Level 1

Midi-Loader

Designed By Jay Goemmer

Revision Date: January 6, 2006

Length:	**21.66”**
Diameter:	**1.33”**
Fin Span:	**6.38”**
Weight:	**1.65 oz**

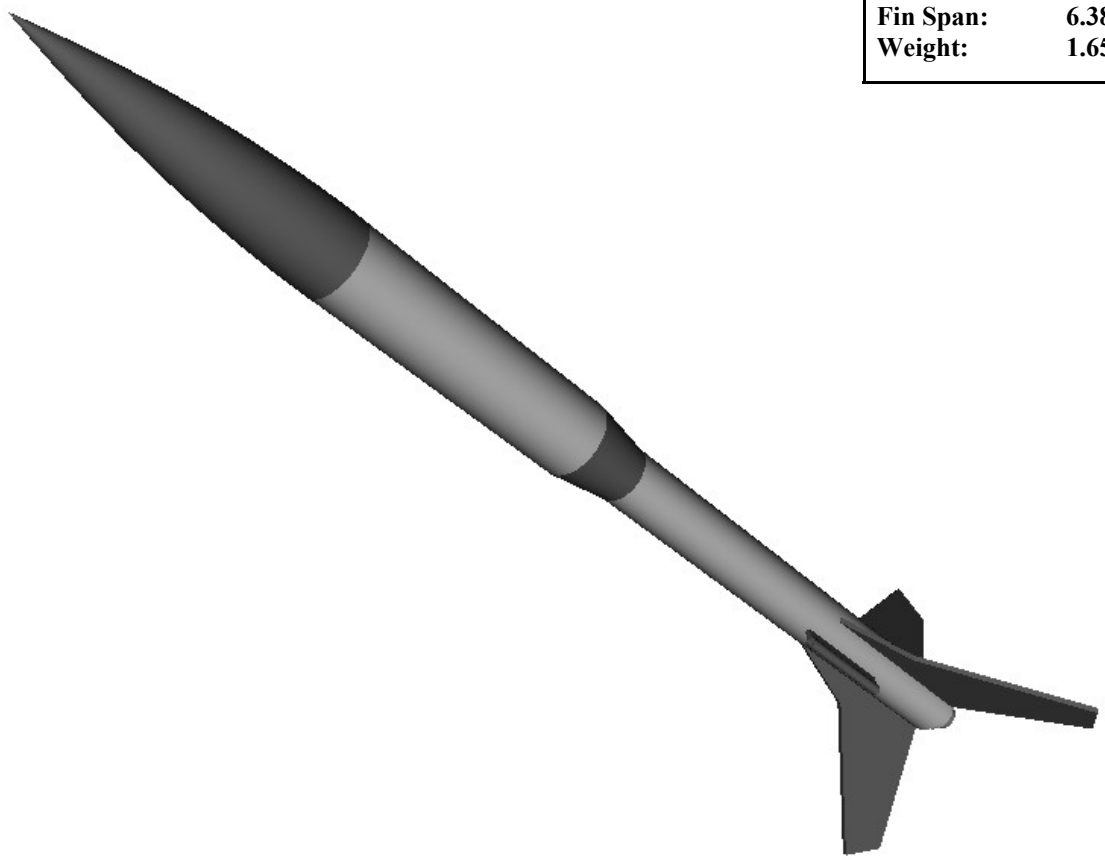


Image created with RockSim 8

Main Parts List

Nose Cone.....PNC-55AC	Launch Lug.....LL-122
Payload Body Tube.....5″ BT-55	Standoff Stock.....3/32″ Sheet Stock
Main Body Tube.....9″ BT-50	Parachute.....CPK-14
Motor Tube.....BT-20J	Shock Chord.....SC-24
Centering Rings.....(2) CR-2050	Shock Chord Mount.....SCK-24
Thrust Block.....CR-520	Screw Eye.....SE-1
Fin Stock.....3/32″ Balsa Sheet	Snap Links.....(2) #12

Optional Parts

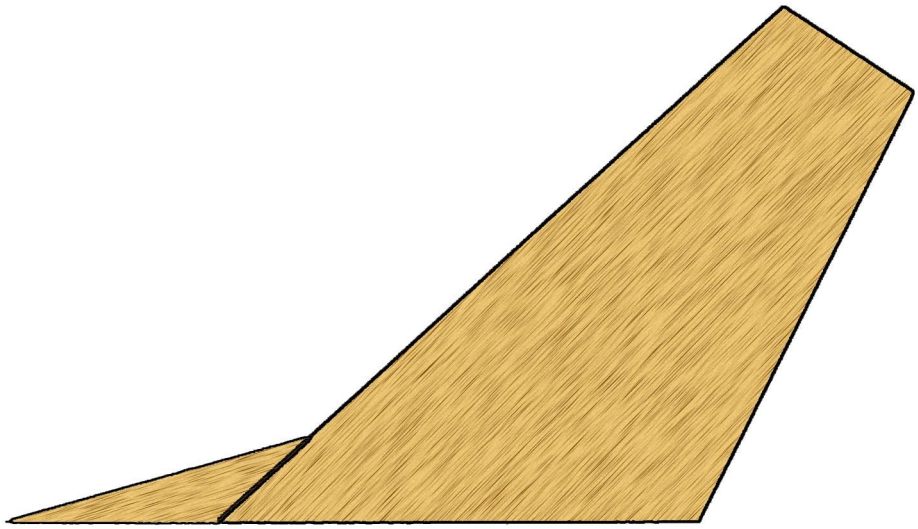
Gas Passage Tube.....2″ BT-5

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.

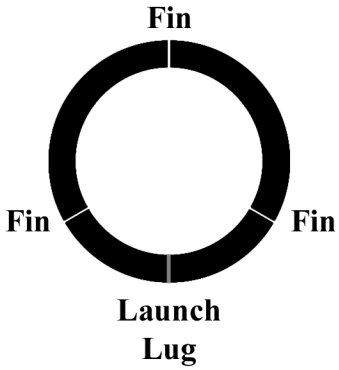
It is also recommended that you have a personal copy of The Model Rocketry Handbook, Seventh Edition, by G. Harry Stine and Bill Stine. Read and understand the sections on Construction, Recovery, and Safety.

Main Fin & LE Extension Templates

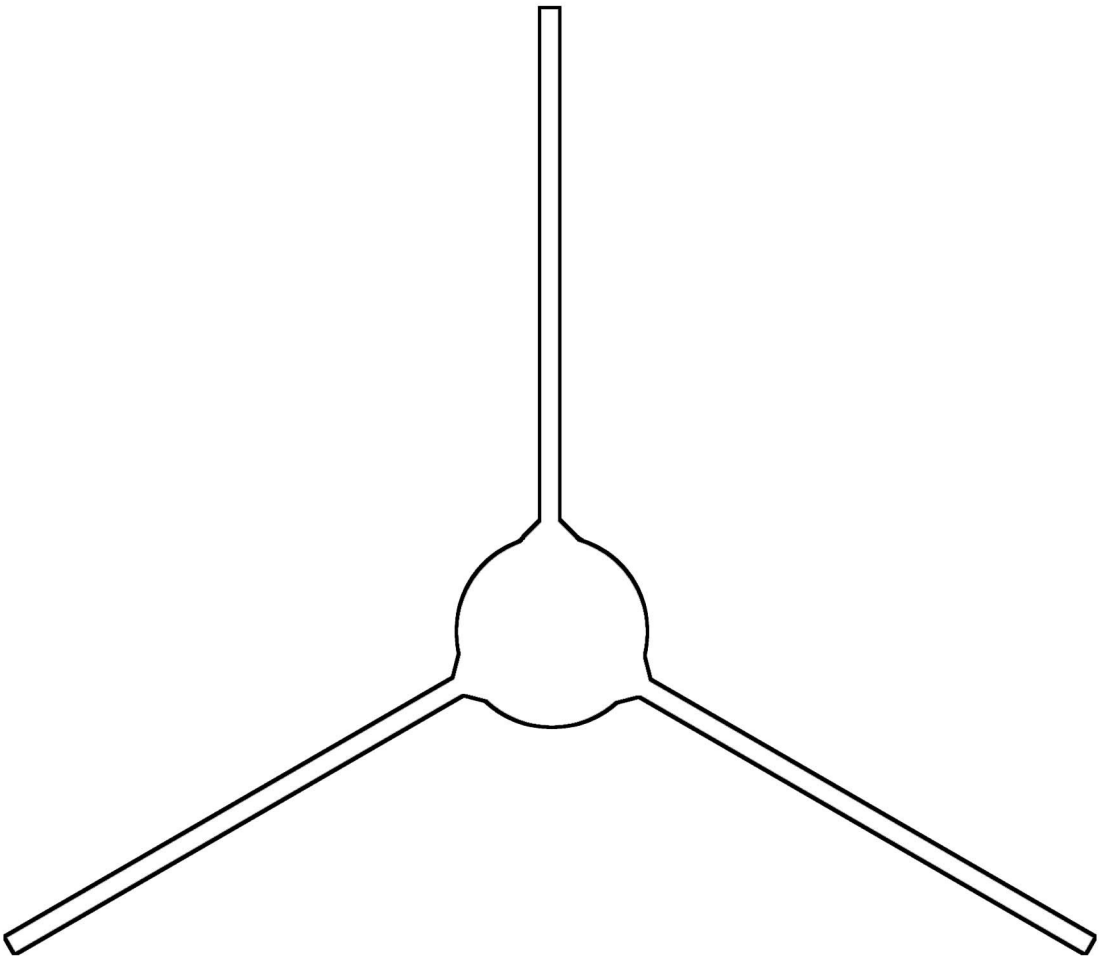


Make 3 each from 3/32" balsa sheet

Fin Locater Guide



Fin Alignment Guide



Cut from 0.05” fiberboard, or multiple layers of cardstock

Launch Lug Standoff Template

Take note of grain direction when cutting from 3/32” sheet balsa.

Read This First

The BARCLONE MIDI-Loader can be built either as a traditional payload-capable booster, or as a non-payload sport flyer. The sport version carries the parachute in the larger compartment above the transition, while the payload version follows the more traditional method of separating the body at the bottom of the transition. Performance with both versions is nominally the same when the payload version carries no load. There is a degree of added construction difficulty when built as the sport version which will require additional skills with a motorized grinding tool. You should give consideration to this before starting construction.

General Assembly Sequence

- **Step 1** Give the body tubes a complete sanding with 220-grit paper to remove the shine from the surface. This roughens up the finish to allow glue, filler, and primer to adhere better.

- **Step 2** Test fit the nose cone and the transition into the body tubes. If the fit is too tight, make adjustments to the shoulder diameters as needed. The shoulders should not be so loose that they fall out of the tubes when held inverted, but not too snug that it takes excessive effort to pull them out.

- **Step 3** Cut out the fin pieces and the launch lug standoff from the balsa sheet, using the template provided on pages 2 and 3. Pay close attention to the grain orientation. The standoff has the grain running perpendicular to the body tube. Give the surfaces a careful sanding with 220-grit to remove the fuzziness. Square up all of the edges at this time.

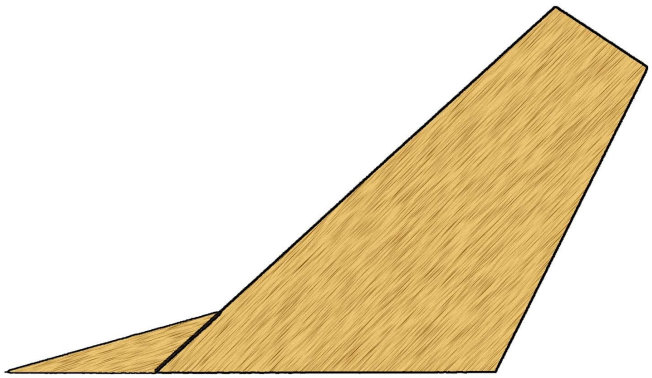


Figure 1

- **Step 4** Begin construction with the fin pieces. Apply a layer of glue to the contacting edges of a main fin and its associated leading edge extension. As shown in Fig. 1 above, arrange these pieces on a sheet of wax paper with the root edges aligned to each other. Pin or clamp these pieces in place until the glue dries.

- **Step 5** Carefully clean away the excess glue from the joints, then sand the joint area with 220-grit paper to level out the surface. Be careful not to gouge the balsa. Round over the outer edges of the fins with 220-grit and 400-grit paper. Do not sand the root edges. Stack the fins together, and apply a layer of thinned glue to the root edges. Allow this to dry completely.

Traditional Payload Version

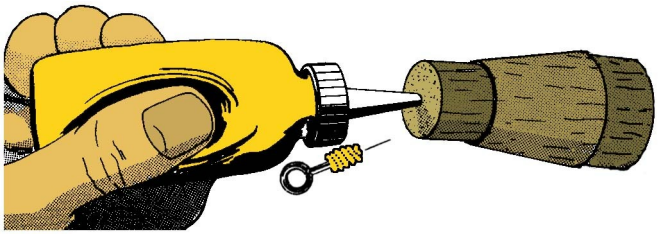


Figure T2

- **Step T6** As shown in Fig. T2, thread the screw eye into the small-diameter shoulder of the transition, then remove the screw eye. Force glue into the hole, and coat the screw eye threads. Reinsert the screw eye into the hole, but do not wipe away the excess glue. Allow to dry in an inverted position (screw eye upward).

Sport Version

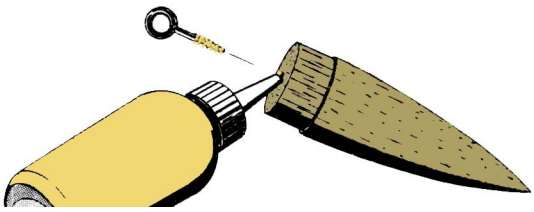


Figure S2A

- **Step S6-A** As shown in Fig. S2A, thread the screw eye into the shoulder of the nose cone, then remove the screw eye. Force glue into the hole, and coat the screw eye threads. Reinsert the screw eye into the hole, but do not wipe away the excess glue. Allow to dry in an inverted position (screw eye upward).

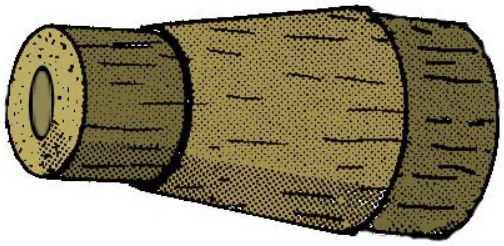


Figure S2B

- **Step S6-B** You will need to cut a hole through the center of the transition, as illustrated in Fig. S2B above. A motorized, hand-held grinding stone can make this job easier. Work slowly to prevent the stone from "walking" away from the centerline. The hole needs to be 0.55" diameter (just over 1/2").

- **Step S6-C** Apply glue with a soft brush completely around the inside of the hole you just cut, then slide the 2" BT-5 tube completely through, until the ends of the tube are even with the ends of the shoulders. Wipe away any excess glue that gets pushed out. This tube provides a smooth liner for the passage of the deployment gasses into the upper compartment.

Both Versions

- **Step 7** Glue the BT-55 payload body tube to the large-diameter shoulder of the transition, and allow to dry.

Motor Mount Subassembly

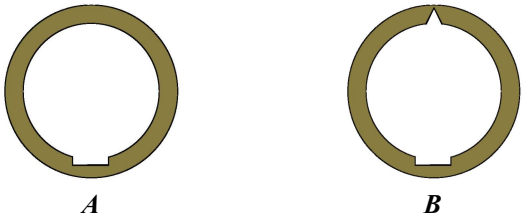


Figure 3

- **Step 8** Modify both of the CR-2050 centering rings as shown in Fig.1A. Modify one of the two rings as shown in Fig. 1B. Make the "V" notch large enough to allow the Kevlar thread to pass through without binding.

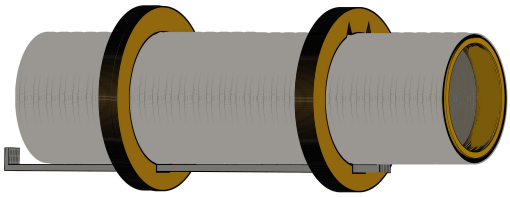


Figure 4

- **Step 9** Mark the motor tube at 1" and 2.5" from one end, and draw lines completely around the tube at these locations. Draw another line the full length of the tube. At the intersection of this line with the 2.5" line, cut a slot wide enough for the tip of the motor hook to slip through. Use the illustration in Fig. 4 above as a reference guide for assembling the mount. Insert one end of the hook into the slot, then slide the "A" ring up from the bottom over the tube and the hook, with the hook aligned in the flat notch, until the ring touches the 1" line. Keep the hook parallel to the tube. Slide the "B" ring down from the top until it is just below the line at 2.5", with the flat notch over the hook. Apply glue to the inside-top of the tube, then insert the CR-520 ring, pushing the ring downward until it "bottoms out" against the hook tip. Apply glue with a brush around the joints of the rings where they contact the tube, on both sides. Clean out any glue that fills the "V" notch, as you will need this notch open in the next step. Set the motor tube subassembly aside until the glue dries.

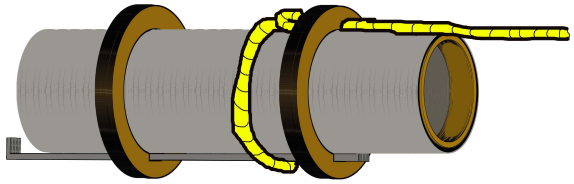


Figure 5

- **Step 10** Tie a slip knot in one end of the Kevlar thread. Slip the mount into this loop, as shown in Fig. 5 above, and pull the loop tight against the tube. Push the **long** end of the thread through the "V" notch in the "B" ring, and pull the excess completely through, pushing the loop of thread firmly against the back edge of the "B" ring. Apply a layer of glue to the thread behind the ring to firmly secure it in place. Set this aside to dry.

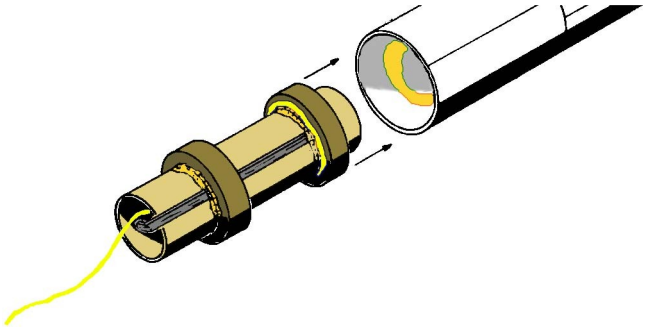


Figure 6

- **Step 11** Push the Kevlar thread down through the center of the engine

mount subassembly from the front and pull tight. Apply a generous bead of glue about 1.5" up inside the body tube at the rear, and spread this evenly all around the inside with a soft brush. As shown in Fig. 6 above, insert the front end of the mount into the tube and push forward through the glue 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.

- **Step 12** Using the Fin Locater Guide, on page 2, mark the sustainer body tube for three fins and for the launch lug standoff. Mark the tube at 3", 3.57", and 5" from the bottom edge of the tube, and draw lines completely around the tube at these locations. Draw lines at each of the three fin locations parallel to the tube up to the 3.57" line. Draw a similar line at the lug location up to the line at 5". Apply thinned glue to the three fin lines between the edge of the tube and the line at 3.57", and to the lug line between the 3" line and the 5" line. Allow these to dry completely.

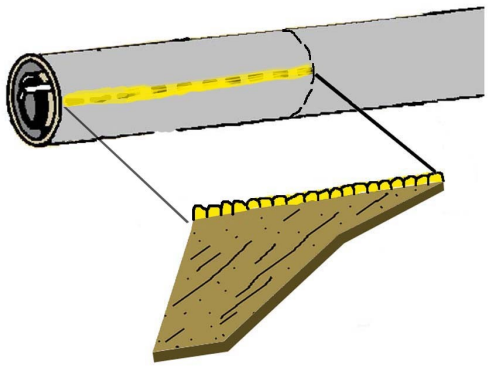


Figure 7

- **Step 13** Apply a bead of full-strength glue to one of the fin alignment lines, between the bottom of the tube and the 3.57" line, and a similar bead to the root edge of a fin. Press the fin to the body as shown in Fig. 7 above, and hold in place for about 15 seconds before releasing. 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 remaining fins.

- **Step 14** Attach the launch lug standoff to the body in the same manner, and allow to dry. Attach the launch lug to the standoff, and allow to dry.

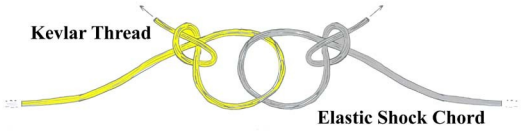


Figure 8

- **Step 15** 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, then push one end of the elastic shock chord through this loop, as shown in Fig. 8 above, and tie a slip-knot loop in it. Pull the two knots tightly together, coat the knots with thinned glue, and allow to dry.

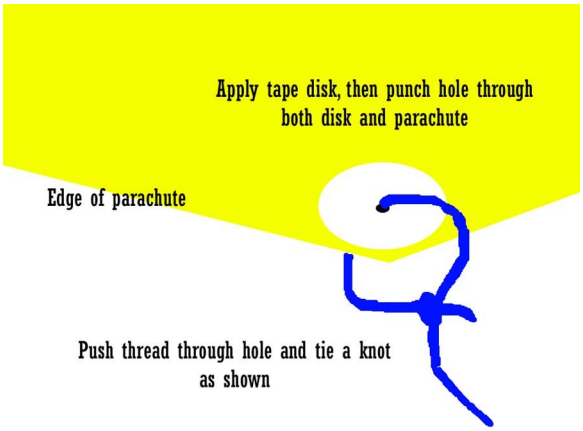


Figure 9

- **Step 16** Assemble the parachute according to the Semroc instruction sheet, except for the modification shown in Fig. 9 above. Attach the shroud lines to the barrel end of the second snap-swivel.

Traditional Payload Version

- **Step T17** Push all of the shock chord into the main body tube, then insert the small end of the transition into the top of the tube. Do not glue.

Sport Version

- **Step S17-A** Push the shock chord through the liner in the transition from the bottom (smaller end) to the top (larger end).

- **Step S17-B** Apply glue inside the top end of the BT-50 main body tube and spread it around with the brush. Insert the small end of the transition into the tube, pulling as much of the shock chord forward as possible to keep it from coming into contact with the glue. Allow to dry.

Finishing Sequence - Both Versions -

- **Step 18** 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. Smooth this out with your finger. This will reinforce the most critical joints on the model and reduce the chances for losing something during launch or landing. Allow to dry completely.

- **Step 19** Insert the nose cone temporarily into the top of the payload compartment, in preparation for grain filling. Do not glue in place.

- **Step 20** Fill the grain of all the balsa pieces, and the body tube spiral seams, with a surfacing treatment of your choice. We 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 or the paper. If deep gouges are present, a second application may be needed. Finish by sanding with a dry 400-grit paper. Tack-rag the model to remove the sanding dust.

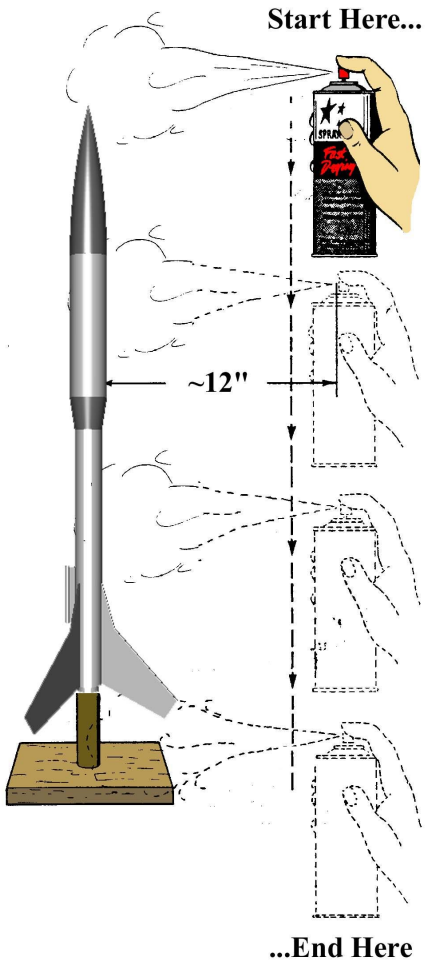


Figure 10

- **Step 21** The illustration in Fig. 10 above shows the general preferred method for priming, painting, and glossing the model, regardless of the spray equipment used -- airbrush, spray gun, or aerosol can. Always spray from the top-down, never from side-to-side. Begin the spraying above the model, and end the spray below the model, to reduce the chances for splattering.

- **Step 22** Use a good-quality sprayed primer over the entire model. We recommend ***Rust-O-Leum White Clean Metal Primer***. Apply at least two coats of primer before sanding with 220-grit paper the first time. Tack-rag the model, and examine the surface for voids or other imperfections such as the tube spiral. If found, give the model additional applications of primer and sand with 400-grit paper. Tack rag the model 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 without sanding in preparation for color coats.

- **Step 23** The choice of paint scheme is left up to you, but the prototype scheme has a white sustainer and payload body, and medium ghost gray for the nose cone, transition, and fins. Give the entire model a coat of white as a base color. When applying trim colors, spray the nose cone separately, using a scrap piece of BT-55 tubing as a holder. Do not use heavy coats, but multiple light coats, building up layers of color. Give the base color at least 48 hours to cure before attempting to mask off for the fins.

- **Step 24** After the final color coat has dried for several days, spray a clear gloss acrylic coat over the entire model. We recommend ***Future Floor Finish*** applied with an airbrush. This product can be thinned with clean ammonia or with ***Windex***. Give this a day to fully cure, then apply the decals shown at the front of these instructions. Allow another day to dry, then wipe away any residue with a soft cloth. Apply a second coat of ***Future*** to seal the decals, and allow

to dry.

Pre-Flight Sequence

- **Step 25** Remove the nose cone from the upper body (for the sport version), or the transition from the lower body (for the traditional payload version). Attach the snap links for the shock chord and the parachute to the screw eye. You should only attach the parachute when you are ready to fly. Never store a parachute inside the model.

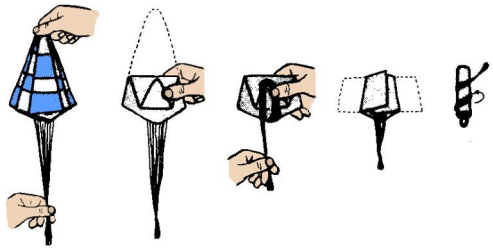


Figure 11

- **Step 26** 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.

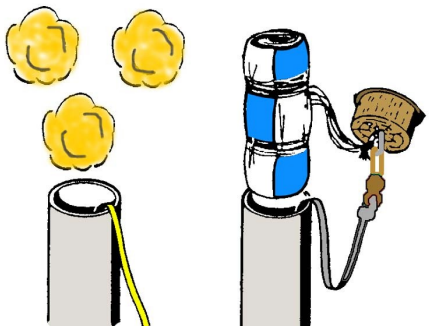


Figure 12

- **Step 27** As shown in Fig. 12, insert about 2" of loose-fill 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 (or just above the hole in the transition, depending on which version you built). 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 28** 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
B6-4
C6-5

- **Step 29** Read and understand the safety code on the last page of this booklet, then go fly!

Developed for BARCLONE Rocketry
by C. P. McGraw

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
0.00 – 1.25	*1/4A – 1/2A*	*50'*
1.26 – 2.50	*A*	*100'*
2.51 – 5.00	*B*	*200'*
5.01 – 10.00	*C*	*400'*
10.01 – 20.00	*D*	*500'*
20.01 – 160.00	*E, F, G*	*1000'*
160.01 – 320.00	*2G*	*1500'*

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