

About Centuri Engineering

Centuri Engineering Company was started in 1961 by Leroy (Lee) Piester in his garage while he was still in college in Phoenix, Arizona. With his wife, Betty, they built Centuri into one of the largest model rocket companies ever.

Centuri was known for its unusual and innovative designs, producing over 140 different kits with something for every model rocketeer. They also produced model rocket engines and pioneered the modern composite high powered engines with their Enerjet line.

Centuri Engineering was sold to Damon in the late 1960's and shared the same parent corporation with Estes Industries, the largest model rocket company in the world. The Centuri product line was kept separate from the Estes line until 1983. A few of the old kits have been reissued by Estes since then, but for the most part, Centuri Engineering Company lives today only in the dreams of the senior members of the model rocket community.

About the Centuri Orion™

The Orion was released in the 1971 Centuri Catalog in late 1970. Introduced as a big and highly detailed single engine demonstration rocket, the Orion used parts from the Saturn 1B and Saturn V kits to give it the look of a futuristic NASA interplanetary exploration rocket. The first production models used a balsa nose cone and six balsa pod cones. The pod cones were replaced with plastic just after release and the large nose cone was replaced with a plastic version several months later. It was released as Catalog No. KC-8 and retailed for \$4.95.

The Semroc Retro-Repro™ Centuri Orion™ is very close to the original. All the nose cones are balsa like the original version. The vacuform wraps are replaced with embossed glossy card stock and balsa parts to provide for greater detailing. The parachute is reduced to 16" for less drift with the lower weight.

What is a Retro-Repro?

A Retro-Repro™ is a retro reproduction of an out-of-production model rocket kit. It is a close approximation of a full scale model of an early historically significant model rocket kit from one of the many companies that pioneered the hobby over the past half century. A Retro-Repro™ is not a true clone or identical copy of the original. It incorporates improvements using modern technology, while keeping the flavor and build appeal of the early kits.

March 7, 2010

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Box 1271 Knightdale, NC 27545 (919) 266-1977

Centuri
ORION™

1970
Retro-Repro

**FUTURISTIC
SCALE-LIKE**

EASY TO BUILD

FUN DEMOS

**BALSA FINS &
NOSE CONE**

**FLYING MODEL
ROCKET KIT**

LASER CUT FINS

MADE IN THE USA

SEMROC

Made in the U.S.A by Semroc Astronautics Corporation - Knightdale, N.C. 27545

Centuri Orion™ Kit No. KV-41

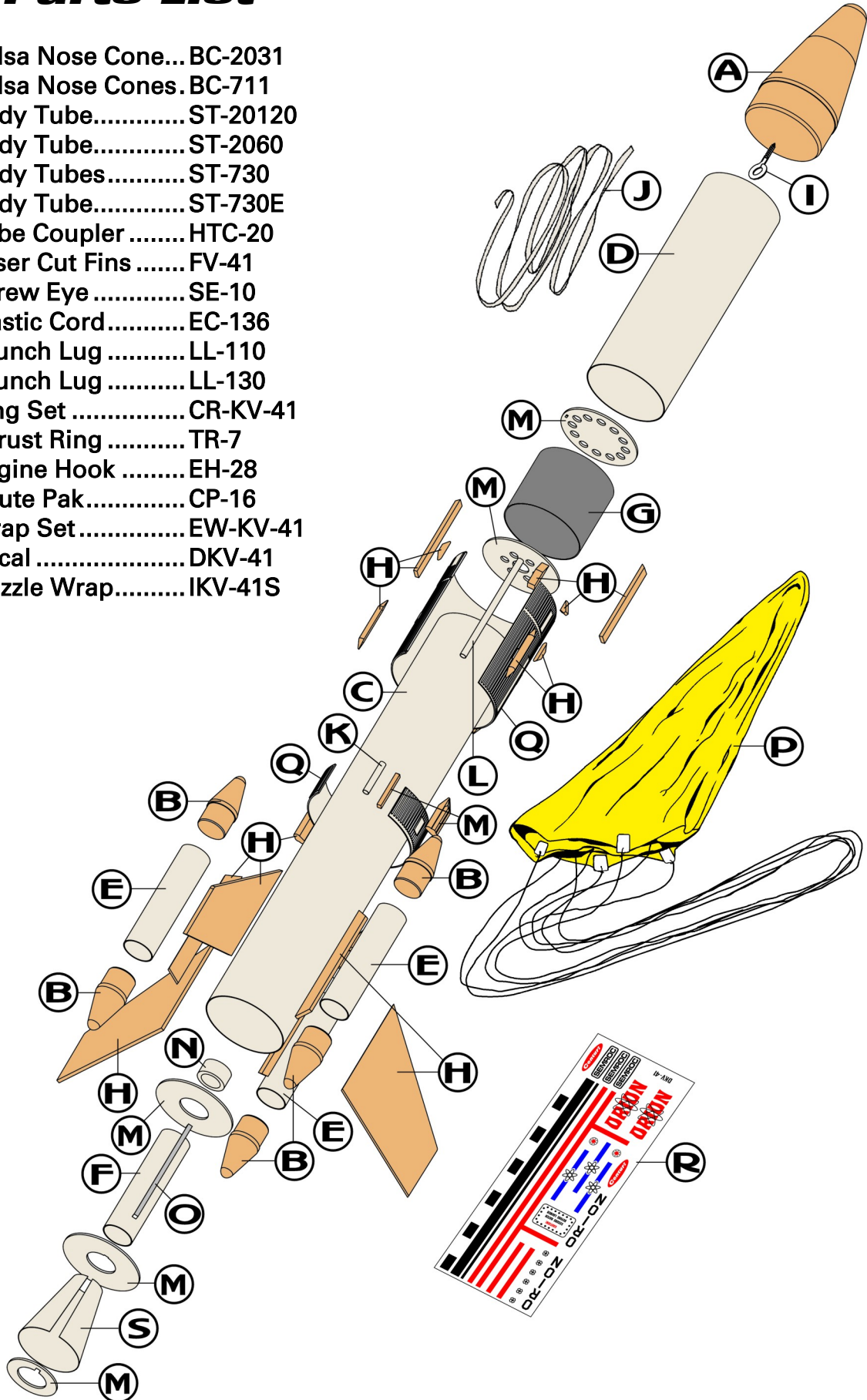
Specifications	Engine	Approx. Altitude
Body Diameter 2.04" (5.2 cm)	B6-2	175'
Length 22.6" (57.4 cm)	C6-3	475'
Fin Span 7.3" (18.6 cm)		
Net Weight 3.1 oz. (88.0 g)		

PARACHUTE RECOVERY

Parts List

EXPLODED VIEW

- A 1 Balsa Nose Cone... BC-2031
- B 6 Balsa Nose Cones. BC-711
- C 1 Body Tube..... ST-20120
- D 1 Body Tube..... ST-2060
- E 3 Body Tubes..... ST-730
- F 1 Body Tube..... ST-730E
- G 1 Tube Coupler HTC-20
- H 1 Laser Cut Fins FV-41
- I 1 Screw Eye SE-10
- J 1 Elastic Cord..... EC-136
- K 1 Launch Lug LL-110
- L 1 Launch Lug LL-130
- M 1 Ring Set CR-KV-41
- N 1 Thrust Ring TR-7
- O 1 Engine Hook EH-28
- P 1 Chute Pak..... CP-16
- Q 1 Wrap Set..... EW-KV-41
- R 1 Decal DKV-41
- S 1 Nozzle Wrap..... IKV-41S



BEFORE YOU START!

Make sure you have all the parts included in this kit that are listed in the Parts List in the center of these instructions. In addition to the parts included in this kit, you will also need the tools and materials listed below. Read the entire instructions before beginning to assemble your rocket. When you are thoroughly familiar with these instructions, begin construction. Read each step and study the accompanying drawings. Check off each step as it is completed. In each step, test-fit the parts together before applying any glue. It is sometimes necessary to sand lightly or build-up some parts to obtain a precision fit. If you are uncertain of the location of some parts, refer to the exploded view to the right. It is important that you always ensure that you have adequate glue joints.

TOOLS

In addition to the parts supplied, you will need the following tools to assemble and finish this kit.

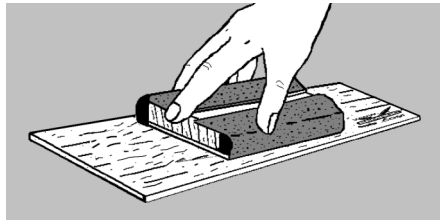


ASSEMBLY

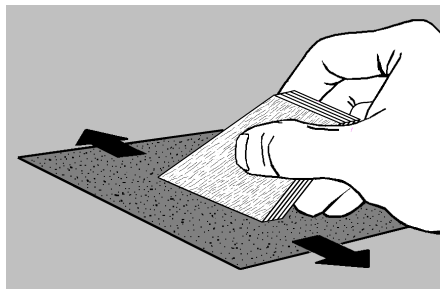
1. These instructions are presented in a logical order to help you put your Centuri Orion™ together quickly and efficiently. Check off each step as you complete it and we hope you enjoy putting this kit together.

FIN PREPARATION

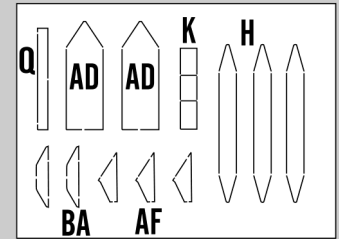
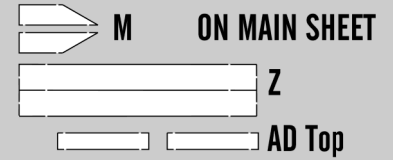
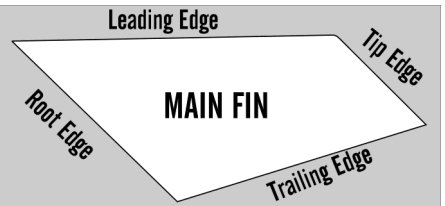
2. Lightly sand each side of the laser-cut fin sheets (FV-41). Carefully push the laser-cut fins from their sheets. Start at one point on each fin and slowly and gently work around the fin.



3. Stack all the similar fins in a set. Line the set of fins up squarely and sand the fins back and forth over some fine sandpaper to get rid of the hold-in tabs as shown below.

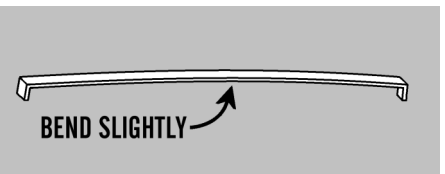


4. Round the leading and trailing edges of each main fin and the shortest end of the three pod fins. Leave the tip and root edges flat. The root edges will be glued to the body tube. Use this guide for sanding the smaller pieces later. As the small pieces are completed, it may be easier to paint them before final assembly.

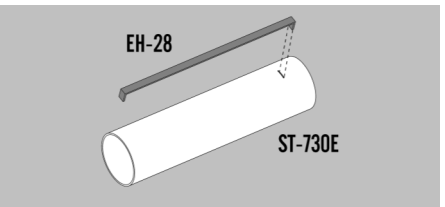


ENGINE MOUNT

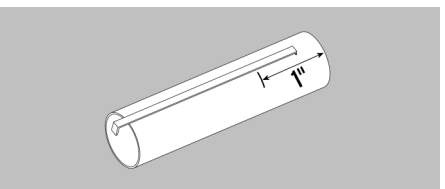
5. Bend the engine hook (EH-28) slightly so it forms a slight bow in the direction shown.



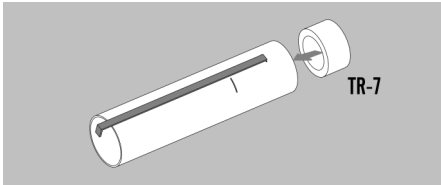
6. Insert one end of the engine hook into the punched slit in the engine tube (ST-730E). There are three other tubes the same size without the slit.



7. Mark the engine tube 1" from the punched end.

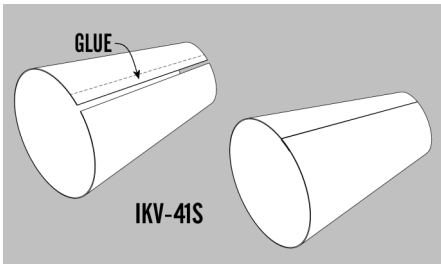


- ❑ 8. Glue the thrust ring (TR-7) against the top of the engine hook. After the ring is in place, run a bead of glue around the inside of the ring to protect it from the ejection gases.

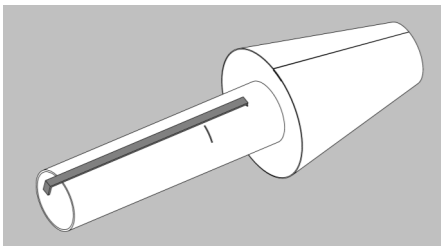


NOZZLE

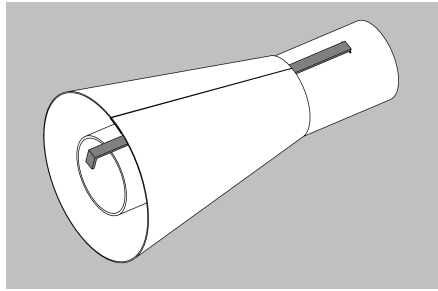
- ❑ 9. Cut out the nozzle shroud from its sheet. Form it into a cone and apply a small amount of glue to the tab on one end as denoted by the dotted line. Attach the free end over the glue so its end is even with the dotted line and hold in place until the glue sets. Some glues will shrink and warp the paper, so white glue or CA glue is recommended.



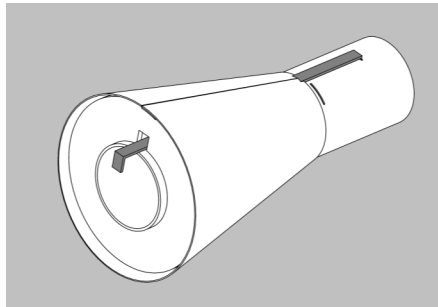
- ❑ 10. Apply a bead of glue around the engine tube at the mark. Apply another bead of glue along the engine hook near its middle. A small piece of masking tape can be used to hold the hook in place.



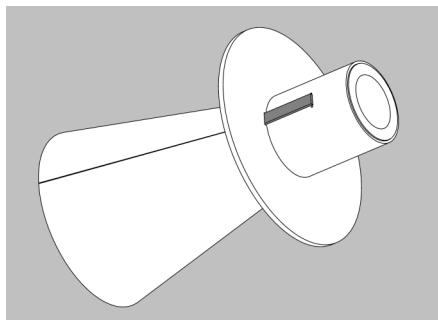
- ❑ 11. Slide the nozzle shroud over the engine tube until the mark is even with the small end of the shroud.



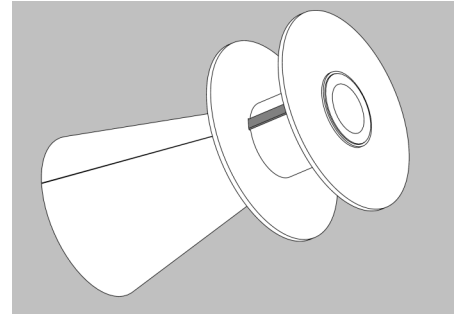
- ❑ 12. Carefully remove the smallest ring from the laser-cut ring sheet (CR-KV-41). Slide it over the end of the engine tube and inside the nozzle shroud. Apply a thin bead of glue around the joints formed by the ring and tube and ring and shroud. Make sure the engine hook moves freely in the slot.



- ❑ 13. Carefully remove the larger centering ring with a small notch on the inner hole. Slide it over the end of the engine tube aligning the notch over the engine hook. Position it against the end of the nozzle shroud. Apply a thin bead of glue around the joints formed by the ring and tube and ring and shroud. Allow to dry.

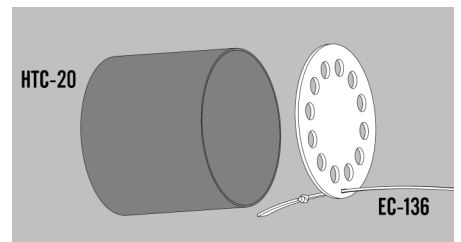


- ❑ 14. Carefully remove the larger centering ring with only one hole. Slide it over the end of the engine tube until it leaves about 1/16" of the engine tube exposed. Apply a thin bead of glue around the joints on both sides of the ring. Allow to dry in a vertical position.

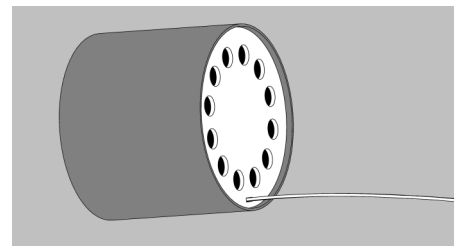


EJECTION BAFFLE

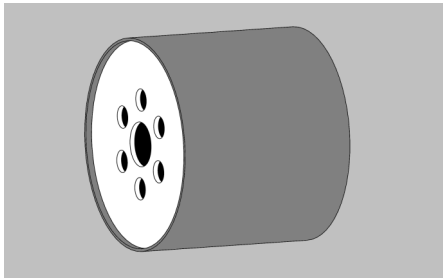
- ❑ 15. Carefully remove the remaining baffle rings from the laser-cut sheet. Punch all the smaller holes free. Using the ring with the most holes (top of baffle), insert one end of the elastic shock cord (EC-136) into the small slot near the edge. Tie a knot in the end and pull it until the knot is against the ring. Apply a generous bead of glue on the knot. Insert into one end of the coupler tube (HTC-20).



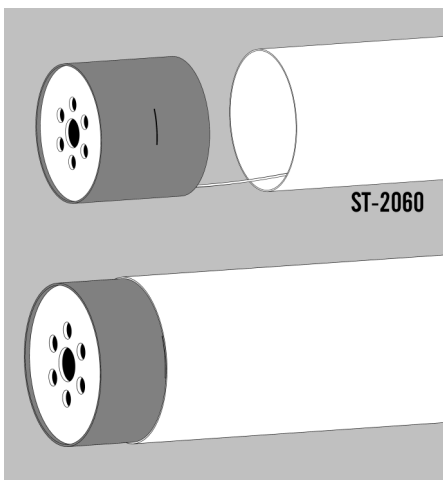
- ❑ 16. Adjust the ring until it is about 1/16" inside the coupler tube. Apply a generous bead of glue around both edges of the baffle ring against the coupler tube.



❑ **17.** Apply a bead of glue inside the opposite end and carefully insert the remaining baffle ring. Use a pencil or small dowel to help get it in position about 1/16" inside the coupler tube. Apply a thin bead of glue around the joint. After the assembly is dry, apply a layer of glue to the outside of the bottom ring to protect it from hot gasses.

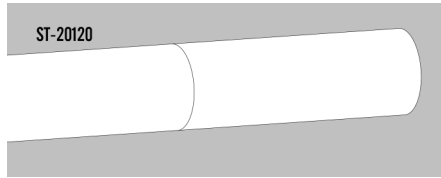


❑ **18.** Mark the coupler tube about 7/8" from either end. Apply a bead of glue inside one end of the smaller body tube section (ST-2060). Slide the elastic cord through the tube and insert the top end of the coupler in the body tube until the mark is even with the end of the tube. Continue with the next step before the glue dries.



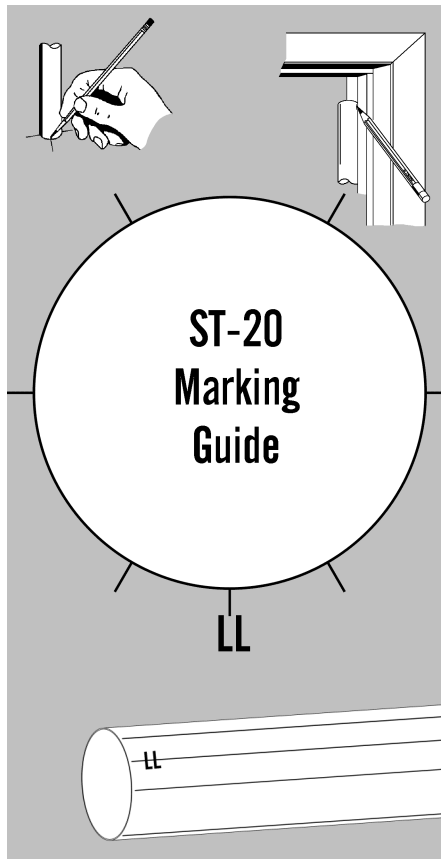
❑ **19.** Apply a bead of glue inside one end of the large body tube (ST-20120). Slide the baffle into the end of the tube until the tubes are even with each other. Roll the assembly on a flat surface to make sure the tubes are parallel with each other. Allow to

completely dry while slowly rotating the tube to make sure any excess glue is uniformly distributed inside the tube.



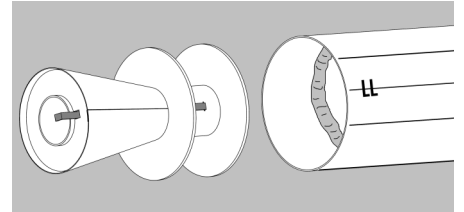
MARK TUBE

❑ **20.** Stand the body tube assembly on the fin guide below with the baffle end pointed upward and away from the guide. Place seven marks on the tube at the positions indicated. Place a mark LL on the line that will be used for the launch lugs. Find a convenient channel or groove such as a partially open drawer, a door jamb (as shown,) or a piece of molding. Using the channel, extend the LL mark the full length of the tube. Extend the six other marks about 4" from the bottom of the tube to provide lines for aligning the fins.

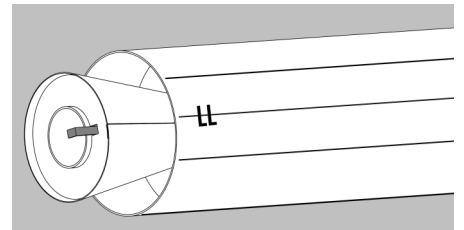


ENGINE MOUNT

❑ **21.** Apply a generous bead of glue about 3/4" inside the end of the body tube. Insert the engine mount until the bottom ring is about 1" inside the body tube and about 1" of the nozzle is outside the tube. Allow to dry.

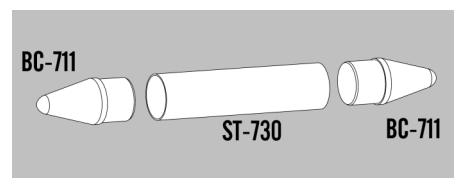


❑ **22.** Apply a bead of glue around the bottom (exposed) centering ring joint using a piece of scrap balsa or a cotton swab. Allow to dry.

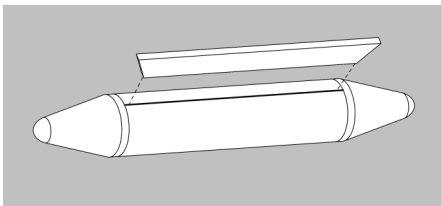


TANK ASSEMBLY

❑ **23.** Apply a bead of glue inside each end of one of the small body tubes (ST-730). Insert a small nose cone (BC-711) in each end. Allow the assembly to dry. Repeat for the other two tank assemblies. Lay them aside to completely dry.

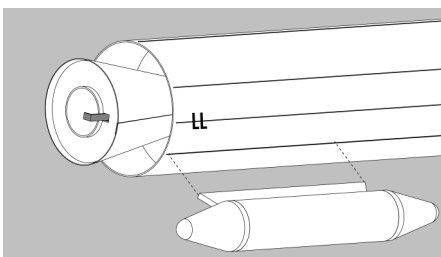


24. Place a mark along the side of a tank assembly using a channel or drawer slide. Apply glue to the shorter of the two long sides of one of the pod fins and position it along the line. Remove the fin, set it aside and allow it to almost dry, apply additional glue, and reposition. Repeat for the other two tank assemblies. If you follow these instructions, the fins will not require much additional work to keep them aligned. Allow the fins to completely dry, checking carefully to make sure they are parallel with the body tube.

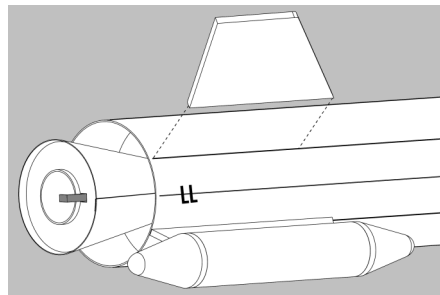


ATTACH FINS

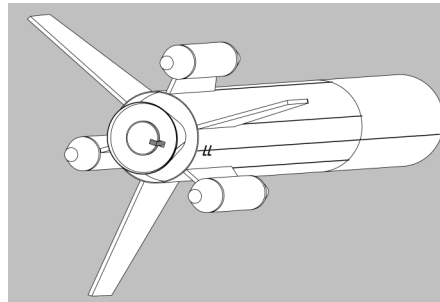
25. Apply glue to the longest edge of one of the tank assemblies and position it along the line just below the LL line as shown. Remove it, allow to almost dry, re-glue and reposition it. Allow this tank assembly to dry before proceeding, checking for perpendicular positioning with the main body tube.



26. Apply glue to one of the main fins and position it along the line just above the LL line as shown. Remove it, allow it to almost dry, re-apply glue and reposition it. Allow this fin to dry before proceeding, checking for perpendicular positioning with the main body tube.

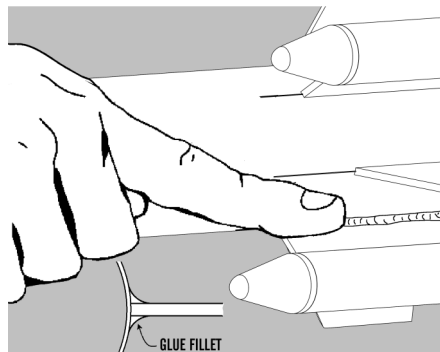


27. Alternate the remaining tank assemblies and main fins, making sure they are parallel with the main body tube. Allow everything to dry completely.



APPLY FILLETS

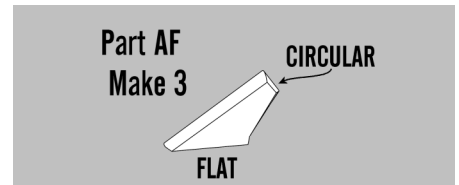
28. After the fin assembly is completely dry, run a small bead of glue along both sides of each fin-body tube joint. Using your forefinger, smooth the glue into fillets. Allow this assembly to dry in a vertical position.



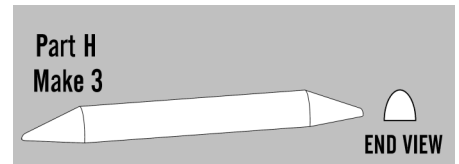
DETAIL PARTS

Note: A small emery board will make the shaping of the following parts much easier.

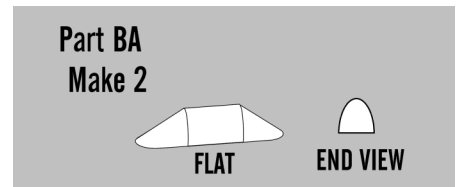
29. Locate the three ullage rocket fairings (**Part AF**). They should be sanded to a circular shape on the tip by rounding the front and back sides. Leave the bottom flat.



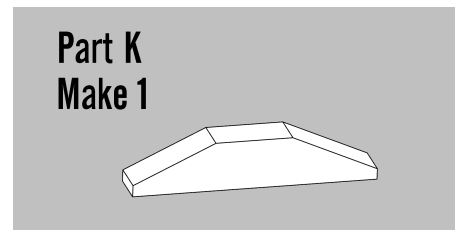
30. Locate the three retro-rocket housings (**Part H**). Sand them so the front and back have a rounded conical shape and the middle part is rounded as shown. Leave the bottom flat.



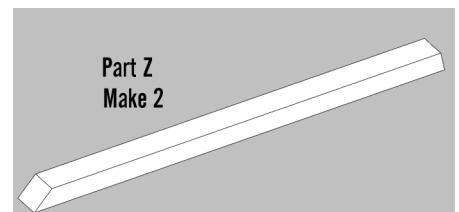
31. Locate the two chilldown pump fairings (**Part BA**). Sand them so the front and back have a rounded conical shape and the middle part is rounded as shown. Leave the bottom flat.



32. Locate the LH2 fill fairing (**Part K**). Sand it so the front and back sections have a slope using the very faint laser cut marks or hold-in tabs as guides. Leave the middle part and the bottom flat.



33. Locate the two electrical tunnels (**Part Z**). Sand them so the front section has a 45 degree slope. Leave the other sides flat.



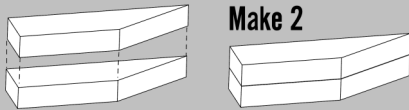
❑ **34.** Locate the rear electrical tunnel (**Part Q**). Sand it with a 45 degree slope on the front and rear edge. Leave the other sides flat.

Part Q
Make 1



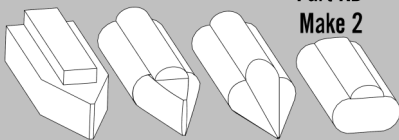
❑ **35.** Locate all four pieces of the secondary APS fairings (**Part M**). Glue two of the pieces together as shown. Sand all the edges except the longest (bottom) edge rounded. Leave the bottom edge flat. Repeat with the remaining two pieces to make a second fairing.

Part M
Make 2



❑ **36.** Locate the top and bottom sections of the two primary APS fairings (**Part AD**). Glue a top piece on one of the bottom pieces, centered and even with the back edge. Sand the side edges rounded and sand the top piece to a half round shape. Sand a slope on the front as shown in the third drawing. Leave the rear flat as shown in the fourth drawing.

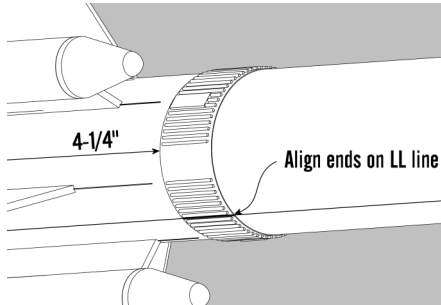
Part AD
Make 2



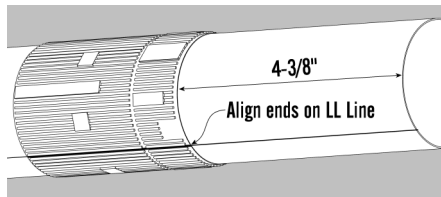
APPLY WRAPS

❑ **37.** Start with the bottom (smaller) wrap. Fit it around the main body tube, 4-1/4" from the bottom and with the ends aligned

with the LL line. There is a top and bottom on each wrap. Make sure the first flat area on the wrap is positioned as shown. Apply a thin film of white glue on the dull side and place it around the body tube as it was aligned during test fitting.

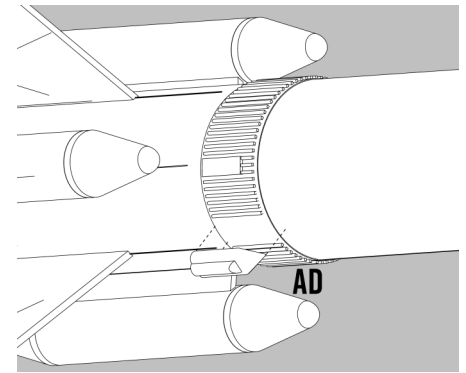


❑ **38.** Continue with the top wrap. Fit it around the main body tube, 4-3/8" from the top and with the ends aligned with the LL line. Make sure the wrap has the smaller section toward the top of the body tube. Apply a thin film of white glue on the dull side and place it around the body tube as it was aligned during the test fitting.

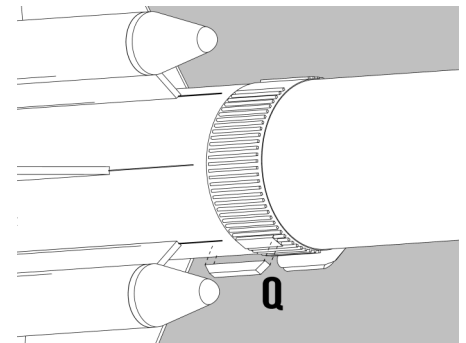


APPLY DETAILS

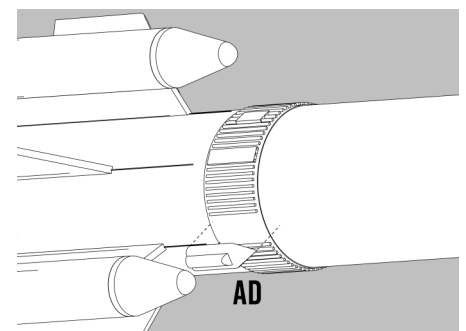
❑ **39.** Position the model as shown with the LL line pointing directly downward. Viewing the model from the bottom, all the parts will be positioned as the model is turned clockwise. The first part that will be applied is one of the primary APS pieces (**Part AD**). It will be aligned on the first wide flat area, with the bottom even with the end of the corrugations and the pointed end extending beyond the top edge of the wrap onto the body tube.



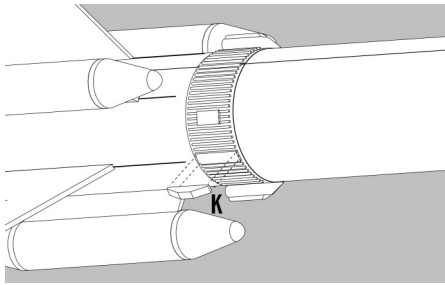
❑ **40.** Rotate the model slightly clockwise. Apply glue to the bottom of the rear electrical tunnel (**Part Q**) and apply it to the next flat area. It will overhang slightly off the back and onto the body tube.



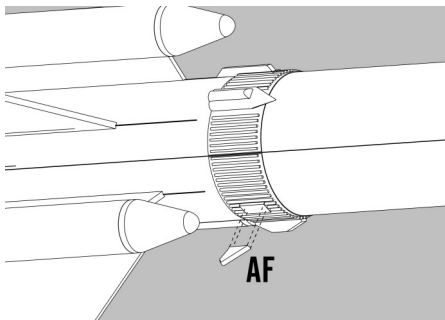
❑ **41.** Rotate the model clockwise until the second wide flat spot appears. The second primary APS piece (**Part AD**) will be applied. Align it on the wide flat area, with the bottom even with the end of the corrugations and the pointed end extending beyond the top edge of the wrap onto the body tube.



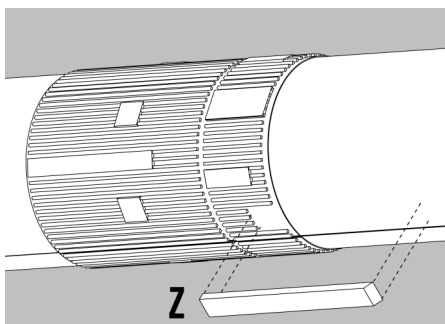
- ❑ **42.** The LH2 fill fairing (**Part K**) will be centered on the next flat area.



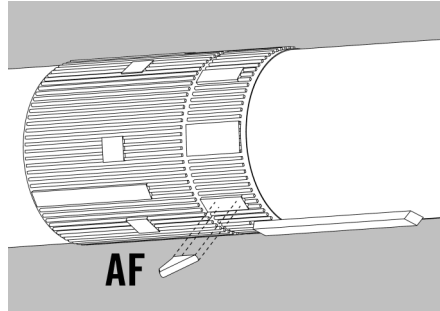
- ❑ **43.** One of the three ullage rocket fairings (**Part AF**) should be centered on the final flat spot on the lower wrap.



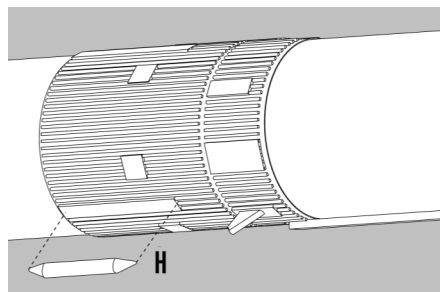
- ❑ **44.** Position the model as shown with the LL line pointing downward. The first part that will be applied to the upper wrap is one of the two electrical tunnels (**Part Z**). It will be aligned on the first flat area at the top of the wrap, with the bottom even with the end of the corrugations and the slanted end extending beyond the top edge of the wrap onto the body tube.



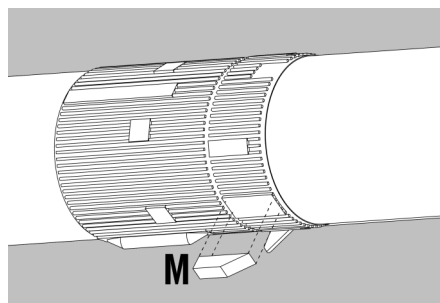
- ❑ **45.** The second of the three ullage rocket fairings (**Part AF**) is centered on the next flat area beside the electrical housing. The six squares on the bottom of the wrap do not get detail pieces. They will have a target decal applied later.



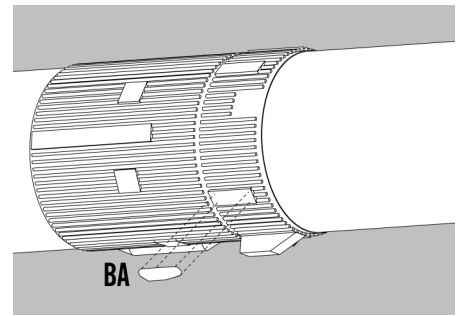
- ❑ **46.** The first of the three retrorocket housings (**Part H**) is centered on the next long flat area on the wrap.



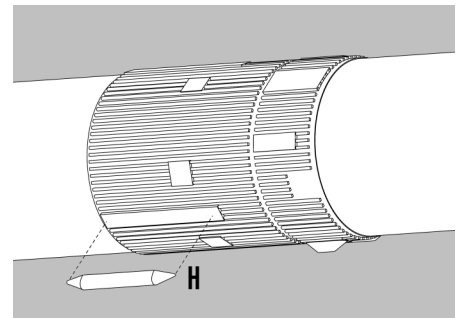
- ❑ **47.** The first of the two secondary APS fairings (**Part M**) is centered on the next flat area on the wrap.



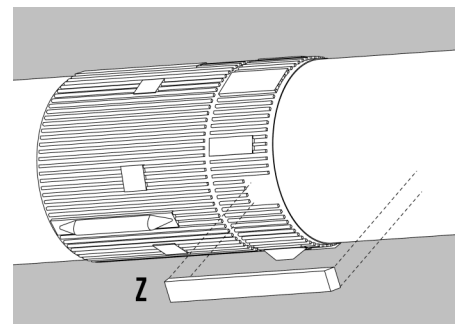
- ❑ **48.** The first of the two chill-down pump fairings (**Part BA**) is centered on the next flat area on the wrap.



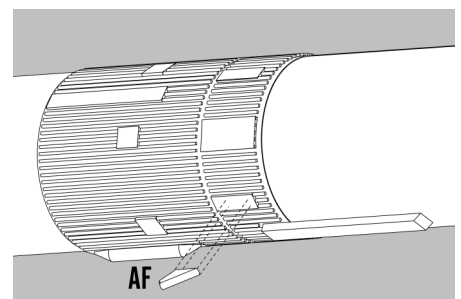
- ❑ **49.** The second of the three retrorocket housings (**Part H**) is centered on the next long flat area on the wrap.



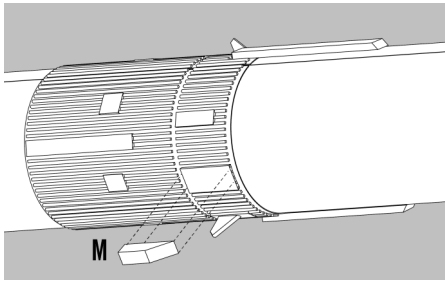
- ❑ **50.** The second of the two electrical tunnels (**Part Z**) will be aligned on the next flat area at the top of the wrap, with the bottom even with the end of the corrugations and the slanted end extending beyond the top edge of the wrap onto the body tube.



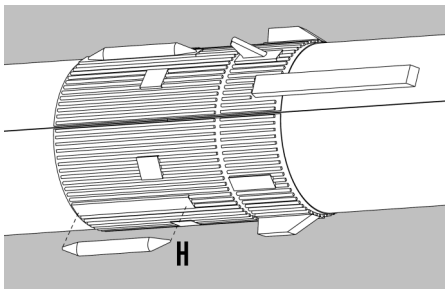
- ❑ **51.** The last of the three ullage rocket fairings (**Part AF**) is centered on the next flat area beside the electrical housing.



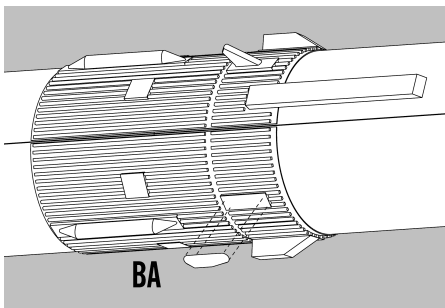
- ❑ **52.** The last of the two secondary APS fairings (**Part M**) is centered on the next flat area on the wrap.



- ❑ **53.** The last of the three retro-rocket housings (**Part H**) is centered on the next long flat area on the wrap.

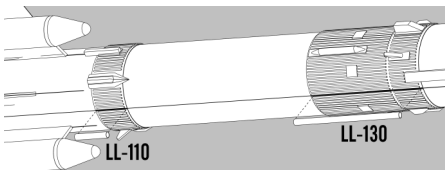


- ❑ **54.** The last of the two chill-down pump fairings (**Part BA**) is centered on the final flat area on the wrap.



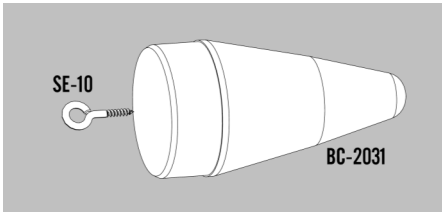
LAUNCH LUGS

- ❑ **55.** Apply a bead of glue to the short launch lug (**LL-110**) and apply it over the joint of the lower wrap on the LL line. Apply a bead of glue on the long launch lug (**LL-130**) and apply it over the joint of the upper wrap on the LL line. Sight from one end to make sure they are parallel with the line.



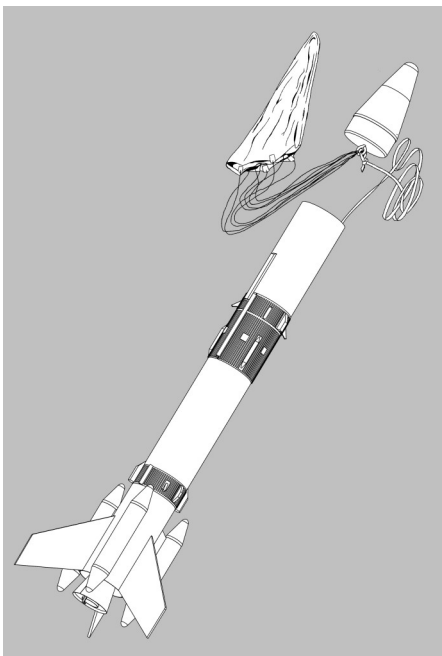
NOSE CONE

- ❑ **56.** Insert the nose cone (**BC-2031**) in the body tube and check for proper fit. The nose cone should be snug to hold itself in alignment. If it is too loose, add masking tape. If it is too tight, sand the shoulder slightly. Turn the screw eye (**SE-10**) into the cone and remove. Add a drop of glue in the hole and reinsert the screw eye.

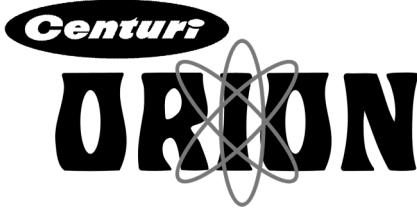


FINAL ASSEMBLY

- ❑ **57.** Assemble the chute (**CP-16**) using instructions included with the chute. Pull the lines tight on the chute and make sure they are all of equal length. Attach the chute by tying them to the screw eye. Put a drop of glue on the joint to keep the lines from moving. Attach the free end of the elastic cord to the screw eye. Put a drop of glue on that joint as well.

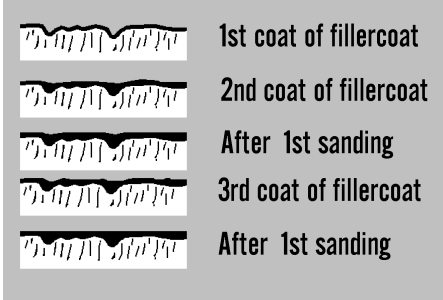


This completes the assembly of your



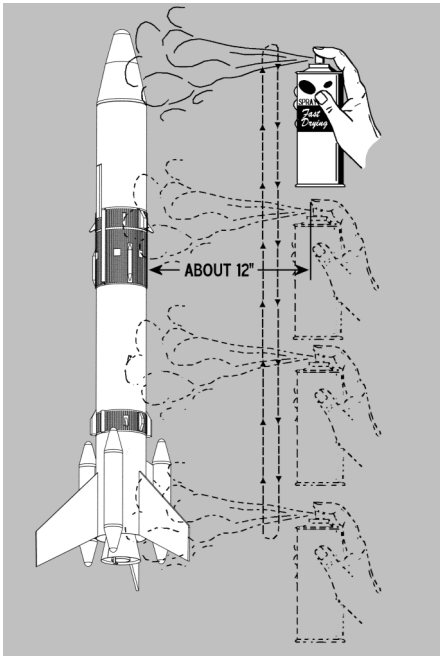
FINISHING

- ❑ **58.** When the fillets have dried, prepare balsa surfaces for a smooth professional looking finish. Fill the wood grain with balsa fillercoat or sanding sealer. When dry, sand with fine sandpaper. Repeat until smooth.



- ❑ **59.** After all balsa surfaces have been prepared, wipe off all balsa dust with a dry cloth. First spray the model with an enamel primer. Choose a high visibility color like white for the final color.

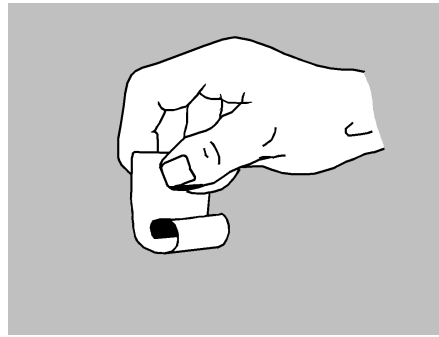
- ❑ **60.** Spray painting your model with a fast-drying enamel will produce the best results. PATIENCE...is the most important ingredient. Use several thin coats, allowing each coat to completely dry before the next coat. Start each spray a few inches above the model and end a few inches below the model. Keep the can about 12" away and use quick light coats. The final coat can be a little heavier to give the model a glossy wet-looking finish.



- ❑ **61.** After the paint has dried, decals should be applied. The decals supplied with the Centuri Orion™ are waterslide decals. Each decal should be cut separately from the sheet. Think about where you want to apply each decal and check for fit before wetting the decal. Use the cover photo for suggested placement. Dip each decal in a small dish of water that has a drop of detergent. It will take about 30 seconds before the decal is loose enough to apply.



- ❑ **62.** Slide the decal in place and use the paper backing to work the bubble out. Repeat for all the decals. Be careful with covering decals with a clear coat. Many of the new sprays are not compatible. Future floor polish is suggested.



FLIGHT PREPPING

- ❑ **63.** Mounting the engine: Use only a B6-2 or C6-3 engine in your Centuri Orion™. Insert the engine and make sure the engine hook keeps the engine in snugly. The hook may be slightly bent to make sure the engine is retained.

- ❑ **64.** Apply a few sheets of recovery wadding in the top of the main body tube. Since an ejection baffle is used, recovery wadding may not be absolutely necessary. Fold the parachute and pack it and the shock cord on top of the recovery wadding. Slide the nose cone into place, making sure it does not pinch the shock cord or parachute.

- ❑ **65.** Refer to the model rocket engine manufacturer's instructions to complete the engine prepping. Different engines have different igniters and methods of hooking them up to the launch controllers.

- ❑ **66.** Carefully check all parts of your rocket before each flight as a part of your pre-flight checklist. Launch the Centuri Orion™ from a 1/8" diameter by 36" long launch rod.

- ❑ **67.** After each flight, promptly remove the spent engine casing and dispose of properly. Clean any residue from your model for many flights.