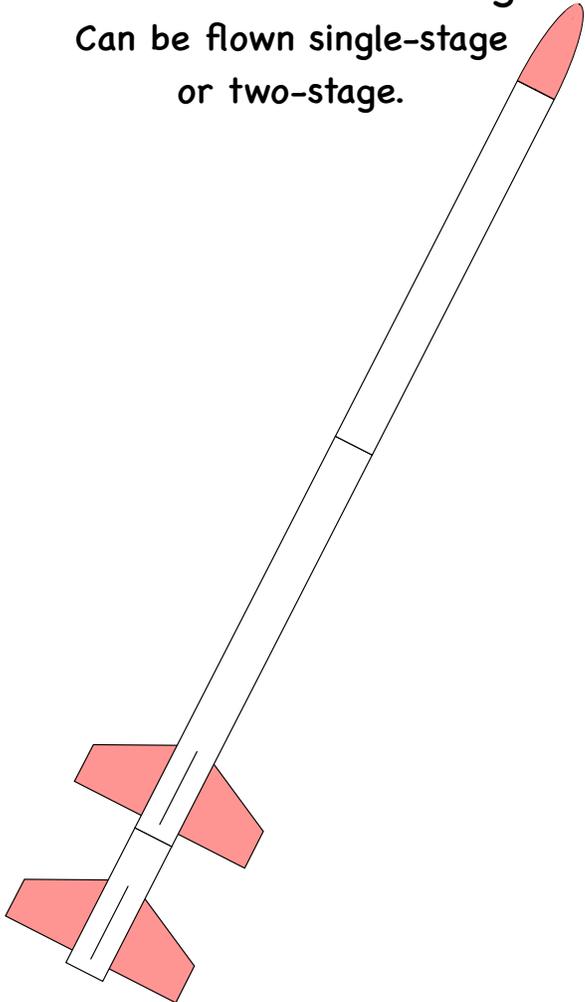


Versi-Loader 2

A Competition Payload Model
Rocket Kit for 18mm Engines

Can be flown single-stage
or two-stage.



Specifications:

Length (Two-Stage)*: 20.5"/52.1 cm

Dia.: .739"/18.77 mm

Weight (Two-Stage w/Payload)*: 2 oz/56.5 gm

Skill Level: Beginner/Intermediate

Parachute Recovery

Center of Pressure (Two-Stage): 17.3" from tip of
nose cone

Recommended Engines (Single Stage): A8-3;
B6-6; C6-7; D10-7; D21-7

Recommended Engines (Two Stage):

Booster Stage: A8-0; B6-0; C6-0

Upper Stage: A8-5; B6-6; C6-7

* Length and weight may vary depending on how you decide
to build the model, see instructions for full details.



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Please be sure to read the instructions thoroughly before beginning. Test fit all parts before applying adhesive.

Parts List - Be sure to check the following list to assure your kit is complete:

1 Body Tube (8" Long); 1 Payload Tube (8" Long); 1 Booster Tube (2.75" Long); 1 Balsa Nose Cone; 1 Balsa Bulkhead; 1 Engine Block; 1 Metal Screw Eye; 1 Kevlar® Shock Cord; 2 Launch Lugs; 2 Balsa Fin Sets; 1 Payload Kit (1 Tube; 2 Ply Circles; 1 Bag of Sand); 1 Yellow Pusher Tube; 1 Tube Marking Guide; 1 Parachute Kit; 2 Pieces of Foam Padding; 1 Craft Stick.

Tools & Materials - You will need the following to complete your model:

Adhesives – a thin or medium viscosity cyanoacrylate ("CA") glue can be used for most steps and is recommended (other adhesives, such as wood glue, [i.e., Elmer's Carpenters Glue or Titebond] or epoxy can be used if you prefer and are familiar with their use, but the use of a CA glue will usually provide the lightest weight model); hobby knife with a sharp #11 blade; pencil; felt tip marker; sandpaper (medium - 220 or 280, fine - 320 or 400, & [optionally] extra fine - 500 or 600); pencil; Sanding Sealer (or other balsa filler coat); Thinner (appropriate for the type of sanding sealer used); Small Paint Brush (to apply sealer); Spray Paint (such as Rust-Oleum, Krylon, or Testors is recommended. Be sure **not** to mix different types or brands of paint without testing.) - primer (optional), color(s) as desired (see step # 13).

Recommended, but not required: sanding block; extender tip for cyanoacrylate glue; gram scale (see step # 8).

Optional (see instructions): accelerator for cyanoacrylate glue; material to fill body tube seams and/or any imperfections in wood parts, such as Elmer's Carpenters Wood Filler, Interior Spackling Paste, etc.

You can download the "Rocket Caddy" from the Downloads section of our website to make a stand that will hold your model horizontally. You may find this helpful when building this kit.

Assembly Instructions - You can use the checkboxes to mark off each step as they are completed. Note: while waiting for glue to dry in Steps 3 through 7, you may complete Steps 8 through 11. At any time during construction you can make the parachute, Steps 14 through 17.

1) Lightly sand the outside of the body tube, the payload tube and the booster tube with medium or fine sandpaper until the surface just loses its' shine, this will allow better glue adhesion. Set the payload tube aside for now (there are two identical longer tubes, it doesn't matter at this point which one you use). Take the yellow pusher tube and put it inside the booster and body tube to hold them together. You want the tubes to fit fairly snugly and not slip around so you will probably need to wrap some tape around the ends of the yellow tube before inserting it (see Figure A).

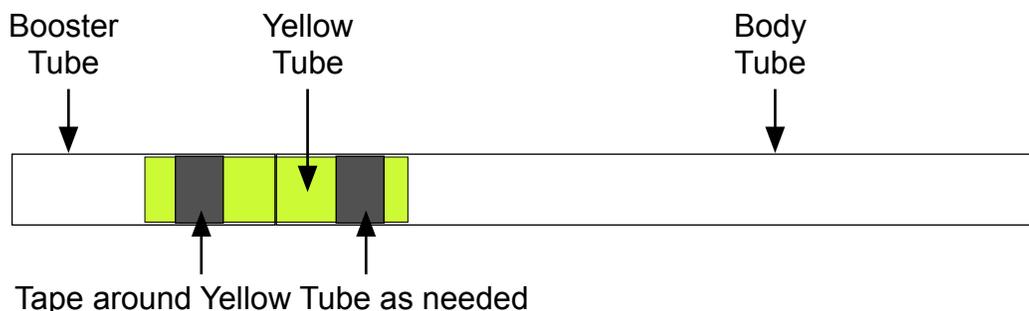


Figure A

Locate the Tube Marking Guide on page 12 and cut it out. Wrap the guide around the body tube - line up the marks on each end to align the guide (see Figure B). Use a piece of tape to hold the guide in place. With a sharp pencil mark the body tube at the arrows at the end of each line for the three fins and the launch lug (note: if you are going to launch your rocket out of a tower launcher, do not mark the tube for the launch lug). Remove the guide from the tube and set aside.

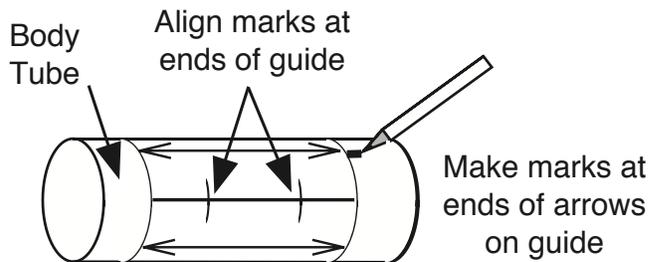


Figure B

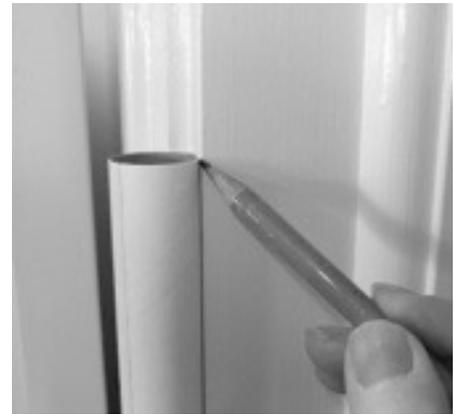
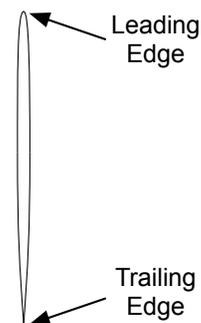


Figure C

Using something such as a door frame (as shown in Figure C), a piece of metal angle (see Figure D), or a drawer edge, extend the marks the length of both the body tube and the booster tube. Be sure to note which line is for the launch lug (if using). Make a mark on each fin line 1/4" from one end of each tube (this will be the bottom end of the rocket). If you will be using launch lugs, make a mark 2 1/2" from the same end on the launch lug line of the body tube and one 1/2" from the end on the booster tube.



Figure D



End View of Fin

Figure E

□ 2) Locate the balsa sheets with the laser-cut fins. Using your hobby knife carefully remove the fins from the sheets. For maximum efficiency, round the leading edge of each fin and taper the trailing edge to a sharp point, creating a “teardrop” shape (see Figure E). The root and tip edges on each fin should be kept square. Using medium grit sandpaper, shape each fin as directed - a sanding block is highly recommended for this. If you don't have a sanding block, lay the sandpaper down on a flat surface and move the edges of the fin against the sandpaper. Be careful not to remove too much wood at one time - roughly shape one side then turn the fin over and do the same on the other side. Continue this procedure with the medium and then fine sandpaper to further

shape and smooth the fins until you are satisfied with their appearance. Repeat with extra fine sandpaper if desired.

□ 3) Lay the booster and body tube horizontally on a flat surface (the edge of a table is a good place) on in the Rocket Caddy. Starting with the booster, position one of the fins along one of the fin lines you drew in step #1. The trailing edge of the fin should just touch the mark 1/4" from the end of the tube (see Figure F). Be sure the fin is straight out from and parallel to the tube (you can sight down the line you drew on the tube to help with this). Using your CA glue (with extender tip, if available), apply a very small amount of glue to the joint between the fin and body tube to tack the fin to the tube. If necessary, use the point of a pencil or a straight pin to spread the glue along the root edge of the fin. If desired, use CA accelerator to cure the glue more rapidly. Note: If using a wood glue, apply a thin layer of glue to the root edge of each fin and to the body tube where the fins will be attached and allow to dry. One fin at a time, apply another thin layer of glue to the root edge and firmly press the fin in place on the body tube and allow to dry. Repeat with the fin on the main body tube along the same fin line.

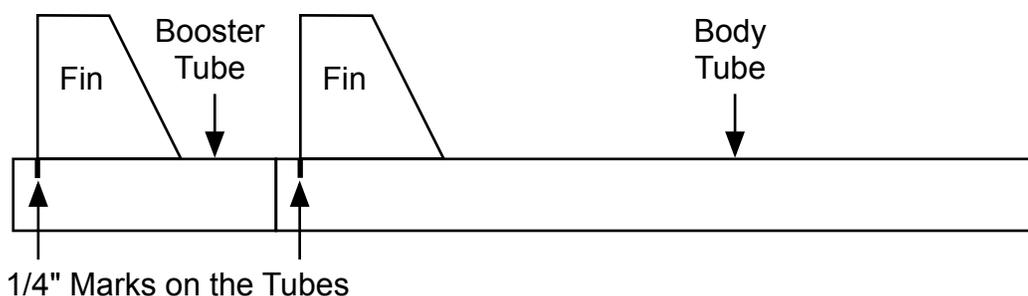


Figure F

When the fins are dry, rotate the tube and apply the fins along the next fin line. Repeat with the last set of fins. You can double-check the alignment of the fins by setting the end of the tube on the “Fin Alignment Guide” (on page 12 of these instructions) and looking down from the top of the tube. Minor mis-alignments may be adjusted by slight pressure applied to the tip of the fin. If any of the fins are grossly out of alignment, carefully snap the fin off the body and repeat the gluing procedure (you may need to lightly sand the body tube and/or fin root to remove any cured glue). Be **very** careful during this step **not** to get any glue on the joint between the booster and body tube or the yellow tube inside so as not to inadvertently glue the tubes together! If desired, go ahead and separate the two tubes and remove the yellow tube before beginning to glue the fins on, but it may make it a bit more difficult to keep the fins properly aligned to one another.

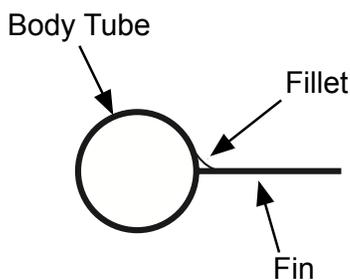


Figure G

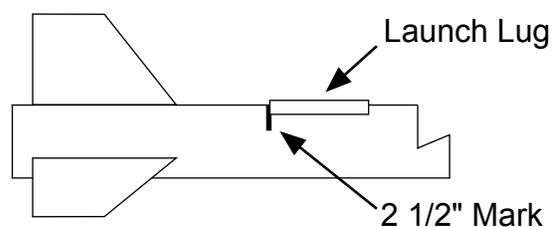


Figure H

□ 4) To strengthen the fin attachment and to reduce drag, apply fillets to the joint between the fin and body (see Figure G). Apply a drop of CA glue to the joint and spread evenly with the point of a pencil

or a straight pin. Allow the model to rest horizontally while the CA dries. Repeat on all fins. Repeat as needed until a smooth, even fillet is created. If using a wood glue, apply a small amount of glue to the joint between the root edge of the fin and the body tube. Smooth the glue with your finger to form a smooth fillet and remove any excess glue. Allow the model to rest horizontally while the glue dries. Repeat on all fins.

If needed, sand the fillets until smooth (you can wrap some medium to fine sandpaper around a cylindrical object of the correct size, such as a small dowel or piece of metal or plastic tubing, to help with sanding evenly).

□ 5) Locate the launch lugs (if using). Using the same method as you used to attach the fins glue one of the launch lugs to the main body tube - the bottom edge of the lug should be at the 2 1/2" mark on the launch lug line (see Figure H). Be sure the lug is parallel to the body tube and allow to dry. If you separated the booster from the main body, reattach them now with the yellow tube as you did in Step #1 and be sure the launch lugs lines are properly aligned with one another. Now glue the launch lug to the booster at the 1/2" inch mark on the launch lug line - be sure that the two launch lugs are aligned with each other - sliding an 1/8" launch rod (or very straight 1/8" dowel, etc.) through the lugs as you glue the second one into place will help with the proper alignment. When the lugs are dry apply fillets to them as you did to the fins.

□ 6) If you have not already done so, separate the booster from the main body and remove the yellow tube. Remove any tape from the yellow tube. Locate the Kevlar® cord (it looks like a heavy piece of thread) and the engine block (the small ring shaped piece that fits inside the body tube). *Firmly* tie one end of the Kevlar® cord around the engine block. Make sure the knot is just at the top of the engine block, and not on the outside of the block. If needed, trim any excess cord at the knot leaving about 1/4". Take the yellow pusher tube and make a pencil mark 1/4" from one end of the tube. Locate the engine block and attached shock cord. To avoid getting glue on the shock cord, thread the shock cord down through the center of the engine block and then through the yellow tube, leaving the knot at the top end of the engine block. Be sure that the loose end of the shock cord is on the **inside** of the block as shown in Figure I.

Using the included craft stick, apply a layer of wood glue all around the **inside** of the main body tube about 2 1/4" to 2 1/2" up inside the tube from the end with the fins on it. Insert the engine block (with the knot end first) into the tube and use the yellow tube to push the engine block into place (up to the 1/4" mark on the pusher tube as shown in Figure J). Remove the pusher tube, wipe away any glue that may have gotten on it and set aside. Allow the engine block to dry. When the glue is completely dry thread the shock cord back through the engine block so that the cord is inside the main body tube.

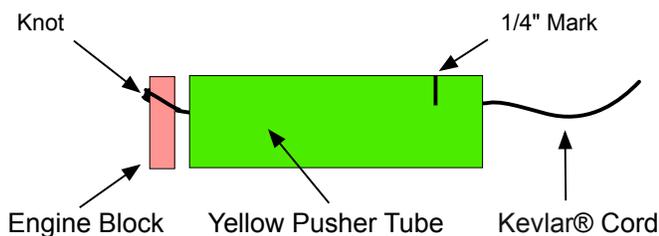


Figure I

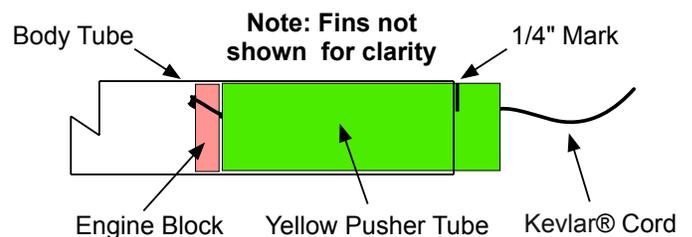


Figure J

□ 7) Locate the nose cone and the payload tube. Glue the nose cone into one end of the tube. When dry you may apply one of the recommended filler materials (see "Tools and Materials" on page 2) to the seam between the nose cone and the tube and allow to dry. Sand the filler material with medium

or fine sandpaper until it is flush with the surface of the tube. Repeat as needed to totally fill the seam (this will reduce drag).

- 8) Locate the bag with the payload materials. See Figure K as needed for this step. Glue one of the plywood circles into one end of the tube and allow to dry. Be sure that it is well glued so that the sand cannot escape. A standard NAR Competition Payload weighs a minimum of 28 grams, so to get as close to that weight as possible the use of a gram scale is recommended (if you do not have a gram scale use as much of the supplied sand as you can fit into the tube). Place the tube with the open end up on your scale, also place the second plywood circle on the scale at the same time. Pour the sand into the tube until the scale shows 28 grams. Glue the second plywood circle into the open end of the tube to enclose the sand.

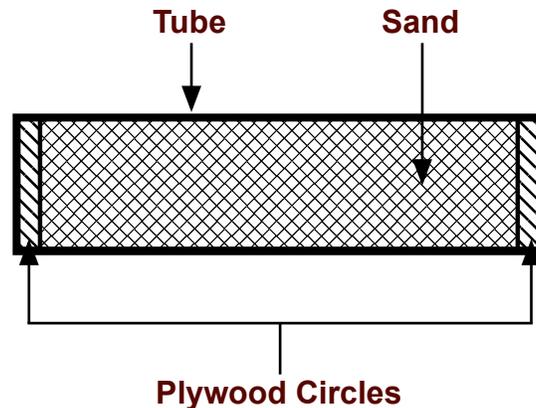


Figure K

- 9) Locate the balsa bulkhead and the screw eye. Thread the screw eye into the center of the one end of the bulkhead. Remove the screw eye and put some glue into the hole in the base of the nose cone and thread the screw eye back in and allow to dry.

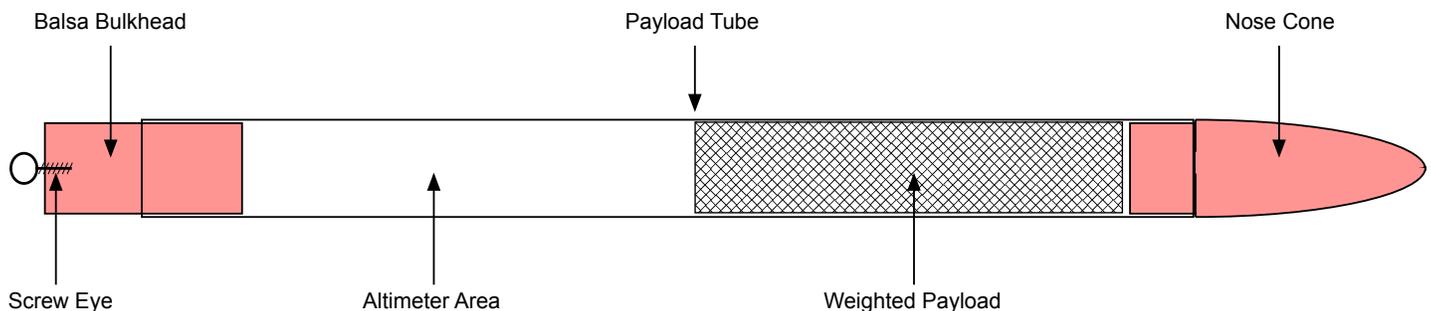


Figure L

- 10) The payload tube will house the weighted payload (which you made in step #8) and the altimeter that will record how high your model will fly. Note that the NAR competition rules allow several approved altimeters that may be used. There are many from multiple manufacturers that will fit inside this size tube and will vary in length. The most current list of approved altimeters can be found on the NAR web site at: <http://www.nar.org/contest-flying/us-model-rocket-sporting-code/appendix/altimeters-approved-for-contest-use>. Be sure to check the manufacturers specs to be sure the altimeter you chose will fit inside the diameter of this model. The tube is supplied at this length to allow most of the longer altimeters to fit along with some padding at each end. If you are using a

smaller altimeter, you may cut the tube shorter if desired (this will reduce overall surface area and therefore drag).

If you wish to shorten the tube note how far down the payload will come and also note that the balsa bulkhead will be inserted about half-way into the bottom of the payload tube (see Figure L). Be sure to leave enough room for the altimeter itself as well as any padding (such as the included foam pieces). Refer to the instructions for your particular altimeter to see if the manufacturer suggests any specific methods of protection.

11) For the altimeter to function properly you will need make holes in the payload tube (the altimeter works by reading relative changes in air pressure, so the altimeter cannot be in a totally sealed tube). Usually multiple small holes evenly spaced around the altimeter area of tube are used. See the recommendations from the manufacturer of your specific altimeter for the size, number and location of the holes. Be sure the holes will not be blocked by any padding, etc. Holes may be made with miniature drill bits, push pins, twirling the tip of a sharp hobby knife, etc. The holes should be as clean as possible, if there are any rough edges you can apply a small amount of thin CA glue and sand after it has cured.

12) Firmly tie the loose end of the Kevlar® cord to the screw eye at the base of the balsa bulkhead.

13) A complete paint job will add weight, however a smoother finish can allow the model to reach greater altitudes than an unpainted model. Whether you decide to paint the model or not, it is recommended to fill the balsa parts to smooth them and reduce drag. Prior to beginning this step, be sure to read any instructions on the brand of sanding sealer you are using - follow the manufacturers directions if they vary from those below. Be sure to use the thinner recommended by the manufacturer to clean your brush. Using fine sandpaper (then extra fine, if desired) go over all the wood parts to ensure they are smooth. If there are any dents or “dings” in any of the wood parts, apply one of the recommended filler materials to the area and allow to dry. Sand the area until smooth and repeat if necessary. Next apply a coat of sanding sealer to all wood parts (the nose cone and fins) - it is not necessary to seal the bulkhead. Allow the sealer to dry then apply a second coat. After the second coat is dry, sand with medium or fine sandpaper until the surfaces are smooth. Continue with single coats of sealer, sanding in between each coat, as needed until the wood grain is completely filled and the surface is smooth.

If you decide to paint the model, be sure to read the instructions on the brand of paint you are using - follow the manufacturers' directions carefully. Be sure not to mix different types or brands of paint without testing. It is recommended (but not absolutely necessary) that you apply one or more coats of primer before the color coats of paint - this will give a much smoother surface to your model and allow the paint to adhere better. If using primer, sand with fine and/or extra fine sandpaper after each coat is completely dry. Use as many coats as needed to get a smooth finish before proceeding to the color coats.

14) Locate the bag with the parachute materials. Lay the canopy on a smooth, hard, flat surface. Fold the canopy in half and then in half again, and in half one more time – this will allow you to find the center of the canopy – the center will be at the point created by the folds (See Figure M). With a felt tip marker, make a small mark at this point. Unfold the canopy with the center mark up and smooth out the canopy.

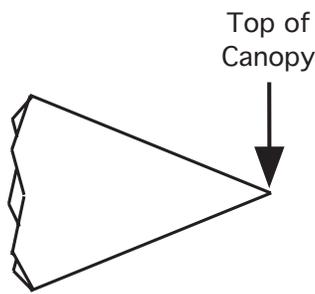


Figure M

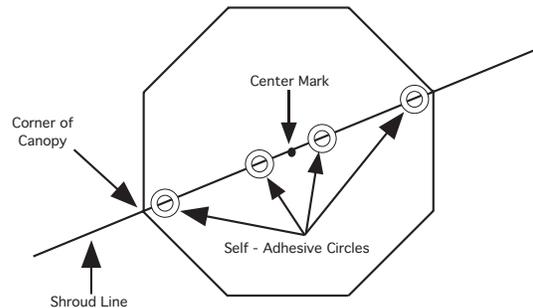


Figure N

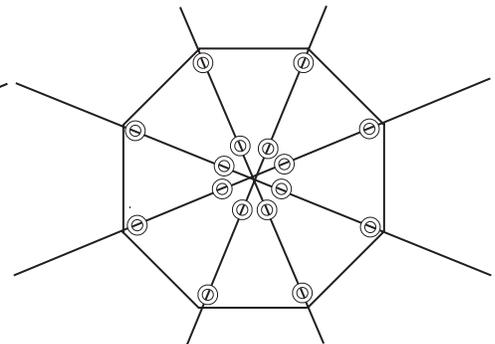


Figure O

□ 15) Refer to Figure N as needed for this step. Locate the shroud line material. Even the ends of the pieces and fold the lines in half. Mark the center point of the lines with a felt tip marker. Take one of the shroud lines and lay it on the canopy – the center mark on the shroud line should be at the center mark on the canopy, the ends of the line should extend over two opposite points of the canopy. Take one of the adhesive circles and place it (adhesive side down) over the shroud line as close as possible to the edge of one of the points of the canopy. Place another circle over the shroud line at the point on the opposite side of the canopy. Place a third across the line about one inch from the center mark and press firmly in place. Take another circle and place on top of the line one inch from the center mark on the opposite side of the third circle. Repeat with each of the remaining lines so that the top of the canopy appears as in Figure O. Press down firmly on all the tape strips to be sure that they are well attached to the canopy and shroud lines.

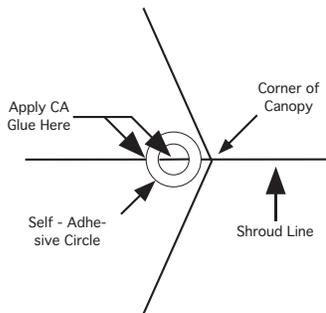


Figure P

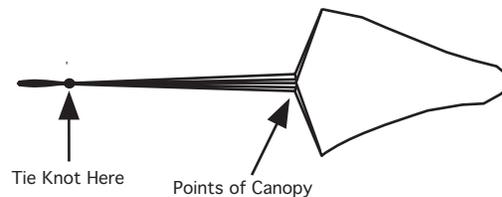


Figure Q

□ 16) This step is not required, but is highly recommended. With thin cyanoacrylate (CA) glue, apply a **small** amount of glue to the center and top edge of the circles at the canopy corners (see Figure P) – **do not** apply glue anywhere else! Be sure you use an extender tip for the glue to apply as small an amount of CA as possible. Keep a paper towel or rag handy to quickly wick away any excess glue. **Be very careful** not to get any CA on the canopy or the shroud lines other than as indicated! After you have applied CA to all the circles, allow the glue to cure completely before you move on to the next step. This will prevent the canopy from “creeping” up the shroud lines.

□ 17) With one hand, pick up the parachute by the top center of the canopy. With your other hand, gather together the shroud lines. Pull down on the lines so that the points of the canopy are all even (see Figure Q). Tie a knot about two to three inches from the bottom of the lines. Thread the ends of the lines through the eyelet of the snap swivel (moisten the lines if needed) and tie firmly. Apply a small amount of wood glue to the knot and allow to dry. Trim any excess line from the knot. Attach the parachute to the rocket by attaching the snap swivel to the screw eye at the bottom of the balsa bulkhead.

Flight Preparation & Launching

Flying with a Payload:

Refer to Figure R as needed. Remove the balsa bulkhead from the payload tube. Activate your altimeter according to the instructions from the manufacturer. Insert the payload as far as it will go into the tube and then insert your altimeter along with any desired padding. Be sure the vent holes are not obstructed. Wrap enough tape around the top end of the balsa bulkhead so that it is a *very* snug fit in the payload tube - you don't want it coming loose during flight or recovery! Insert the bulkhead into the payload tube. Note: if you wish to test fly your model without an altimeter, you can put the yellow pusher tube into the space that would be for the altimeter to prevent the payload from shifting backwards during flight (if you shortened the payload tube, cut the yellow tube to the appropriate length).

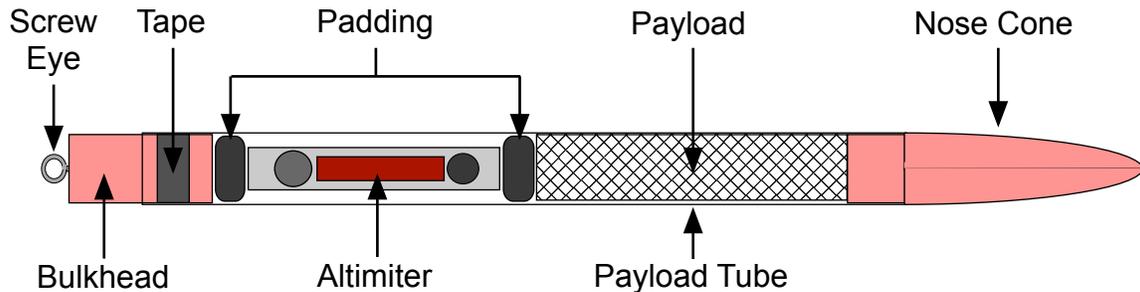


Figure R

Loosely insert some flame - proof recovery wadding into the top of the body tube. Use enough wadding to fill the tube to a depth of at least one and a half body diameters. Use a pencil or dowel to *lightly* tamp the wadding down towards the top of the engine mount.

Pack the parachute according to the following directions (or use any method that you feel comfortable with). Hold the parachute by the top of the canopy and the ends of the shroud lines until the canopy of the parachute is formed into a spike. Fold the canopy in half vertically then roll into a cylinder small enough to fit easily into the body. Wrap the shroud lines around the parachute. Insert the Kevlar® shock cord, then the parachute down into the body tube. Slide the bulkhead into the body tube. Be sure to check the fit of the bulkhead - if too tight, sand the shoulder down - if too loose, wrap with tape. The bulkhead should be loose enough to slip out easily, but tight enough so that you can turn the model upside down without it falling out.

Single Stage Flights:

Select an engine from the list of recommended engines (if flying in competition, be sure to use the correct impulse specified for the event). Test fit the engine into the bottom of the body tube. Remove and wrap enough masking tape around the engine until it fits snugly into the body tube. The engine should fit tightly enough so that you cannot pull it out easily with your fingers. For further insurance to prevent the engine from kicking out at ejection, a strip of 1/2" masking or Mylar® tape may be placed around the exposed end of the engine and the bottom of the body tube if desired. Insert the igniter according to the manufacturer's directions.

Be sure to check the center of gravity (CG) after the engine is in place, the rocket should balance at least 15" from the tip of the nose cone (or further forward). Stability should not be a problem when flying with a payload.

Place the rocket on the launcher by sliding the launch lug over the launch rod or by placing the rocket into a tower launcher. Attach the micro-clips to the igniter. Move back to a safe distance & be sure the launch area is clear. Check for low flying aircraft, give the countdown & launch!

Two Stage Flights:

Select a booster engine and an upper stage engine from the list of recommended engines (if flying in competition, be sure to use the correct total impulse specified for the event). Butt the nozzle end of the upper stage motor to the top end of the booster motor and hold together with a single wrap of cellophane ("Scotch") tape (see Figure S). Test fit the upper stage engine into the rear of the upper stage - push it up until it meets the engine block. Remove and wrap enough tape around the upper engine as shown in Figure S until it fits snugly into the tube. The engine should fit tightly enough so that you cannot pull it out easily with your fingers. Wrap tape around the top end of the booster engine as shown. Slide the booster section over the engine and align the fins (and launch lugs, if using). Insert the igniter into the booster engine according to the manufacturers directions.

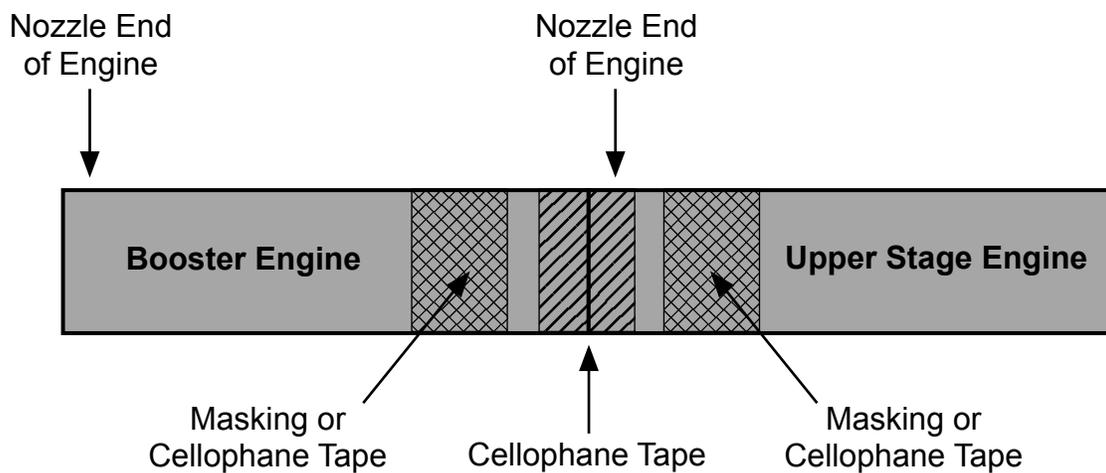


Figure S

Be sure to check the center of gravity (CG) after the engine is in place, the rocket should balance at least 17" from the tip of the nose cone (or further forward). Stability should not be a problem when flying with a payload.

Place the rocket on the launcher by sliding the launch lugs over the launch rod or by placing the rocket into a tower launcher. Attach the micro-clips to the igniter. Move back to a safe distance & be sure the launch area is clear. Check for low flying aircraft, give the countdown & launch! Be sure to have an extra pair of eyes on hand to help track and recover the booster section!

Flying without a Payload:

Although designed primarily as a payload model, the Versi - Loader 2 is also capable of being an acceptable Parachute or Streamer Duration model in the higher impulse events (B & up) as well as in Altitude events, or even as just a fun, high-flying Sport Model! If flying without a payload, follow the above instructions of course omitting the payload weight and altimeter. Tape the bulkhead into the payload section leaving about 3/4" exposed to fit into the main body. Depending on what event you are flying, you may want to replace the enclosed parachute with a different recovery device.

Insert the wadding and pack the parachute as noted above.

Single Stage Flights:

Select and tape engine in place as noted above. Be sure to check the center of gravity (CG) after the engine is in place, the rocket should balance at least 15" from the tip of the nose cone (or further forward). If the CG is too far aft, you will need to add weight. Weight (in the form of modeling clay, etc.) may be added to the payload section if needed.

Place the rocket on the launcher by sliding the launch lug over the launch rod or by placing the rocket into a tower launcher. Attach the micro-clips to the igniter. Move back to a safe distance & be sure the launch area is clear. Check for low flying aircraft, give the countdown & launch!

Two Stage Flights:

Select a booster engine and an upper stage engine from the list of recommended engines and insert into the model as noted in the instructions above.

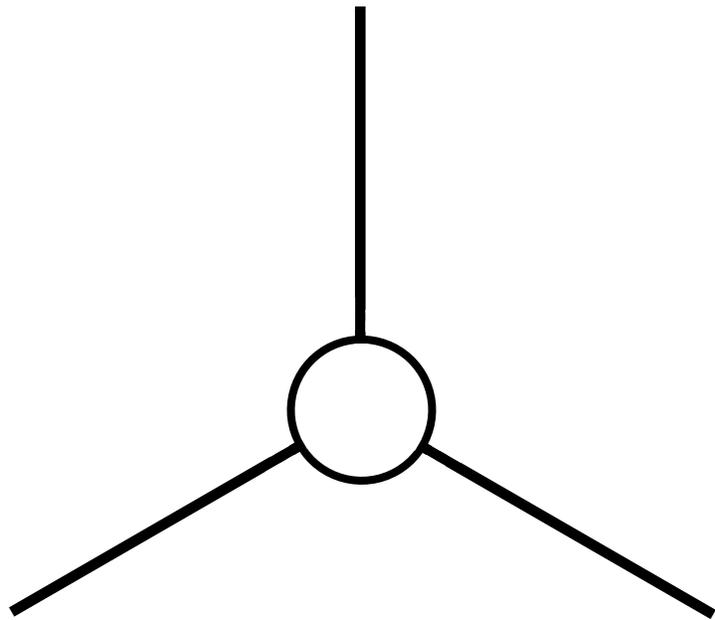
Be sure to check the center of gravity (CG) after the engine is in place, the rocket should balance at least 17" from the tip of the nose cone (or further forward). Weight can be added to the payload section if needed as noted above under "*Single Stage Flights*".

Place the rocket on the launcher by sliding the launch lugs over the launch rod or by placing the rocket into a tower launcher. Attach the micro-clips to the igniter. Move back to a safe distance & be sure the launch area is clear. Check for low flying aircraft, give the countdown & launch! Be sure to have an extra pair of eyes on hand to help track and recover the booster section!

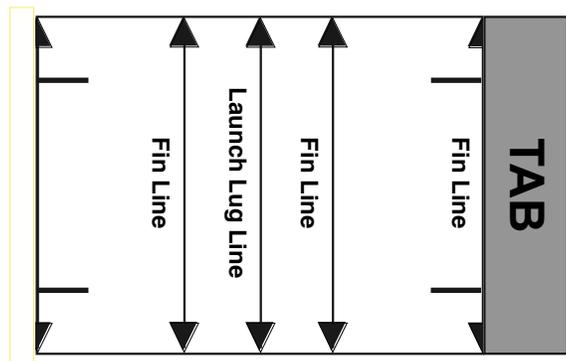
Be sure to read & follow the NAR Safety Code before flying this or any other model rocket!

(Note: the NAR Safety Code is normally included with each package of Model Rocket Engines and can also be found on the National Association of Rocketry web site at www.nar.org)

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Fin Alignment Guide



Tube Marking Guide