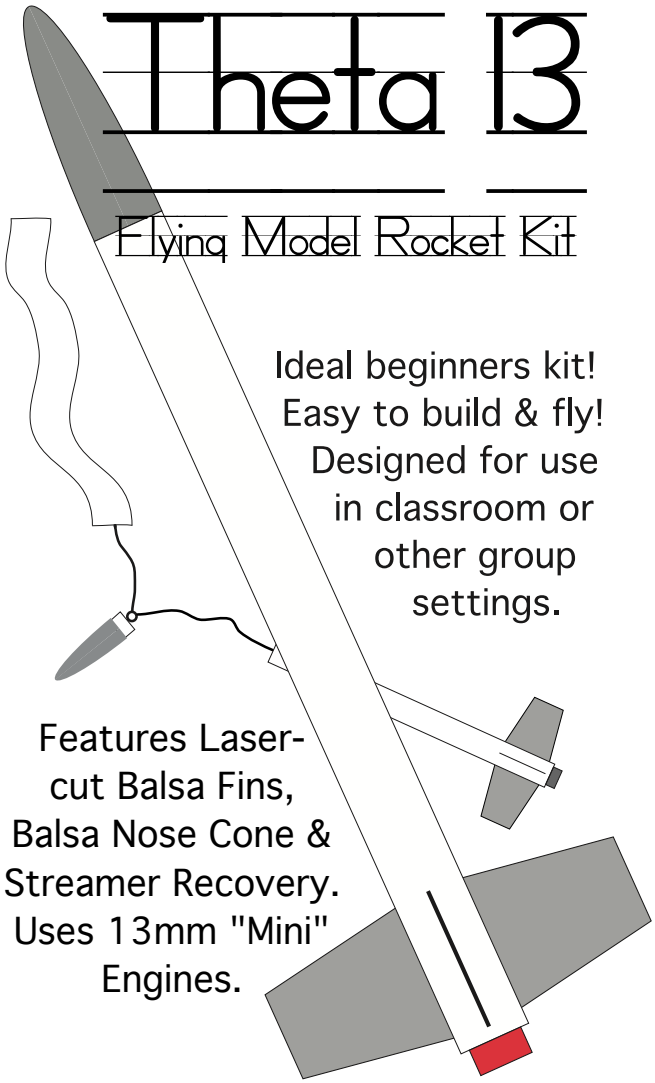
Theta 13

Flying Model Rocket Kit



Ideal beginners kit!
Easy to build & fly!
Designed for use in classroom or other group settings.

Features Laser-cut Balsa Fins, Balsa Nose Cone & Streamer Recovery. Uses 13mm "Mini" Engines.

Specifications:

- Length:14"/35.6cm
- Diameter: 0.74"/18.8 mm
- Weight: 0.6 oz/17 gm
- Streamer Recovery
- Recommended Engines:
  - 1/4A3-3T; 1/2A3-2T; 1/2A3-4T; A3-4T; A10-3T
- Skill Level: Beginner

Kit EKTH - 13

This is a model rocket kit requiring construction. Tools, adhesives, finishing materials, launch equipment and engines are not supplied.

AEROSPACE SPECIALITY PRODUCTS
P.O. Box 1408, Gibsonton, FL 33534
www.asp-rocketry.com

Estimated (calculated) altitudes:

with 1/4A3-3T: 105 feet/32 meters

with 1/2A3-2T: 230 feet/70 meters

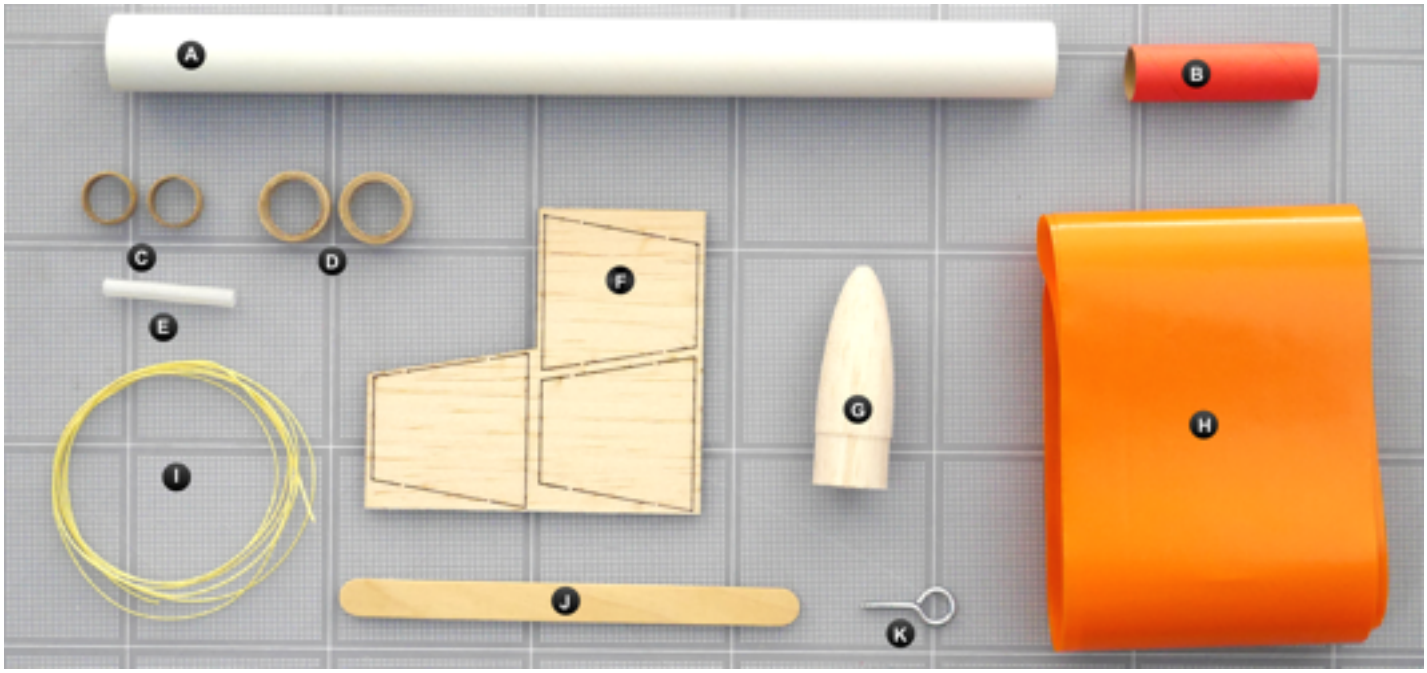
with 1/2A3-4T: 255 feet/78 meters

with A3-4T: 535 feet/163 meters

with A10-3T: 495 feet/151 meters

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

1 White Body Tube (A); 1 Red Engine Tube (B); 2 Engine Blocks (C); 2 Centering Rings (D); 1 Launch Lug (E); 1 Set of Laser-Cut Balsa Fins (F); 1 Balsa Nose Cone (G); 1 Plastic Streamer Material (H); 1 Kevlar® Shock Cord (I); 1 Wooden Craft Stick (J); 1 Metal Screw Eye (K).



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

Required: Adhesive (A wood glue, such as Elmer's Carpenters Glue or Titebond can be used for all steps and is recommended); sandpaper (medium - 220 or 280 grit); pencil; scissors; hobby knife; tape (cellophane, aka Scotch Tape, and/or masking).

Optional: sandpaper (fine - 320 or 400 grit, extra fine - 500 or 600 grit); sanding sealer (or balsa fillercoat); thinner (appropriate type for the sanding sealer); small paint brush; paint (Spray paint, such as Krylon or Testors is recommended. Be sure not to mix different types or brands of paint without testing.) - primer; colors as desired & clear; sanding block; tack cloth.

Assembly Instructions - you can use the checkboxes to mark off each step as they are completed.

☐ 1) We'll start by building the Engine Mount. Refer to Figure A as needed. Locate the engine tube (the red tube), the two engine blocks (the smaller spiral-wound paper blocks that fits inside the engine tube), the two centering rings (the larger spiral-wound rings that fits the outside of the engine tube), and the Kevlar® shock cord (which looks like a heavy piece of thread).
Test fit the centering rings over the engine tube - they should be a smooth, yet snug, fit. If needed use your sandpaper on the inside of the rings so that they fit easily. Set the rings aside for now.
Use your pencil to make two marks on the engine tube 1/4" (0.25") from each end. Take the Kevlar® and tie one end firmly around the middle of the engine tube. If needed, trim any excess cord at the knot leaving about 1/4" to 1/2". Take one of the centering rings and thread the loose end of the shock cord through the centering ring and slip the ring just over the end of the engine tube. Apply a thin layer of glue around the outside of the tube at the 1/4" mark then slip the ring into place at the

1/4" mark. Apply another thin layer of glue around the tube at the other 1/4" mark and slip the remaining centering ring into place.
Apply a thin layer of glue inside the end of the tube and slip one engine block in the end and then the second right behind it and push both into place as shown in Figure A. Be sure that the blocks are on the same end of the tube as the shock cord is and the end of the second block is even with the end of the engine tube. Set the engine mount aside to dry.

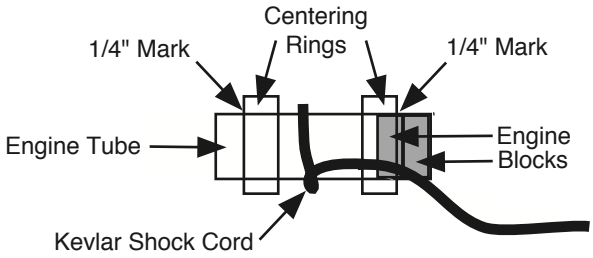


Figure A

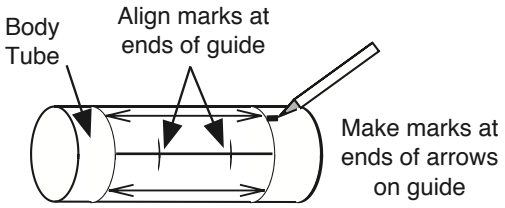


Figure B

☐ 2) Locate the white body tube. Very lightly sand the outside the of the tube with medium or fine sandpaper until the surface just loses its shine. This will allow the glue to penetrate the paper of the tube and the fins to stick to the tube better. Locate the Tube Marking Guide on page 9 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. Be sure to note which line is for the launch lug. Remove the guide from the tube.
Using something such as a door frame (as shown in Figure C, try not to get pencil marks on the door frame while you do this!), a piece of metal angle (see Figure D), or a drawer edge, connect the marks and extend each line the full length of the tube.
On each of the 3 fin lines, make a mark 1/8" (0.125") from one end of the body tube (this will be the bottom end of the tube) and also make a mark on the launch lug line 2" from the bottom end of the tube.


Figure C


Figure D

☐ 3) When the engine mount has completely dried it is time to glue it into the body tube. First take the loose end of the shock cord and thread it through the top end of the engine mount tube (the end the engine blocks are in) so that it hangs out the back of the tube (see Figure E) - this will help to prevent from getting glue on the shock cord while you are gluing the engine mount in.

Test fit the engine mount assembly into the body tube. If needed, sand the outside of centering rings for a smooth, but snug, fit. You should be able to slide the engine mount into the tube in one smooth motion. Remove the engine mount from the body tube.
Locate the wooden craft stick and make a mark on the craft stick 1 1/4" (1.25") from one end. Put some glue on the end of the stick and spread a generous, even layer of glue about 1 1/4" up on the *inside* of the body tube (see Figure F).

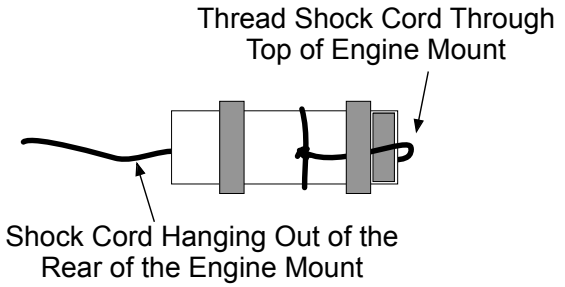


Figure E

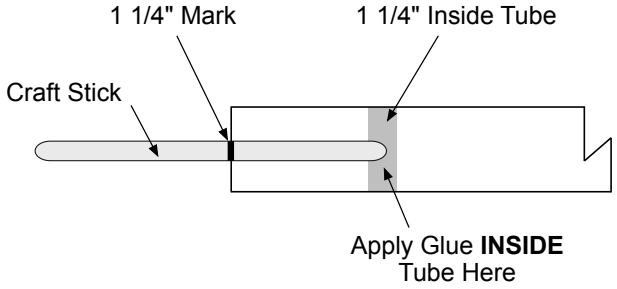


Figure F

Next apply a thin layer of glue to the outside of the rear centering ring (the one further away from the engine block, see Figure G). In one smooth motion insert the engine mount into the bottom of the body tube (be sure to insert the end with the engine blocks first!). The bottom of the lower centering ring should be even with the bottom of the body tube (the red engine tube will extend out from the bottom of the body tube), as shown in Figure H. Wipe away any excess glue that may have come out near the rear centering ring and allow to dry completely. After the mount is dry, thread the shock cord back through the engine mount so that the cord is inside the body tube.

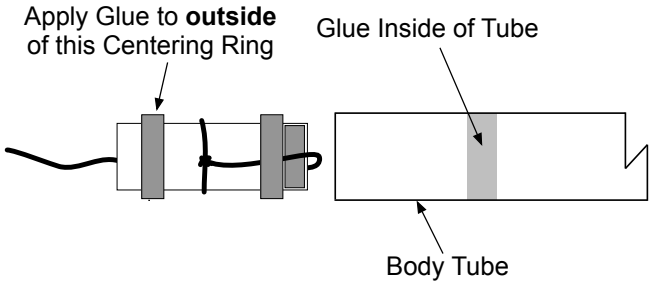


Figure G

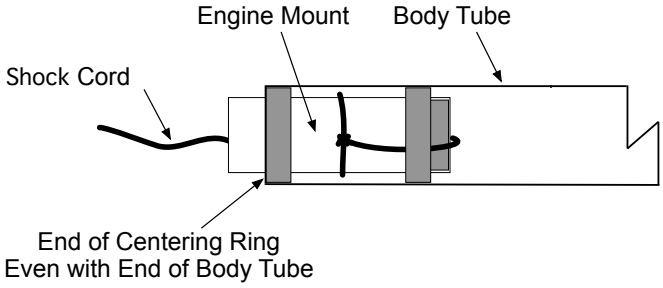


Figure H

☐ 4) Locate the set of fins. Carefully remove the fins from the laser cut sheets of wood. You may need to separate them from the surrounding wood with your hobby knife.

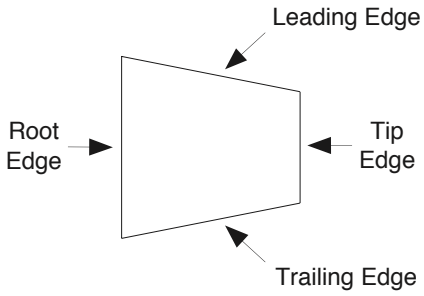


Figure I

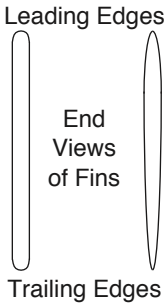


Figure J

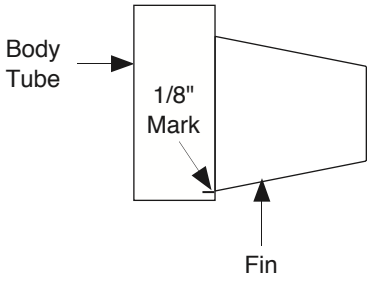


Figure K

It is not required, but if desired, you may round or airfoil the leading and trailing edges of the fins. This will make the fins more aerodynamic and allow you rocket to fly higher than it would if you just left the fin edges square (the airfoiled, or “teardrop” shaped fin is more aerodynamic than a fin that is just rounded). In either case, be sure to keep the root edge (the edge that will be glued to the body tube) square. The tip edge may be kept square or rounded. See Figures I and J (the left example in Figure J is a rounded fin, the right example is an airfoiled fin). Using medium grit sandpaper, shape each fin as desired - a sanding block may be used 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.

□ 5) You will now attach the fins to the body tube. One fin at a time, apply a thin layer of glue to the root edge of each fin and also to the body tube along the line where the fin will be attached and allow the glue 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. Note that the bottom of the root edge of each fin should be even with the 1/8" mark you made on the body tube (see Figure K). As the glue sets, be sure that the fin is straight out from and parallel to the tube. Looking from the base of the model you can use the lines drawn down the body tube as a guide to be sure the fins are straight. Repeat for the remaining fins. As the glue sets, be sure that the fin is straight out from and parallel to the tube. Looking from the base of the model you can sight down the lines drawn down the body tube as a guide to be sure the fins are straight. You can also use the Fin Alignment Guide on the last page of these instructions to help you in aligning the fins straight out from the body tube. Allow the model to rest horizontally while the glue dries on each fin (you can download the “Rocket Caddy” from our website to make a stand that will hold your model horizontally). Repeat for the remaining fins. See Figure L for what correctly aligned fins should look like and an example of incorrectly aligned fins.

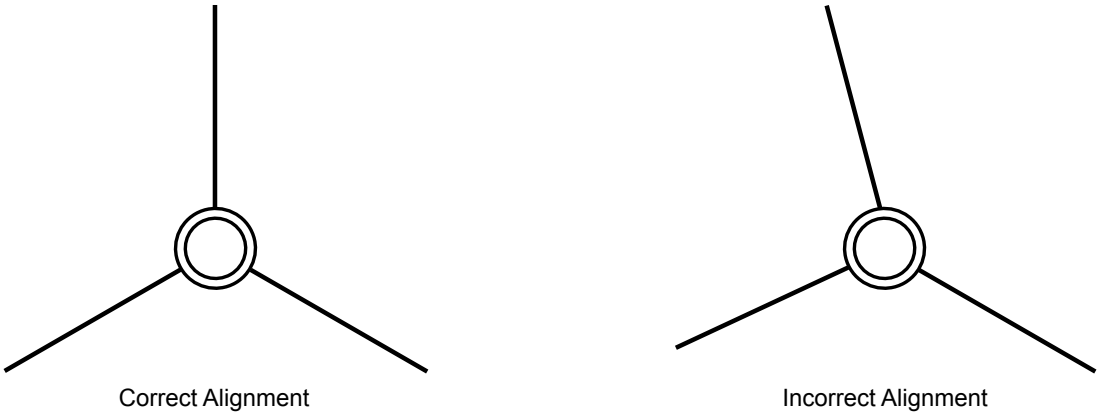


Figure L

□ 6) Locate the launch lug (the very small white tube). Using the same method as you used to attach the fins, glue the lug to the body along the launch lug line you drew earlier. The bottom edge of the lug should be at the 2" mark you made on the line. Be sure the lug is parallel to the body. See Figure M.

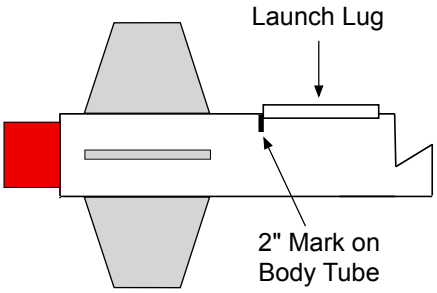


Figure M

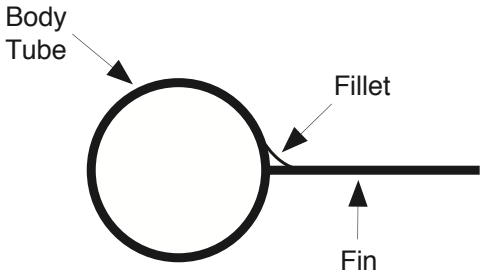


Figure N

☐ 7) After the glue is completely dry, apply a small amount of glue to the joint between the root edge of one of the fins and the body tube. Smooth the glue with your finger to form a small, smooth fillet and remove any excess glue (see Figure N). Continue to add fillets to all the fins. Allow the model to rest horizontally while the glue dries on each set of fins. The fillets will strengthen the fin attachment. Apply fillets to the launch lug as well and allow to dry.

☐ 8) See Figure O for this step. Locate the balsa nose cone and the metal screw eye. Test fit the shoulder of the nose cone into the top end of the white body tube - sand the shoulder if needed for a smooth fit.
Thread the screw eye into the center of the bottom of the nose cone. 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. Firmly tie the loose end of the Kevlar® shock cord to the screw eye.

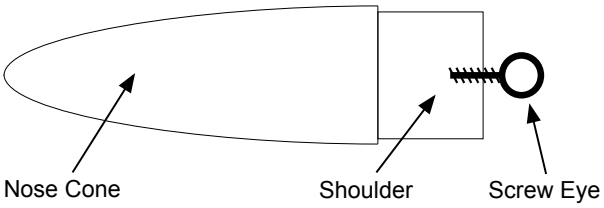


Figure O

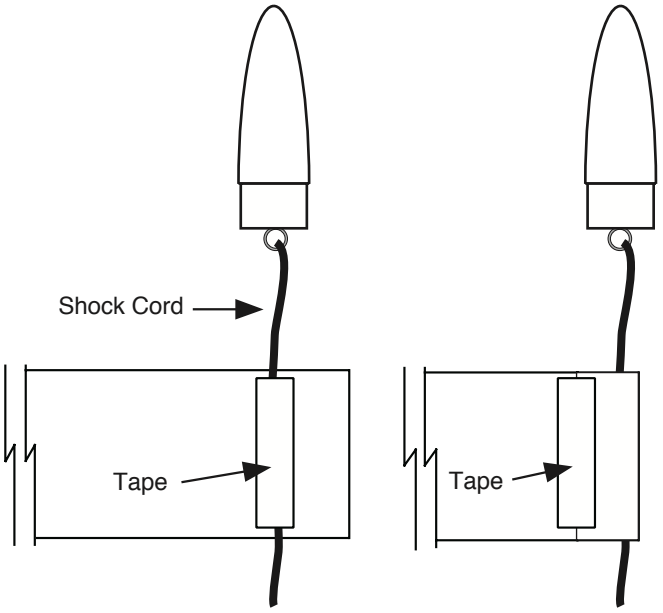


Figure P

☐ 9) Refer to Figure P as needed for this step. Locate the plastic streamer material. Lay the shock cord over the streamer about 3" from the screw eye. The cord should be about 1" from one end of the streamer. Firmly tape the shock cord to the streamer. Next fold the short piece of the streamer back over the shock cord and apply another piece of tape to tape the streamer to itself.
Fold the streamer in half lengthwise. Fold in half again two or three more times then roll the streamer into a small cylinder. Wrap some of the shock cord around the streamer to hold the streamer into a

cylinder. Insert the shock cord then the streamer into the body tube - if the streamer doesn‘t fit easily, rewrap tighter until the cylinder fits easily. Slip the nose cone into place.

Finishing and Decorating

The model may be decorated and/or painted in many ways, depending on how you want it to look and how much time you wish to put into it. The following instructions refer to a full finishing of the model including filling the wood grain. Be sure to do all balsa filling, painting, etc. in a well ventilated area. Alternately you may simply decorate the model with any colors of felt tip markers, decals/stickers, etc. You may paint the model with spray or brush paint without filling the wood grain as described below, but the finish will be rougher and it may take several coats to get the color(s) as desired as the wood parts can soak up the paint. If you decide not to fully finish the model as described below, skip on to the Flight Preparation and Launching section.

□ 10) 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. Wrap a single layer of cellophane tape (or masking tape) around the shoulder of the nose cone (the part that goes into the body tube) - this will prevent building up the thickness of the shoulder while painting. Insert the nose cone shoulder into the top of the body tube. Next apply a coat of sanding sealer to all wood parts (the nose cone and fins)- it is not necessary to seal the nose cone shoulder. 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.

□ 11) You will need to use something such as a dowel or a section of newspaper rolled into a tight cone inserted into the base of your model to hold it while painting. If desired, lightly go over the model with a tack cloth to remove any excess dust or other particles which could mar the finish. It is a good idea to do this before applying each coat of primer and paint. 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.

□ 12) First give a base coat of the lightest color you will be using on the model - several light coats are preferable to one or two heavy coats (this will be true for all the colors you will be using). Apply as many coats as needed to get a nice even color. Allow to dry thoroughly.

□ 13) If applying other colors, use masking tape to cover up the areas of the model you do not wish to paint with the second color. Apply the second color as you did the first and allow to dry. Continue this process if other colors are desired. After the paint has dried carefully remove the masking.

□ 14) At this time you may apply any decals, stickers, trim tape, etc. if desired.
To protect the paint and other decorations, you may apply one or more coats of clear paint (such as Krylon Crystal Clear or similar) and allow to dry.

Flight Preparation & Launching

Remove the nose cone and streamer from the body tube and loosely insert some flame - proof recovery wadding (such as that made by Estes or Quest) into the body tube. Use enough wadding to fill the tube to a depth of at least one and a half body diameters (usually about two or three squares of wadding).

Pack the streamer as you did in Step 9. Insert the shock cord, then the streamer down into the body tube. Slide the nose cone into the body tube. Be sure to check the fit of the nose - if too tight, sand the shoulder down - if too loose, wrap with tape. The nose cone should be loose enough to slip out easily, but tight enough so that you can turn the model upside down without it falling out.

Select an engine from the list of recommended engines. Test fit the engine into the engine mount tube until it meets the engine block - about 3/16" to 1/4" of the engine should be sticking out from the red tube (be sure the nozzle end is facing out! See Figure Q). If the engine is a snug fit, simply put a wrap of tape (either masking tape or cellophane tape) around the red tube and the exposed engine as shown in the bottom drawing of Figure Q. Be sure the tape is well applied and the engine cannot be easily pulled out with your fingers.

If it is not a snug fit, remove the engine and wrap some tape around the outside of the engine about 1/4" from the nozzle end as shown in the top drawing below. Test fit and add more tape if needed to make the engine fit snugly inside the tube. Be sure the engine cannot be easily pulled out with your fingers. If desired you can also add a wrap of tape around the red tube and the exposed engine as shown in the bottom drawing of Figure Q for extra security.

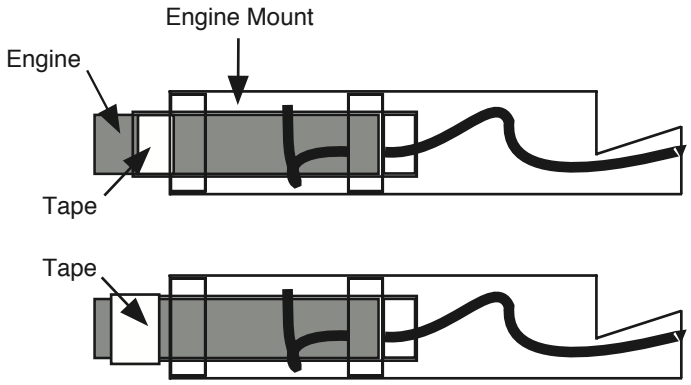


Figure Q

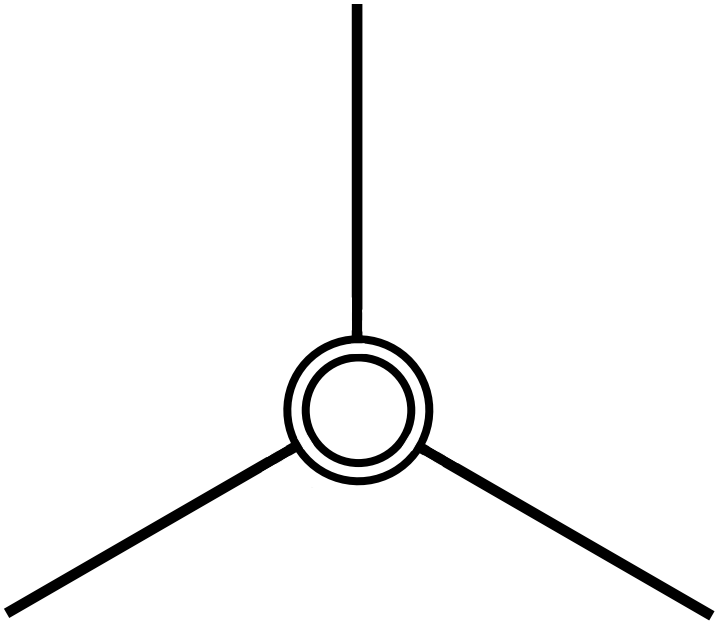
Insert the igniter according to the manufacturers directions.

Place the rocket on the launcher by sliding the launch lug over the launch rod. Be sure the safety key is out of your launch system and 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, insert the safety key, give the countdown & launch!

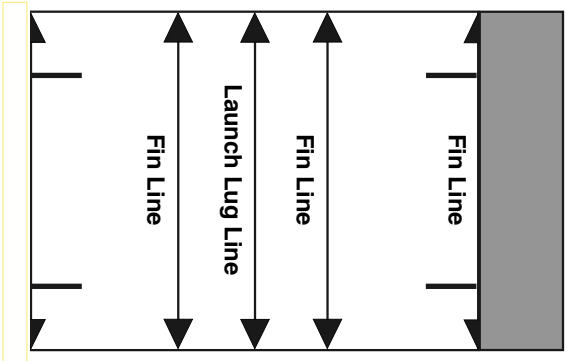
To fly your model again, remove the used engine (be careful if you just flew it, it may be hot!). You may need to use a pair of pliers to grasp the exposed end of the engine to help pull it out. Then repeat the instructions above.

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)



Fin Alignment Guide



Tube Marking Guide