

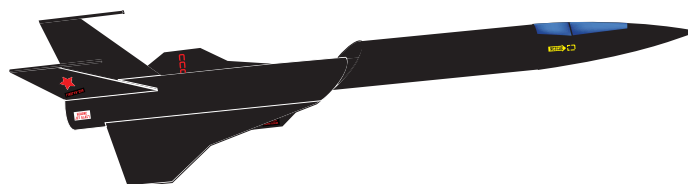


Skill Level 4 – Slightly Challenging

This rocket kit has a shape reminiscent of a Soviet-era fighter jet. The inspiration actually came from the 1982 movie starring Clint Eastwood called "FIREFOX." The model is meant to look like a mean, stealthy fighter jet.

The unique trait of this rocket is the offset body tube. Even though the nose is not on the same centerline as the engine tube, the rocket is robust enough that it flies straight and true on D and E size rocket engines. What makes this a Skill Level 4 rocket is that the builder must cut the tubes at an angle.

The Dynastar FireFox-SHX kit was designed by Shrox, who creates unique designs that can be built using traditional rocket materials. Shrox has always attempted to make kits that don't need a lot of specialty parts that can only be molded from plastic. He likes things that can be easily scaled up or down, so modelers like you can make several different versions of the same kit.



Firefox Parts List

P/N	Description	Qty
10091	AT 24/3.75 (BT-50)	1
10140	AT 41.6/18 (BT-60)	1
10197	AT 66/18 (BT-80)	2
13031	CR 18/24 (Green engine block)	1
13056	1/4" Launch Lug 3.0	1
14400	Spruce Stick 1/8"x3/16"x14.75"	1
15015	DCR 24/41.6	1
15045	Crescent Moon Die Cut Pieces	1
15546	FireFox-SHX Main Wing Fin Set	2
15547	FireFox-SHX Vertical Tail Fins	1
15548	FireFox-SHX Dorsal Fin Sheet	1
19480	PNC 66mm (BT-80)	1
24043	Regular D-Size Engine Hook	1
24044	Regular E-Size Engine Hook	1
29101	32" Parachute Pack	1
29520	Kevlar Shock Cord 300# x 8ft	1
31086	FireFox-SHX Instr. Sheet A	1
31087	FireFox-SHX Instr. Sheet B	1
31088	FireFox-SHX Instr. Sheet C	1
37029	Marking Guide	1
37030	FireFox-SHX Cutting Guide	1
41033	FireFox-SHX Decal	1

Other Tools and Materials Needed

- Scissors
- Hobby knife
- Pencil
- Carpenter's wood glue (or white glue)
- CyA adhesive super glue (medium viscosity)
- Masking tape
- Sandpaper (200 and 400 grit) & sanding block
- Aluminum Angle to draw lines on the tube
- Ruler
- Razor saw to cut wood stick
- Large sheet of plastic or wax paper
- Wood filler or sanding sealer to smooth balsa fins
- Paint brush
- Spray paint
- 24mm spent engine casing to insert engine block
- Long wood dowel to spread glue deep inside tubes



**Mid-Power
Model
Rockets**

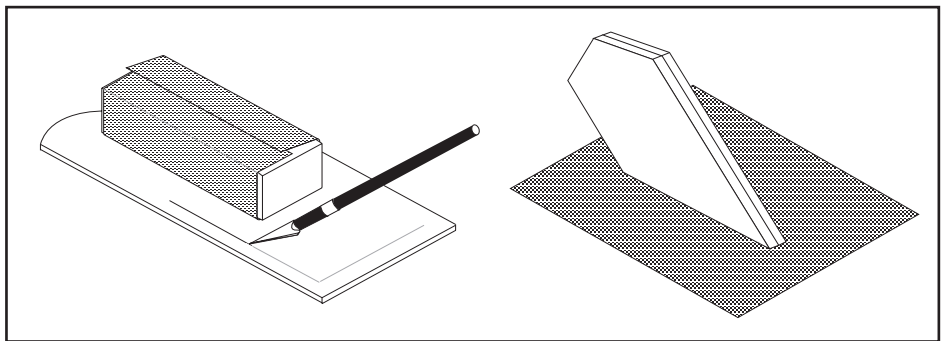
Another quality flying model rocket kit from:
Apogee Components, Inc.
Colorado Springs, CO USA

Visit our web site at: www.ApogeeRockets.com

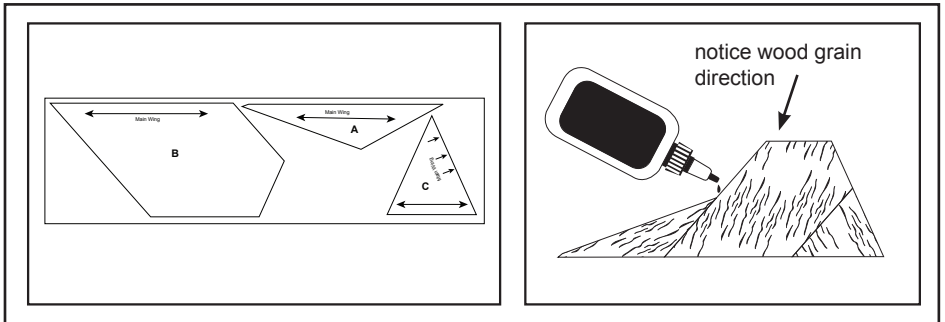
Dynastar Firefox-SHX Assembly

☐ 1. Using 400 grit sandpaper, fine sand the balsa laser-cut sheets before removing the fins. Carefully remove all the pieces from the balsa sheet by freeing the edges with a sharp hobby knife.

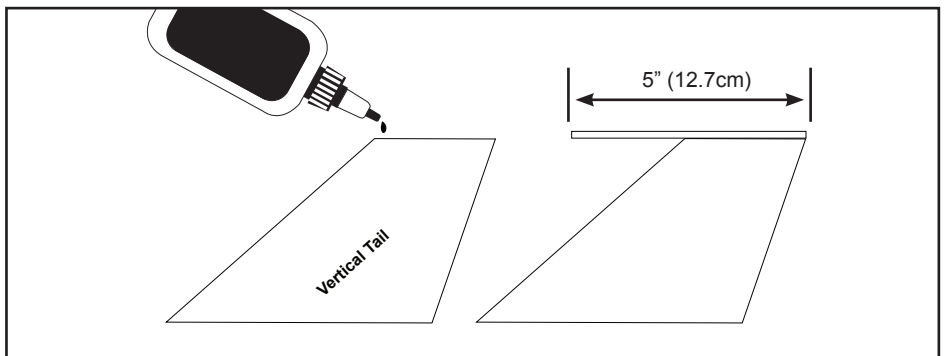
☐ 2. Group the similar fins together and gently sand the edges as shown in the illustration.



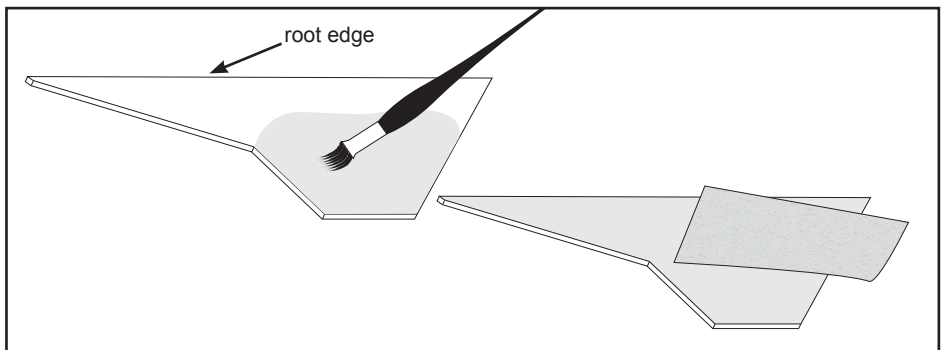
☐ 3. The main wings of the FireFox-SHX are made by joining the balsa pieces together as shown. Place the pieces on a sheet of plastic when gluing them together so they don't stick to your work table as they dry. Use wood glue, and perform this step two times to make left-and right -side wings.



☐ 4. Cut the wood stick into two pieces that are 5 inches (12.7 cm) long. These will be glued to the tip edges of the vertical tail pieces. Place the pieces on a sheet of plastic when gluing them together so they don't stick to your work table as they dry. Use wood glue, and perform this step two times for each of the two vertical tail pieces.



☐ 5. You can apply sanding sealer to the surfaces of the balsa fins to smooth out the wood. Coat both sides at the same time to minimize the chance of the fins warping. Do not allow the sanding sealer to get on the root edge of the fin. This could prevent the fin from bonding well to the body tube when it is glued on later in step 31. Set them aside to dry completely. When they are dry, sand the sealer smooth until you get a desirable surface finish. You may need to repeat this step several times depending on the level of quality you wish to achieve.

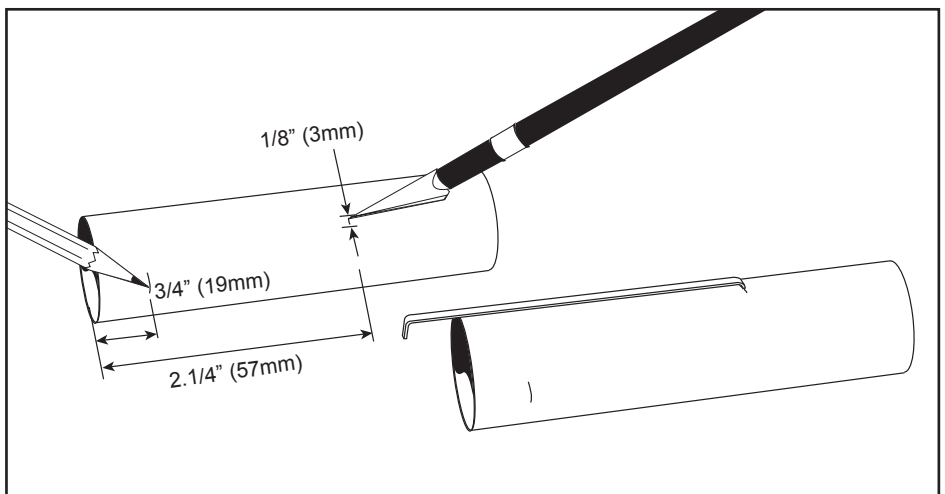


☐ 6. Install your preferred engine hook:

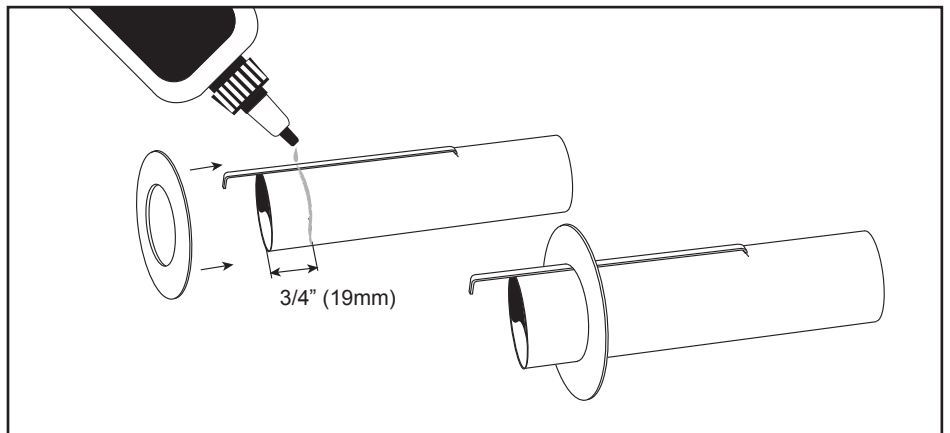
D Engine Hook: Mark the body tube 1/2" (13mm) and then 2-1/4" (57mm) from one end as shown.

E Engine Hook: Mark the body tube 1/2" (13mm) and then 3-1/4" (83mm) from one end. This will be the aft end of the rocket. Make the lines about 1/8" (3mm) long as the picture shows.

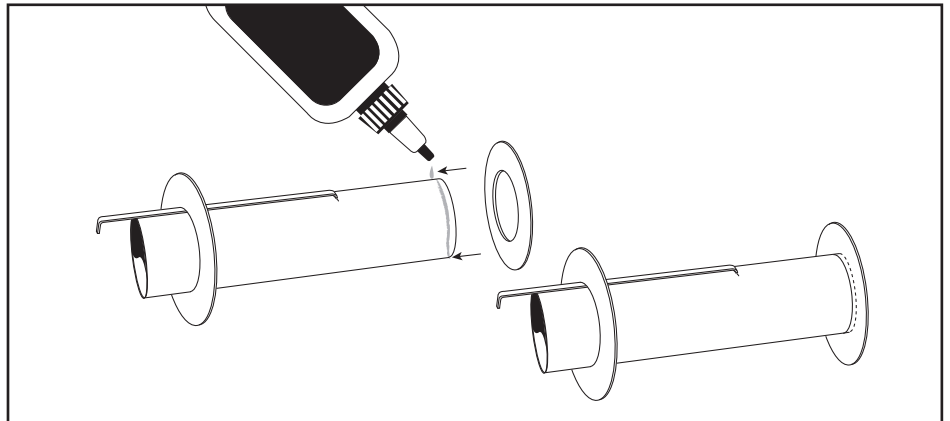
Take a hobby knife and cut a 1/8" (3mm) long slit in the engine tube along the line at the 2 1/4" (57mm) or 3-1/4" (83mm) position. Insert one end of the motor hook into this slit.



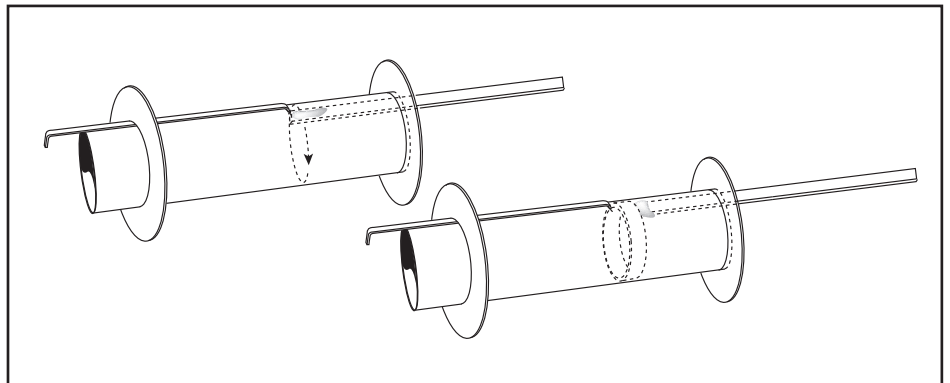
□ 7. Remove one of the engine mount centering rings from the die-cut card sheet. Apply a bead of wood glue around the engine mount tube 3/4 inch (19mm) from the aft end. Slide one of the cardboard rings onto the engine tube over the engine hook and into the bead of glue. Check to be sure the ring is aligned straight, as shown. Allow the glue to dry.



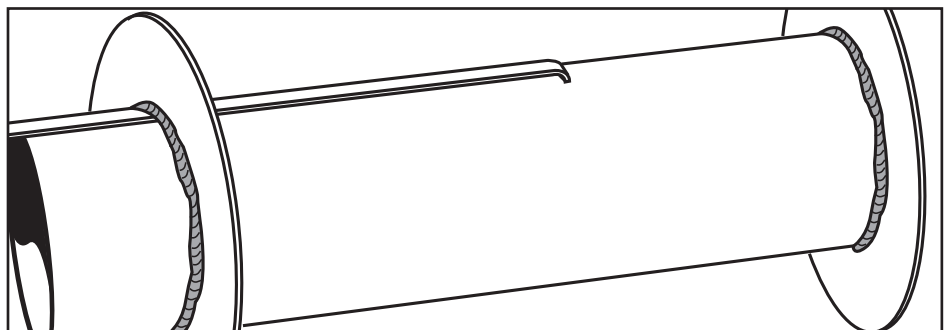
□ 8. Remove a second engine mount centering ring from the die-cut card sheet. Apply a bead of wood glue around the front end of the engine mount tube. Slide the cardboard ring onto the engine tube near the front of the tube. Check to be sure the ring is aligned straight as shown.



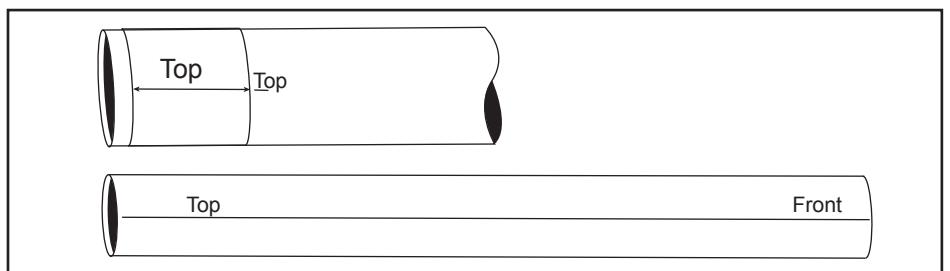
□ 9. Engine block installation: Using wood glue, glue the green centering ring into the forward end of the engine mount tube. Push it in until it rests against the top of the engine hook. Once it is in place and dry, add a fillet of glue around the front edge of the green ring (engine block) using a long wood dowel.



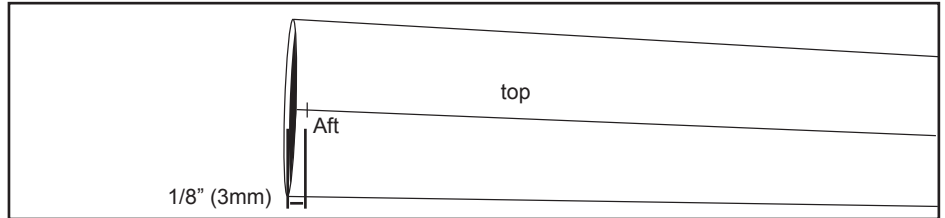
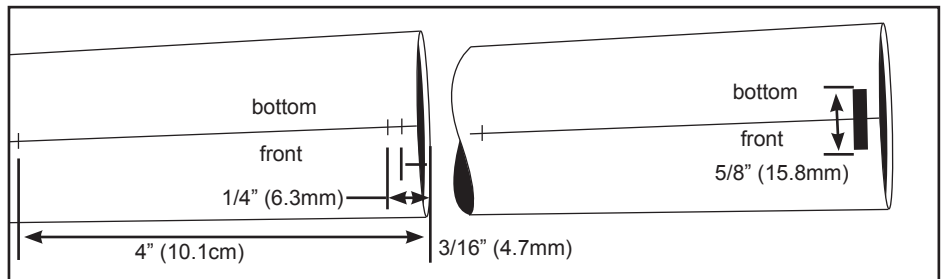
□ 10. After the glue on the engine mount is dry, put a fillet of glue on each side of two the centering rings. These rings take a lot of stress at engine ejection, and you must make sure to have a good glue bond.



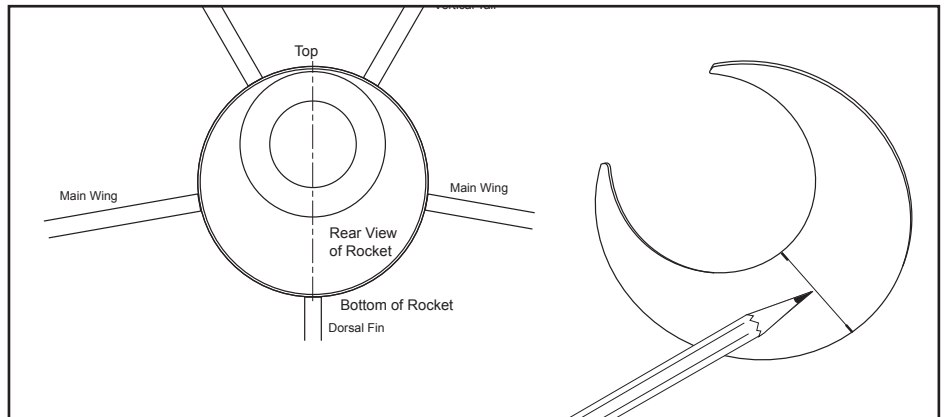
□ 11. Cut out the "Stuffer-Tube" marking guide, P/N 37029 (B). Wrap the guide around the stuffer tube (AT 41.6/18) and tape the ends together. Mark a small line at each of the arrow points and label "top" and "bottom" as indicated on the marking guide, then remove it. Draw a pencil line down the entire length of the tube for both lines. Label one end of the tube as "front."



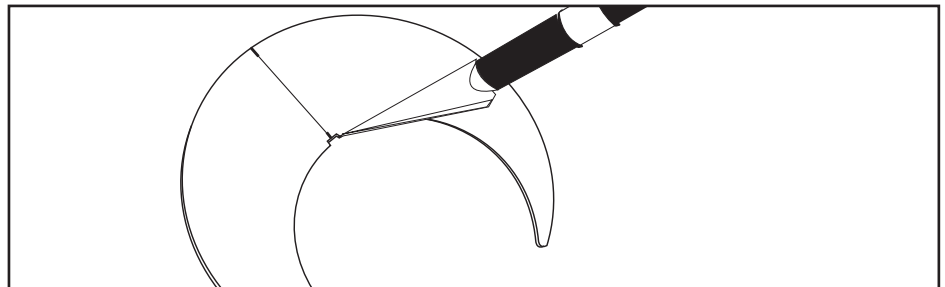
□ 12. Along the “Bottom” line of the stuffer tube, and measured from the front end, make three 1/8” (3mm) wide marks at 3/16”, 1/4” and 4.0” (4.7mm, 6.3mm, and 10.1 cm). Using a hobby knife, cut a slot 5/8” (15.8mm) wide that straddles the “Bottom” centerline, and is between the 3/16” and 1/4” marks (4.7mm and 6.3mm). On the other side of the tube, make a mark 1/8” (3mm) from the aft end of the tube on the “Top”.



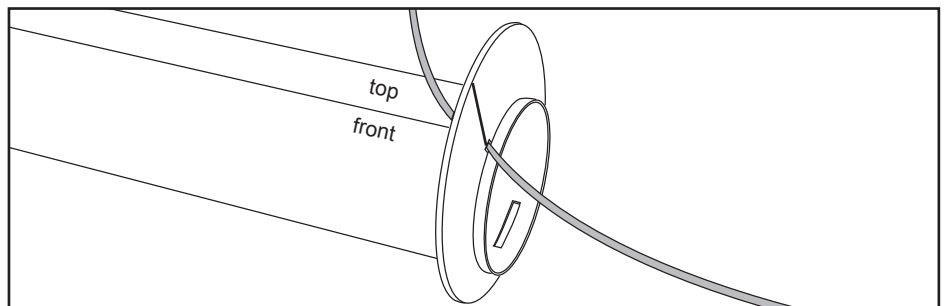
□ 13. Remove the two crescent-moon die-cut pieces, from the cardstock sheet. Mark the centerline of both pieces. Use the “Rear View of Rocket” drawing on the tube marking guide sheet to locate the centerline. Be sure to mark both the inside and outside edges of the piece as shown. Then draw a straight line connecting the ends of the centerline.



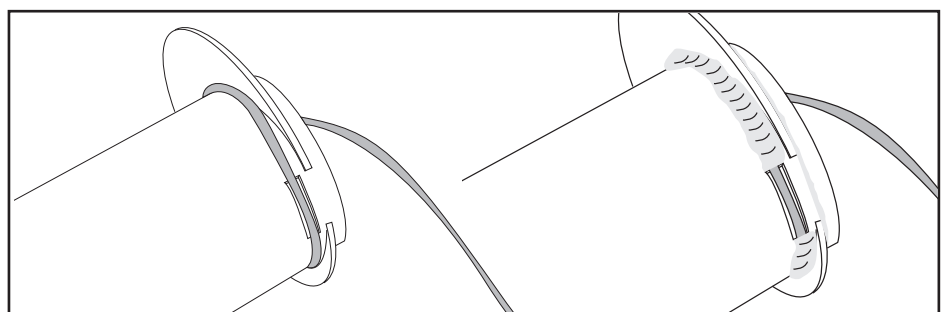
□ 14. Take one of the crescent-moon shaped pieces, and cut a small notch on the inside edge as shown. The notch only needs to be slightly bigger than the diameter of the yellow shock cord.



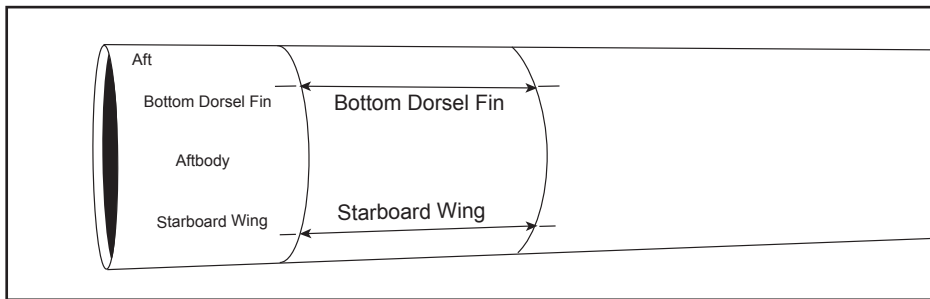
□ 15. Lay one end of the yellow shock cord in the notch in the crescent-shaped piece. Position and glue this piece on the front end of the stuffer tube. It should be positioned just aft of the 1/8” (3mm) mark. The centerline of the crescent-shaped piece should be aligned with the “TOP” line on the stuffer tube. Do not get any glue on the yellow shock cord yet. It should be able to slide through the cardstock piece.



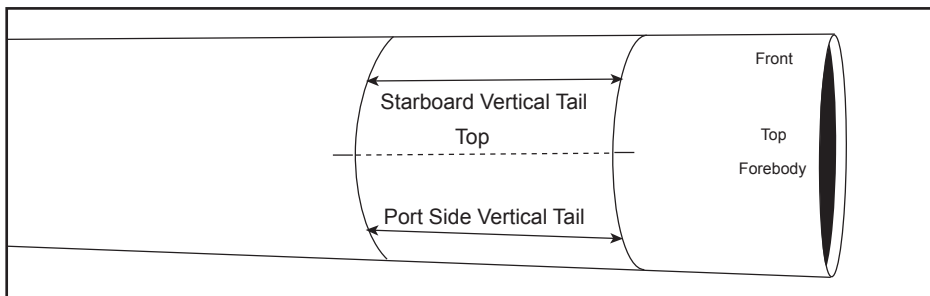
□ 16. When the glue on the cardstock piece is dry, tie the yellow shock cord around the stuffer tube. Position the knot near the notch to plug up the hole. On the bottom of the stuffer tube, the cord should lay in the cut-out slot. When cord is in position, apply a glue fillet over the cord to hold it tight in the joint of the tube and front crescent-moon shaped piece. Also apply a fillet of glue of the front side of the crescent-moon shaped piece where it meets the tube. Set aside to allow the glue to dry.



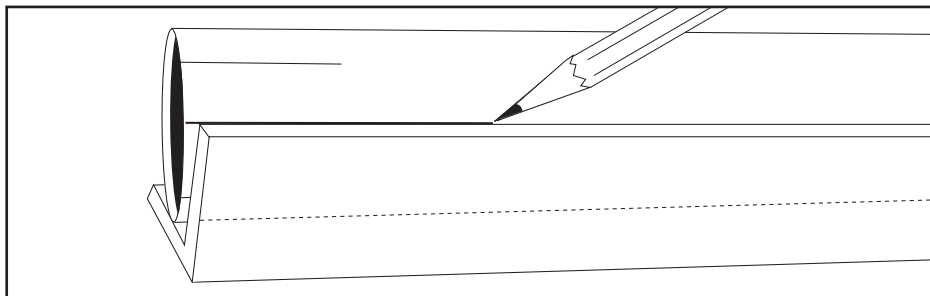
□ 17. Cut out the “main-tube” marking guide. Wrap the guide around the aft end of one of the large white body tubes and tape the ends together. Mark a small line at each of the arrow points and label them as indicated on the marking guide and then remove it. Make sure to label the end of the tube as “Aft End.” This tube will now be known as the “aftbody” tube.



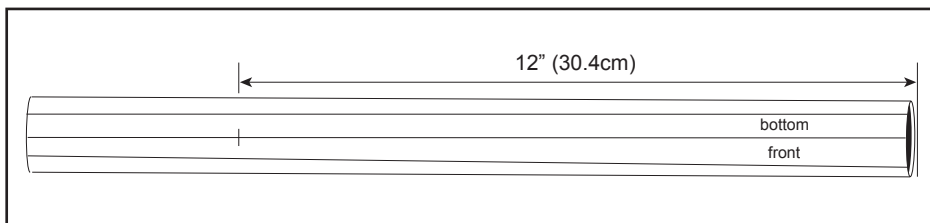
□ 18. Put the “main-tube” marking guide on the other large tube. This time, just apply marks at the “Top” and the “Bottom Dorsal Fin” locations. Be sure to label one set as “Top”, and the other as “Bottom.” This tube will be the “forebody” tube. Label one end of the tube as “FRONT.”



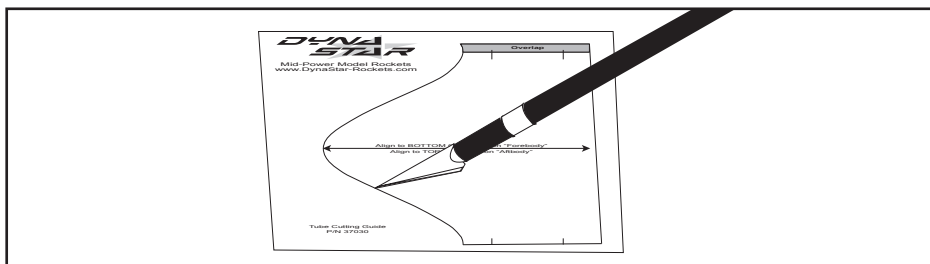
□ 19. Using a metal angle tool (a door frame will work, but it is not recommended on large diameter tubes), draw a pencil line down the outside of the two large body tubes at each pencil mark.



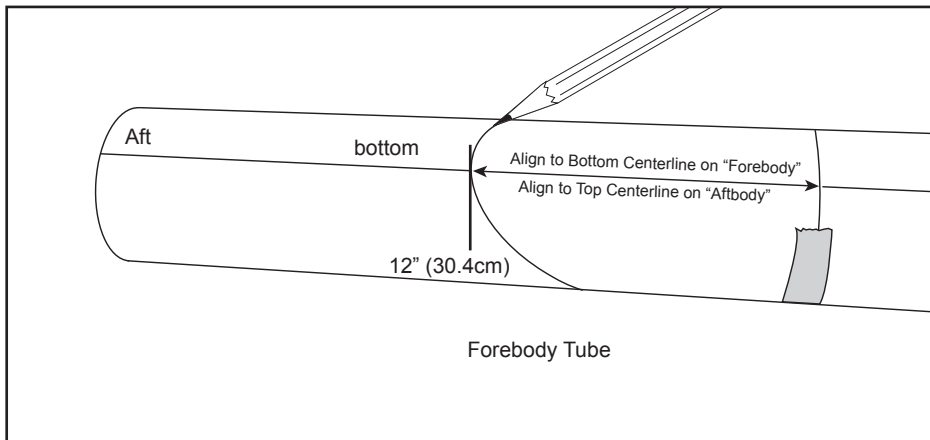
□ 20. On the “forebody” tube, measure and make a mark 12” (30.4cm) from the front end. The mark should be on the “Bottom” centerline.



□ 21. Using a hobby knife and the straight edge on your ruler, carefully cut out the diagonal tube cutting guide from the pattern sheet (P/N 37030).

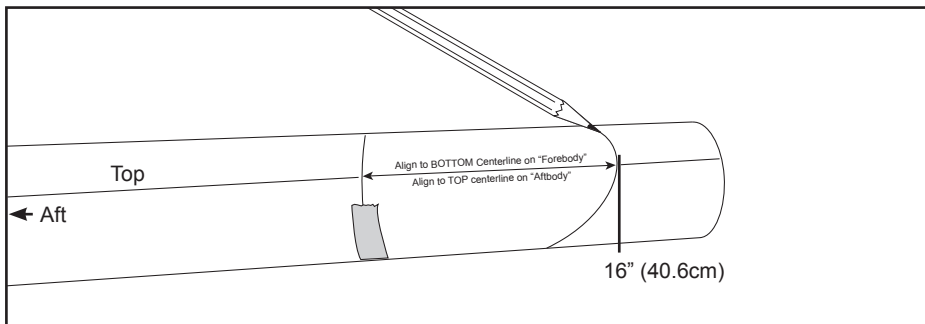
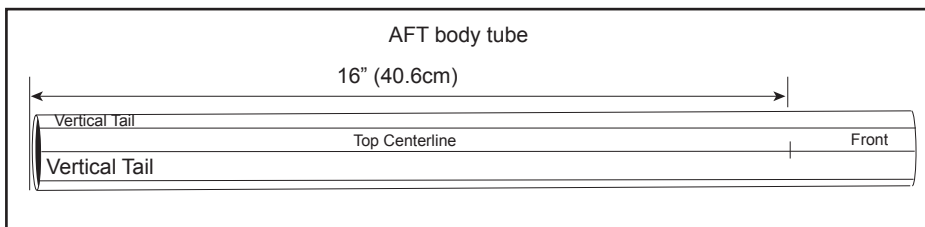


□ 22. Wrap the diagonal tube cutting guide around one end of the “forebody” tube with the straight edge closest to the front of the tube. Make sure the centerline on the guide is aligned with the “BOTTOM” centerline on the tube. Slide it until the curved edge of the cutting guide is flush with the 12” (20.4 cm) mark drawn on the tube. When it is positioned correctly, tape it down on the straight edge so it can’t slide around. Taking your pencil, trace around the edge of the guide as shown. You may now remove the paper guide. Set aside the tube for now. It will be cut later in step 25.



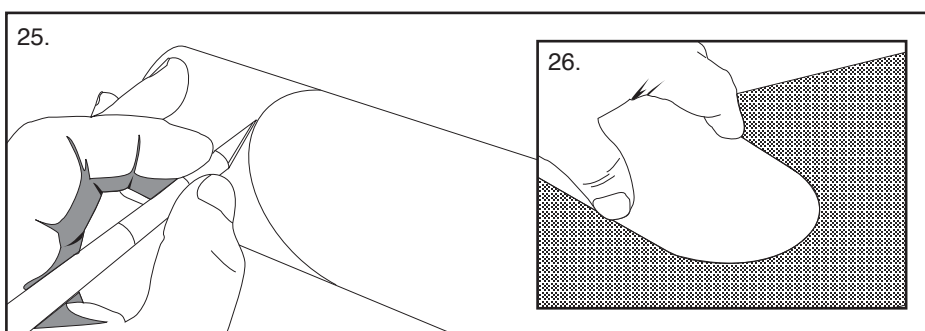
☐ 23. On the “aftbody” tube, measure and make a mark 16 inches (40.6 cm) from the AFT end. The mark should be on the TOP centerline.

☐ 24. Take the same diagonal tube cutting guide and wrap it around the “aftbody” tube with the straight edge closest to the Aft end of the tube. Make sure the centerline on the guide is aligned with the “TOP” centerline on the tube. Slide it until the curved edge of the cutting guide is flush with the 16” (40.6 cm) mark drawn on the tube. When it is positioned correctly, tape it down on the straight edge so it can’t slide around. Taking your pencil, trace around the edge of the guide as shown. You may now remove the paper guide.

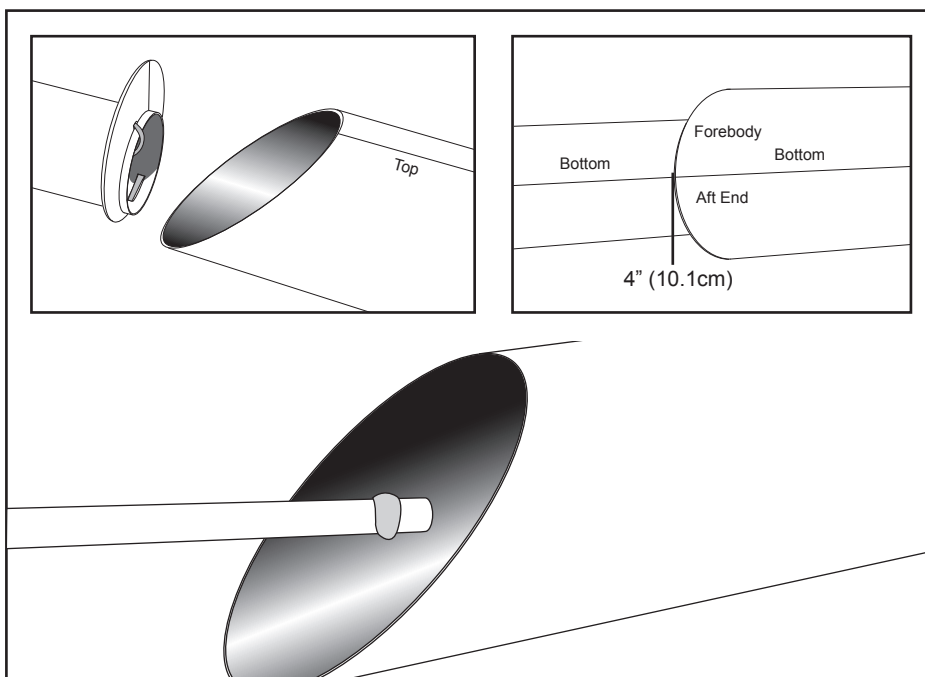


☐ 25. Using a very sharp hobby knife, carefully cut along both lines on two large body tubes as shown. Work slowly! Do NOT try to cut through the tubes in a single pass. Make several light cuts first to be sure that your blade does not stray from the line.

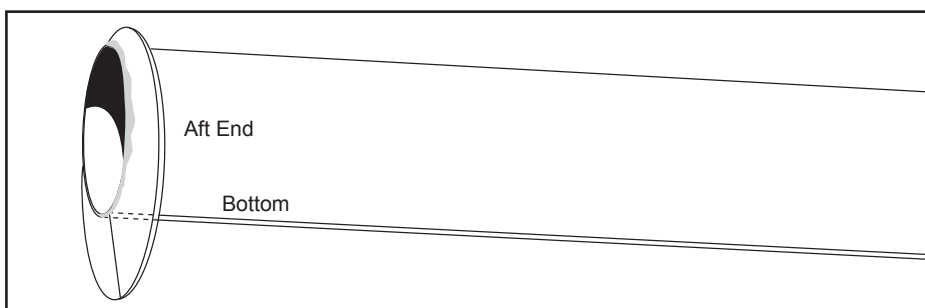
☐ 26. Clean up the edges of the tube by sanding them with 200 grit sandpaper as shown. The edges look better when they are smooth and flat.



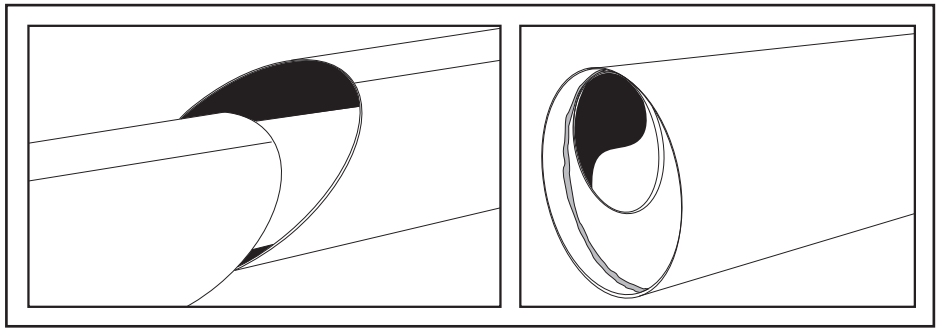
☐ 27. Temporarily feed the shock cord back through the stuffer tube so it doesn’t get glue on it. Then test fit the stuffer tube into the “forebody” tube. Align the “Bottom” centerlines of both tubes. Slide the stuffer tube in until the curved edge of the Forebody tube gets to the 4” mark on the stuffer tube. Make sure the two “Bottom” centerlines are aligned perfectly straight. When you understand how they should be oriented, remove the stuffer tube. Apply glue around the inside of the forebody tube using a wood dowel. The glue should be approximately 1.0” (25mm) from the top inside lip of the tube. Then apply a thin bead of glue to the bottom centerline of the stuffer tube, where it will touch the inside of the forebody tube. Working quickly, reinsert the stuffer tube into the forebody and make sure the bottom centerlines are aligned before the glue has a chance to set. Allow the assembly to dry.



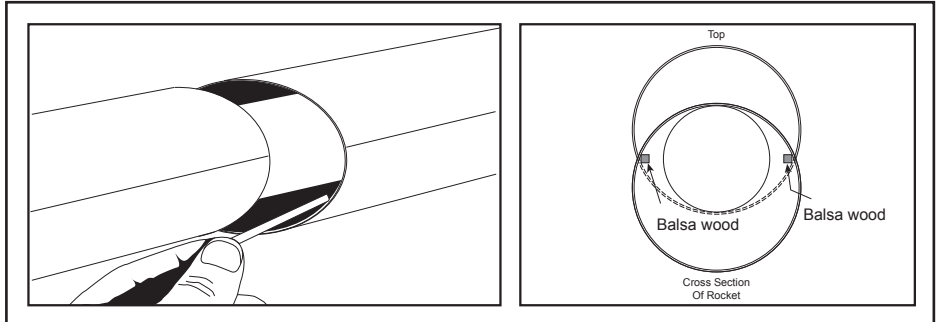
☐ 28. Take the remaining crescent-moon piece and glue it to the rear edge of the stuffer tube. The centerline drawn on the rings from step 13 should be aligned with the bottom centerline of the stuffer tube. Apply a fillet of wood glue to the joint where the tube touches the cardstock piece. Allow the assembly to dry.



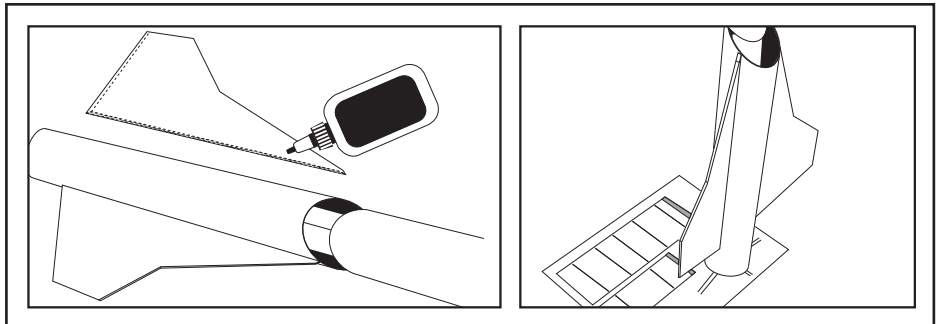
□ 29. Test fit and then glue the stuffer tube into the “aftbody” tube. The top centerlines of the stuffer tube and the “aftbody” tube should be perfectly aligned. The diagonal cut edges of the forebody and the aftbody tubes should just touch. Apply a fillet of glue to the rear crescent-moon piece where it touches the inside of the “aftbody” tube. Allow the glue to dry thoroughly.



□ 30. (Optional) From the excess balsa wood scrap, cut two small sticks. They should be 1/8" (3mm) square by 2" (50mm) long. Carefully wedge them on the inside ends of the body tubes where they touch at the curved ends. The sticks should overlap each tube by an equal amount. Once in place, tack them in there using wood glue. Then come back and add thicker fillets to the joints. This will stiffen up the two tubes where they touch.

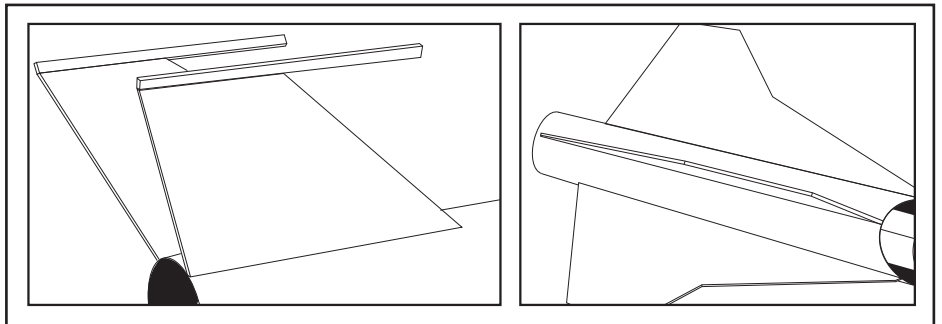


□ 31. Lightly sand the area along which the left and right main wings will be attached, just enough to take the “sheen” off the tube. Apply a very thin layer of wood glue to the root edge of one of the main wings. Allow the glue to dry slightly for three minutes, and then attach it along one of the lines on the body tube, as shown in the illustration. Each wing is attached so that the front tip edge is flush with the diagonally-cut end of the “aftbody” tube. You can check the attachment angle by placing the back end of the tube on the “Rear View of Rocket” drawing on the tube marking guide sheet.

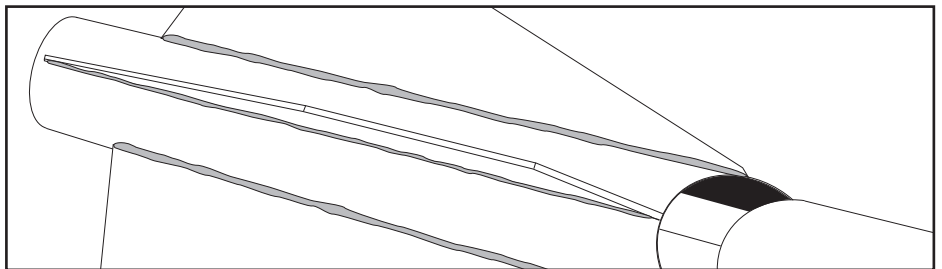


□ 32. Using wood glue, attach the two vertical tails to the aft/body tube. The back edge is flush with the back end of the tube.

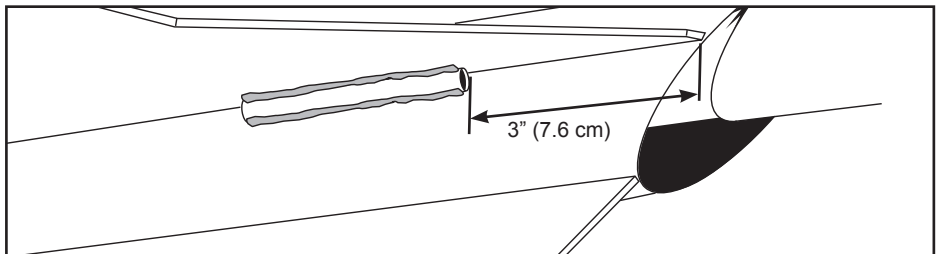
□ 33. Using wood glue, attach the bottom dorsal fin to the bottom centerline on the “aft-body” tube. It is positioned so the leading edge is flush with the diagonally-cut end of the tube.



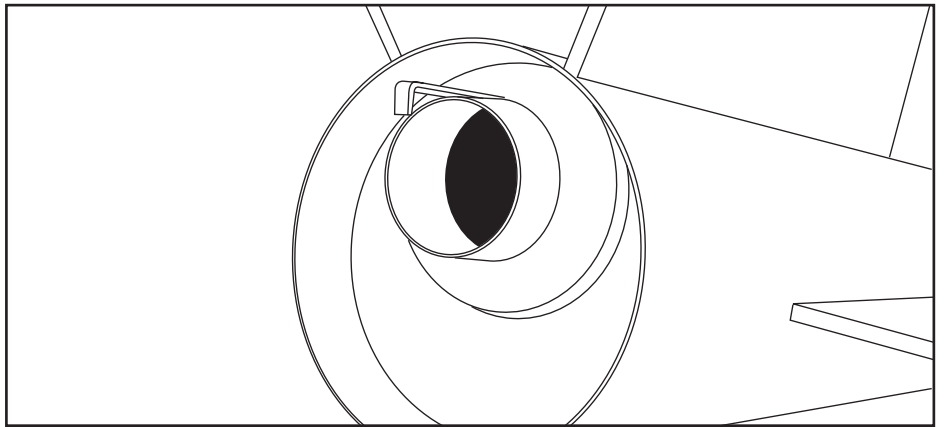
□ 34. Apply a bead of wood glue to both sides of each fin-body tube joint. Pull your finger along the joint to smooth out and remove the excess glue. Lay the tube horizontally while the glue dries.



□ 35. Using wood glue, attach the launch lug to the joint on the bottom edge of the right wing. Position it so that it is 3" (7.6 cm) from the front edge of the tube. Allow the glue to dry. Apply a bead of wood glue to both sides of each launch-body tube joint. Pull your finger along the joint to smooth out and remove the excess glue. Lay the tube horizontally while the glue dries.

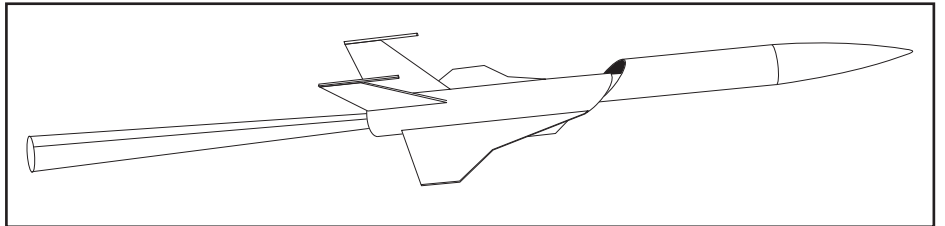


☐ 36. Glue the engine mount assembly (from step 10) into the rear end of the stuffer tube using wood glue. The engine hook should be oriented toward the top of the tube, and the end of the engine tube should be flush with the back edge of the aftbody tube.

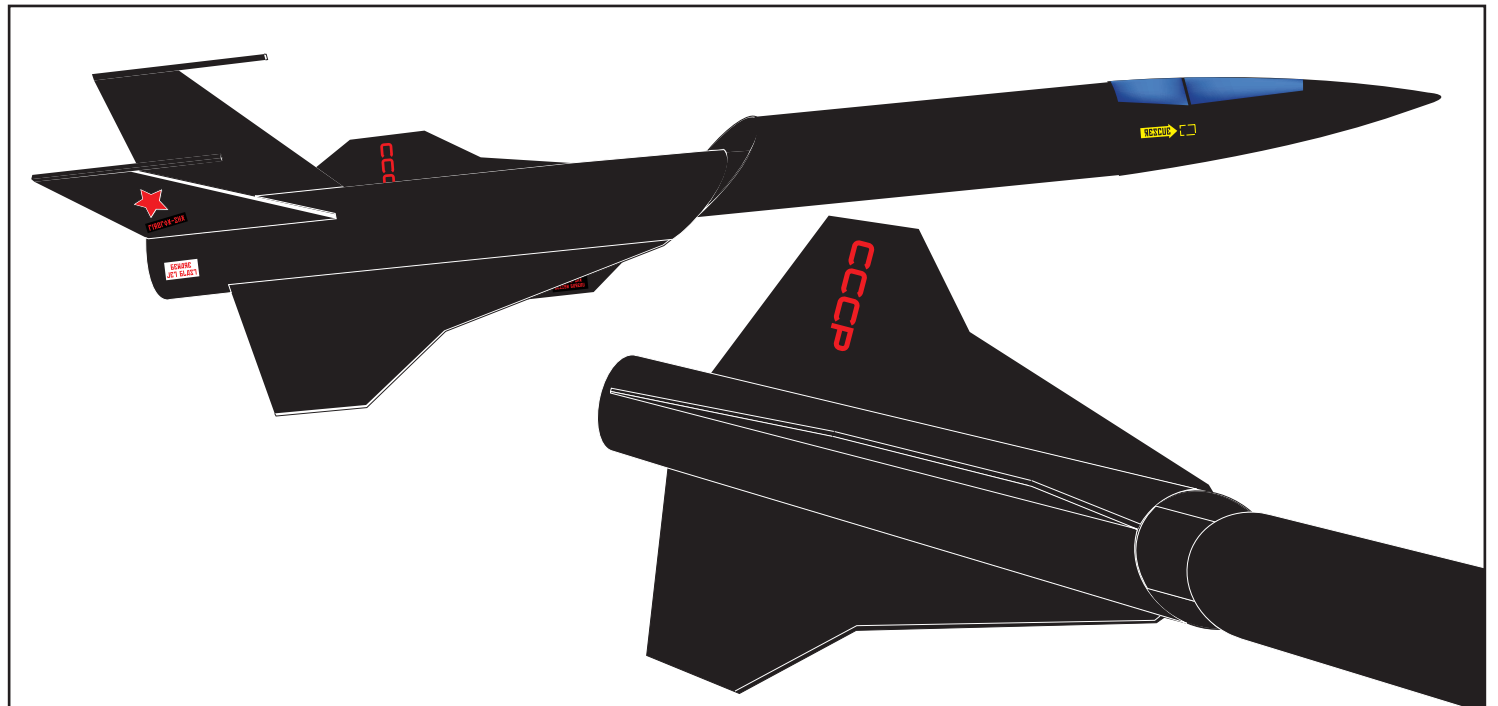
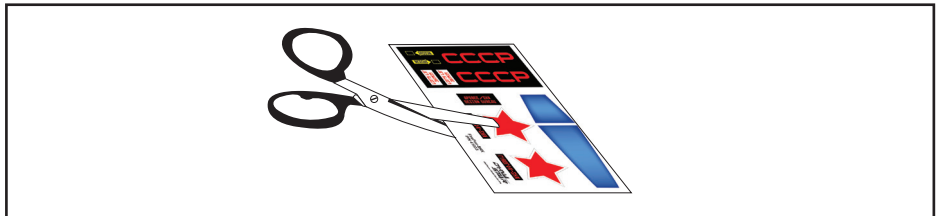


☐ 37. After all the glue has completely dried, you may now paint your FireFox-SHX model rocket (Note: you can temporarily put the nose cone on the white body tube while you paint the rocket).

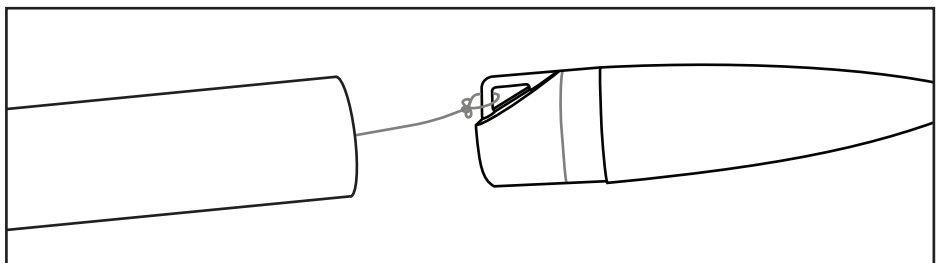
Roll a piece of paper and insert it into the aft end of the body tube so you can hold the model while painting it. For best results, paint the model with primer before using the final paint colors. Follow the directions on the paint can, and always paint outdoors with the wind against your back. Let the paint harden at least 24 hours before proceeding.



☐ 38. Cut around the perimeter of the decal with a pair of scissors. Peel off the paper backing, and affix the decal in place on the model. Use the picture below for decal placement.

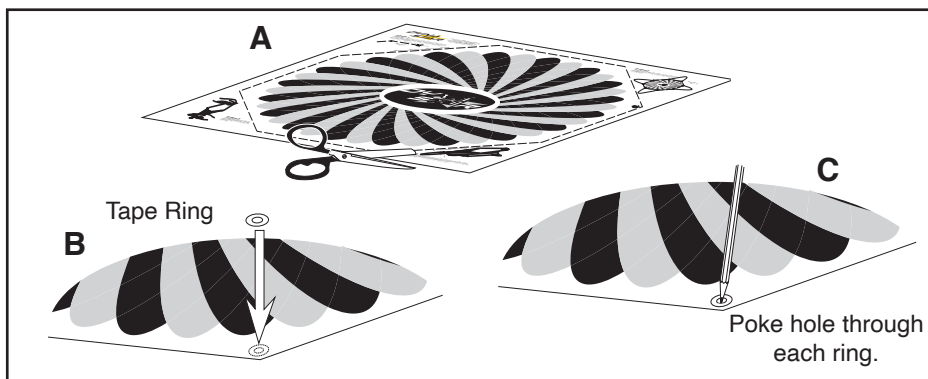


☐ 39. Tie the loose end of the shock cord to the loop on the base of the nose cone using 2 over-hand knots. Apply a little bit of the wood glue onto the knot to keep it from coming untied.



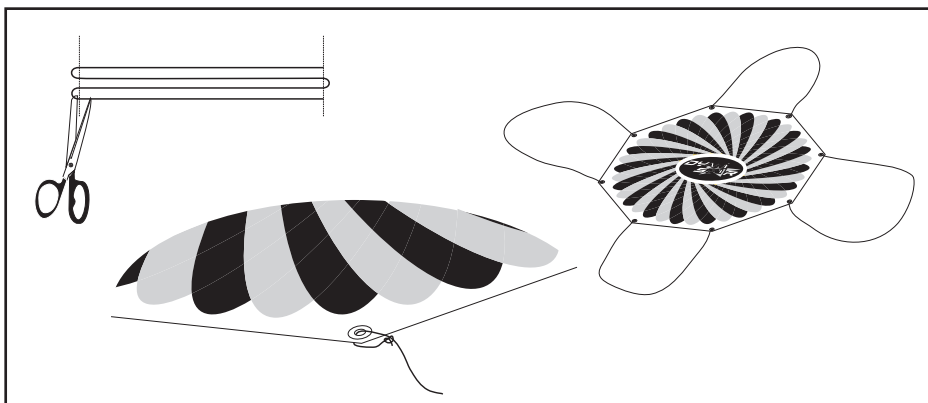
Parachute Assembly

40. Carefully cut out the parachute canopy along the dashed lines for 32". Place one reinforcement ring on each of the marked corners. Take a sharp pencil or knife and poke a hole through the plastic in the center of each ring.



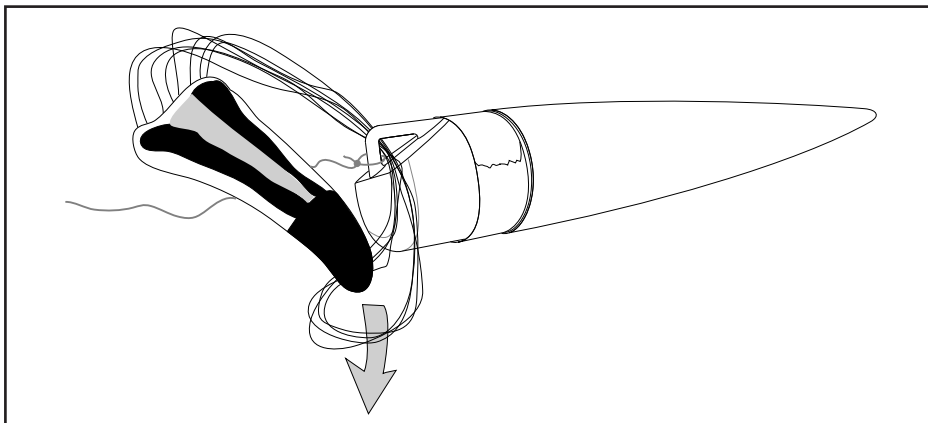
41. Fold the shroud line in half, and cut at the fold to make equal lengths; cut each piece in half again to make a total of four lines of equal length.

42. Pull each parachute line end through a parachute reinforcement ring and tie using two overhand knots. Repeat for all the corners as shown.



43. Holding the parachute at the center of its top, pull the lines together to even up the ends. Thread the 4 looped lines through the loop at the base of the nose cone. Take the top of the parachute and pull it through all 4 string loops at the same time and then pull to tighten the knot. This securely attaches the parachute to the rocket.

44. Congratulations! Your FireFox-SHX rocket is now complete.



Launch Supplies Needed

To launch your rocket you will need the following supplies:

- A model rocket launching system.
- Flame resistant recovery wadding.
- Recommended 24mm Diameter Rocket Engines — see the motor matrix to the right.

Motor Matrix: How High Will the FireFox-SHX Fly With Different Motors

Motor Matrix: How High Will The FireFox-SHX Fly?

Motor Type	Produced by:	Estimated Altitude (feet)	Estimated Altitude (meters)
D12-3	Estes	314.2 ft	95.7 m
E15-4	Aerotech	980.3 ft	298.8 m
E30-4	Aerotech	961.8 ft	293.2 m
E18-4 RMS	Aerotech	944.5 ft	287.9 m
E28-4 RMS	Aerotech	945.8 ft	288.3 m
F24-4 RMS	Aerotech	1130.6 ft	344.6 m
F39-6 RMS	Aerotech	1169.4 ft	356.5 m

The Estes E9 is NOT recommended for use in this rocket. It doesn't have enough kick to keep the rocket going straight up. It will make the rocket go horizontal, which is very dangerous.

The above motor matrix was made using RockSim. Initial conditions: slightly breezy (3-7mph wind), straight up launch angle. You can use RockSim to find other motor combinations that will work well in the Firefox rocket kit. Download the RockSim file for this kit at: www.ApogeeRockets.com/Firefox.asp

Rocket Preflight

- ☐ A. Loosely crumple and insert 8 sheets of recovery wadding into the body tube.
- ☐ B. Carefully fold the parachute and insert it into the tube with the shock cord.
- ☐ C. Insert the motor into the motor tube until the motor hook holds it in place.
- ☐ D. Insert and secure the engine igniter as directed on the package the engines came with.

Countdown and Launch Procedure.

Fly your rocket on a large field that isn't near any power lines, trees, or low flying aircraft. The larger the field, the greater your chances of recovering your rocket. The launch area around the pad must be free of dry weeds and brown grass. Launch only during calm weather with very little or no wind and good visibility. Always use a launch pad that includes a blast deflector.

10. Remove the safety key from the launch controller
 9. Slide the launch lugs over the launch rod to place the rocket on the pad. The rocket should slide freely over the rod.
 8. Attach the micro-clips to the igniter. The clips must not touch the other or the metal blast deflector.
 7. Stand back from your rocket as far as the launch wire allows (at least 5 meters - 15 feet).
 6. Insert the safety key to arm the launch system. The light (or buzzer) on the controller should come on.
- Give a loud countdown 5 ... 4 ... 3 ... 2 ... 1 ... LAUNCH!
- Push and hold the button until the engine ignites. Then remove the safety key and place the safety cap on the launch rod.

Misfire Procedure

Occasionally the igniter will burn, but the motor will fail to ignite. If this happens, the cause is that the pyrogen on the igniter was not in contact with the engines propellant. When an ignition failure occurs, remove the safety key from the launch controller and wait 60 seconds before approaching the rocket. Remove the old igniter from the engine and install a new one. Make sure that the igniter is insert fully into the engine and touches the propellant. Secure the igniter as directed on the engine package and repeat the countdown and launch procedure.

Always follow the NAR* Model Rocket Safety Code when launching model rockets.

*National Association of Rocketry

**Kevlar® is a brand name of E.I. DuPont for their selection of aramid fibers. Only DuPont makes Kevlar®

