

BLACK BRANT VC



Skill Level 4 Moderately Challenging

Included in the Black Brant series of sounding rockets originally developed by the Canadian Government in combination with Bristol Aerospace, the Black Brant VC is a 4-fin variant of the fifth rocket in the series which first flew April 4th, 1970. More than 100 flights of the single-stage VC have been completed since then, and modified versions have flown as upper stages on a number of other Black Brant rockets. All together, more than a thousand Black Brant rockets have been flown with a success rate of over 98%. The combination of longevity, flexibility, and reliability have made the Black Brant family of rockets some of the most popular sounding rockets in history.

As iconic as the Black Brant VC is however, it is also a nearly ideal target for the entry-level scale modeler. As a solid propellant, aerodynamically stabilized, sounding rocket, there is no need for large nose weights or clear plastic ("cheater") fins to make a model stable. Moreover, the surface details are all fairly simple (in fact, many Black Brant flights used exclusively internal antennas). Taken together, it is a perfect model for those with an interest in scale modeling, but only minimal experience.

This kit has been designed to allow for the creation of a reasonably detailed sport-scale model straight out of the package. Nevertheless, the kit is an excellent canvas for additional details, should the builder desire to add them. With balsa wood fins and cardstock details, the rocket is built entirely of materials that any rocket builder will have experience with and the assembly techniques – while requiring care and patience – are techniques that are used in lower skill level models. The Black Brant VC is a perfect start to any exploration of scale modeling. And with its reasonably small scale of 1:15 (or, more precisely, 1:14.66), it flies exceptionally well on a wide variety of readily available 18mm motors, so it is an economical rocket as well.

Black Brant VC Parts List

Item #	Item Name	Qty
10068	AT-18/2.75"	1
10091	AT-24/3.75"	1
10110	AT-29/13"	1
10254	AT-29/3.75"	1
13008	AC-29	1
13029	CR-13/18	1
13031	CR-18/24	3
13035	CR-24/29	2
13051	1/8" Launch Lug 1"	1
15726	Black Brant VC Jig and Detail Parts Cardstock	1
15727	Black Brant VC 3/32"x3" Balsa Fin Sheet	1
19114	PNC-29A	1
24043	Regular "D" Crimped Engine Hook	1
29124	12" Parachute Packs for Kits	1
29519	100# Kevlar* x 6 feet	1
31258	Black Brant VC Instruction Sheet A	1
31259	Black Brant VC Instruction Sheet B	1
31260	Black Brant VC Instruction Sheet C	1
31261	Black Brant VC Instruction Sheet D	1
39055	Black Brant VC Face Card	1
41111	Black Brant VC Waterslide Decals Sheet	1

Needed Tools and Materials

- ☐ Pencil
- ☐ Ruler
- ☐ Hobby Knife with Sharp Blades
- ☐ Scissors
- ☐ Thin CyA Adhesive
- ☐ Medium CyA Adhesive
- ☐ Wood Glue
- ☐ Aluminum Angle Extrusion
- ☐ Masking Tape or Cellophane Tape
- ☐ Wood Filler or Modeling Filler
- ☐ Sandpaper - 180 or 220 grit, 320 or 400 grit
- ☐ Sanding Block (e.g. Sanding Tee - Item # 02100)
- ☐ Pin or Needle

Optional Tools / Finishing Supplies

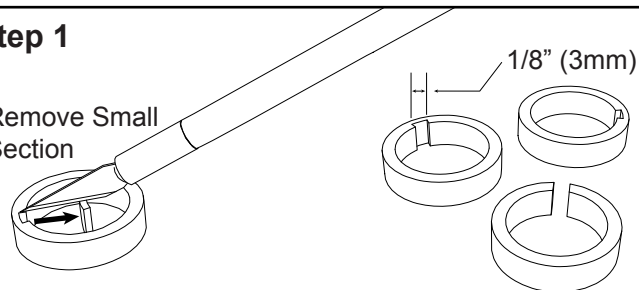
- ☐ Paper Towels
- ☐ Painter's Tape or Masking Tape
- ☐ Sandpaper: 400 grit
- ☐ Paint Supplies: Spray Paint, Brushes, etc.
- ☐ Bowl of Water with a little Dishwashing Soap
- ☐ Tweezers
- ☐ Cotton Swabs
- ☐ Sweing Needle or Short Section of Fine Music Wire

Fuselage:

- 1. The three small green CR-18/24 centering rings must be modified to make room for the engine hook and shock cord. Using a sharp hobby knife, cut a shallow notch $\frac{1}{8}$ " (3 mm) wide in two of the rings. For the remaining ring, remove a full piece $\frac{1}{8}$ " (3 mm) wide to create a "c" ring.
- 2. With a pencil, mark the $2\frac{3}{4}$ " (70mm) long 18mm tube at two points - $\frac{1}{2}$ " (13mm) and 1" (25mm) from the one end of the tube - that is now the forward end. Place a small cut $\frac{1}{8}$ " (3mm) wide at the $\frac{1}{2}$ " (13mm) mark for the motor hook.
- 3. Insert the motor hook into the small slot cut in the 18mm tube from the last step. The hook will extend $\frac{1}{2}$ " (13mm) past the aft end of the motor mount tube. With the motor hook thusly positioned, apply wood glue to the line 1" (25mm) from the forward end of the tube and slide one of the notched centering rings into place behind the line (there should be $\frac{1}{2}$ " or 13mm of the motor hook visible on the forward side of the assembly).
- 4. Tie the kevlar shock cord around the forward end of the 18mm tube, in front of the ring just installed.

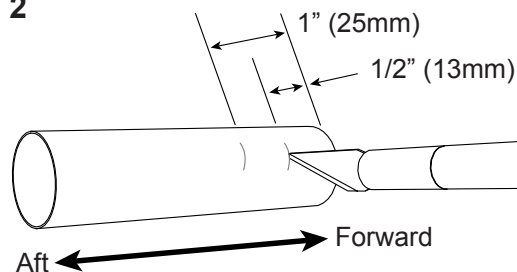
Step 1

Remove Small Section

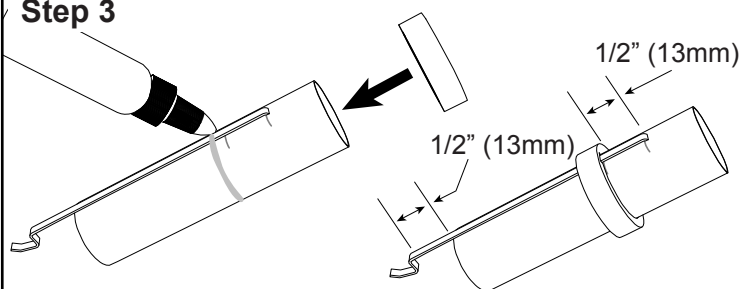


Cut two rings with a notch and one with a slot.

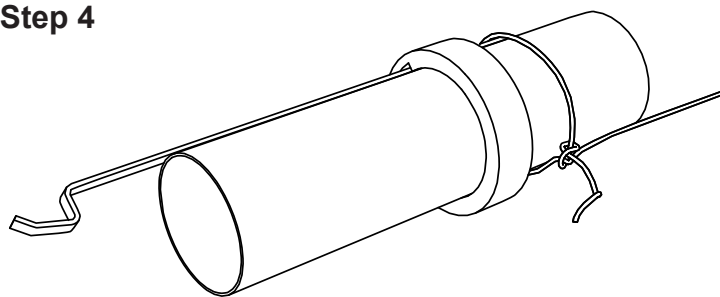
Step 2



Step 3

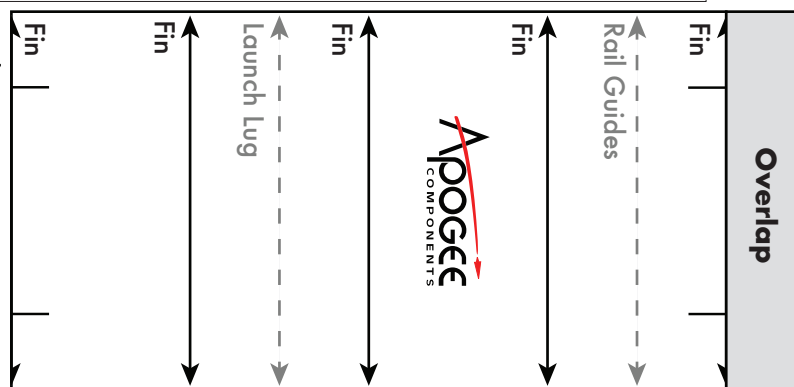
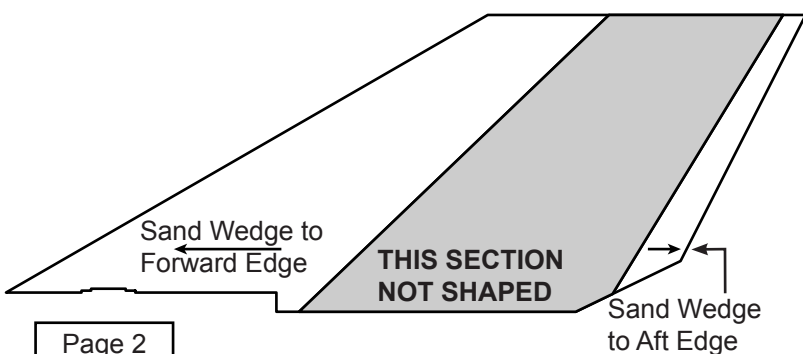


Step 4



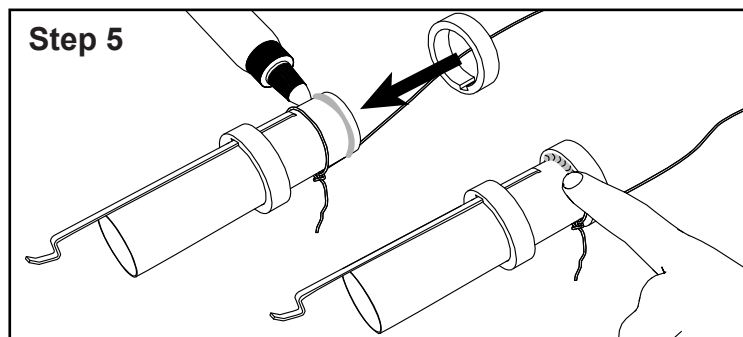
Inner Motor Band Strip

Outer Motor Band Strip

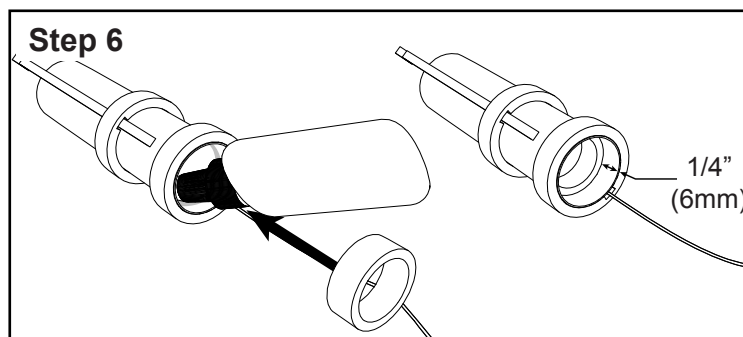


Black Brant VC Marking Guide

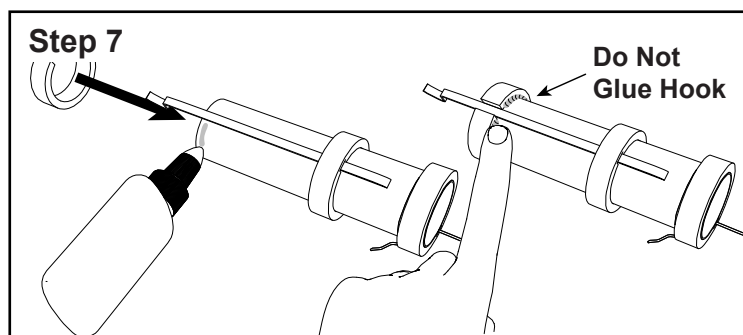
- 5. Pass the shock cord through the second notched ring. Using wood glue, place a ring of glue around the outer forward edge of the tube and slide the second ring over the tube, flush with the end of the motor mount tube. Pull the shock cord tightly against this newly installed ring, and apply a generous fillet of wood glue over the whole surface of the shock cord loop by applying a bead of glue to the joint and forming it into a fillet with the tip of a finger.



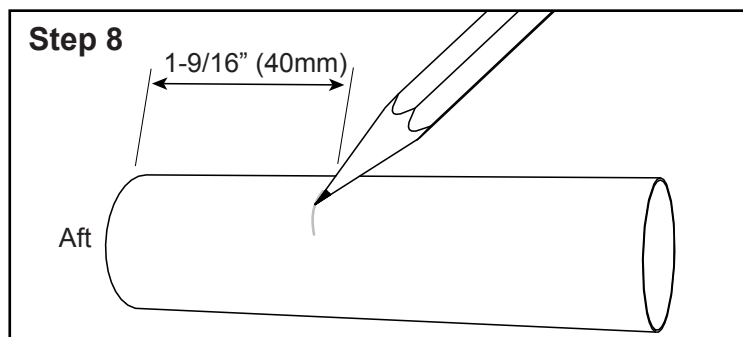
- 6. Apply wood glue to the inside of the forward end of the motor mount tube and insert the small blue CR-13/18 engine block ring so that it presses against the engine hook. The ring should be inset $\frac{1}{4}$ " (6mm) from the forward end of the motor mount tube.



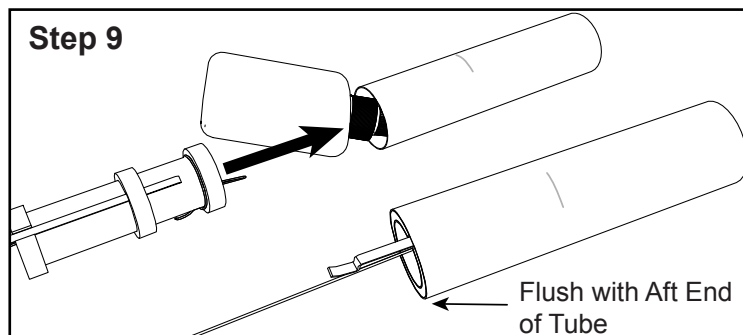
- 7. Apply glue to the outer aft end of the motor mount tube and slide the modified "C" ring (as cut in Step 1) over the tube, so that the motor hook passes through the slot and the ring is flush with the aft end of the tube. Apply a fillet to this aft ring but **DO NOT GLUE THE MOTOR HOOK DOWN**. Allow the motor mount assembly to dry enough that the joints are solid before continuing.



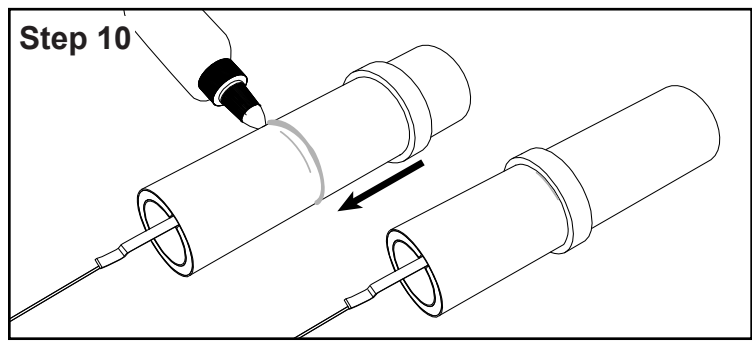
- 8. Using a pencil, mark the 24mm diameter (3-3/4" or 95mm long) tube at a point $1\frac{9}{16}$ " (40mm) from one end. The end that was measured from is the aft end of the tube.



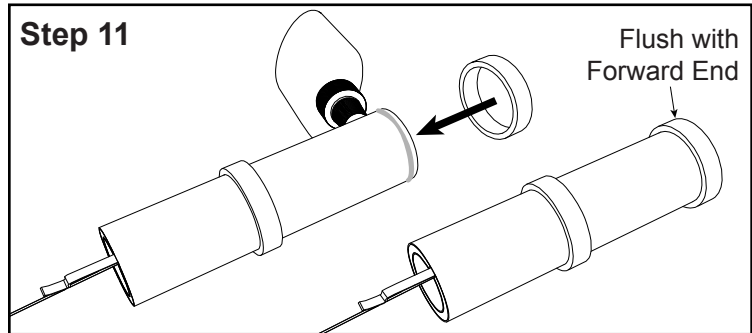
- 9. Taking the motor mount assembly completed in Step 7, route the shock cord through the center of the motor mount tube so that it hangs out the back. Then, apply a ring of glue around the inside edge of the aft end of the 24mm tube marked in the last step. Insert the motor mount assembly, sliding it through the glue and into the tube fully, so that the aft ends of the tubes are flush with one another.



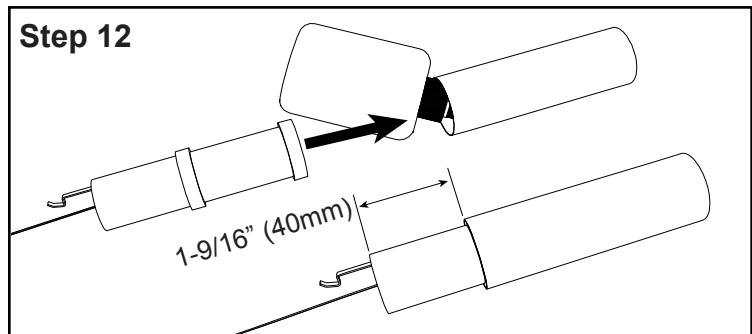
- 10. Slide one of the larger green CR-24/29 rings onto the front of the 24mm tube, then apply wood glue forward of the marked line at the 1-9/16" (40mm) location. Slide the ring into place so that it is just forward of the 1-9/16" (40 mm) mark and clean off any excess glue.



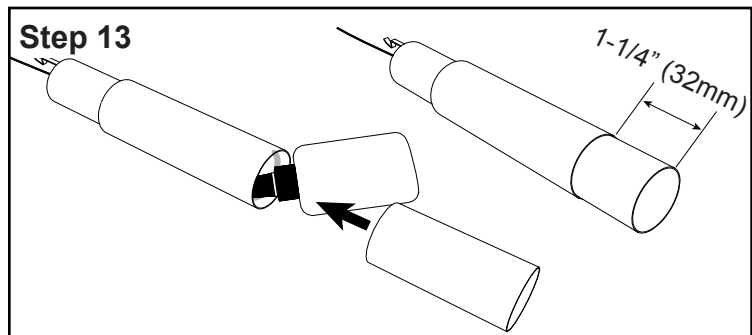
- 11. Apply glue to the forward end of the 24mm tube and glue the second larger green CR-24/29 ring into place, flush with the forward end of the tube.



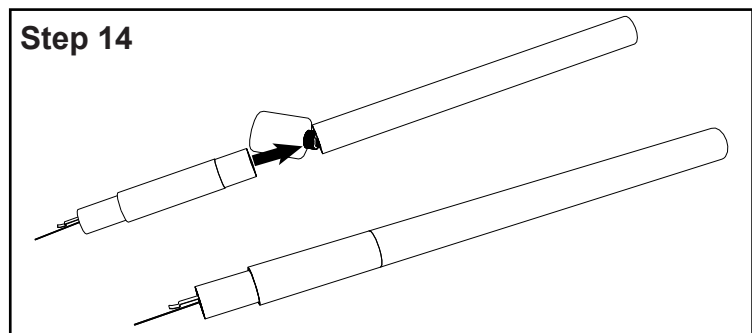
- 12. Apply glue to the inside edge of the 3-3/4" (95mm) long, 29mm body tube and insert the motor mount assembly, sliding it through the glue and into the tube into it so that the aft ring is flush with the edge of the body tube and the 24mm diameter section of the assembly sticks out 1-9/16" (40mm).



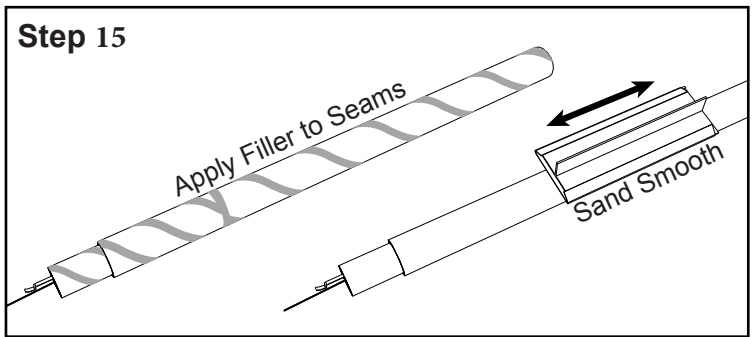
- 13. Apply a bead of wood glue inside the forward end of the assembled section and insert the red coupler halfway, leaving 1-1/4" (32 mm) exposed.



- 14. Once the coupler is solidly affixed into the assembly, apply glue to the interior of one end of the 13" (330mm) long, 29mm body tube and slide the two pieces together. The main construction of the fuselage is now complete and should be allowed to dry prior to moving forward.

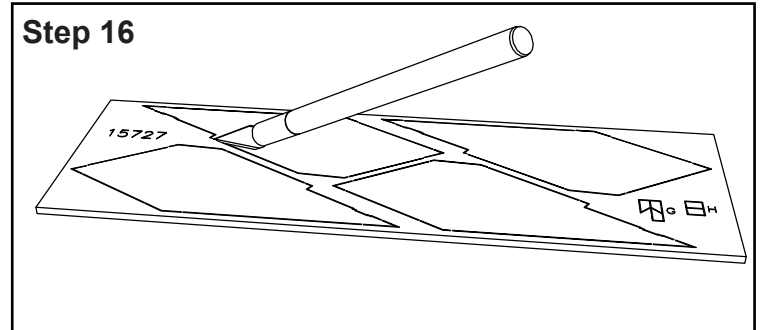


- **15. Optional:** Apply wood filler to the spiral grooves in the tubes, at the joint between the tubes, and on the ends of the exposed centering rings. Allow the filler to dry and then sand the surface smooth. Filling at this point is much simpler than after assembly. To ensure solid construction however, sand so that only a minimal amount of filler remains and that it is entirely dry before gluing other parts to the surface of the tube.

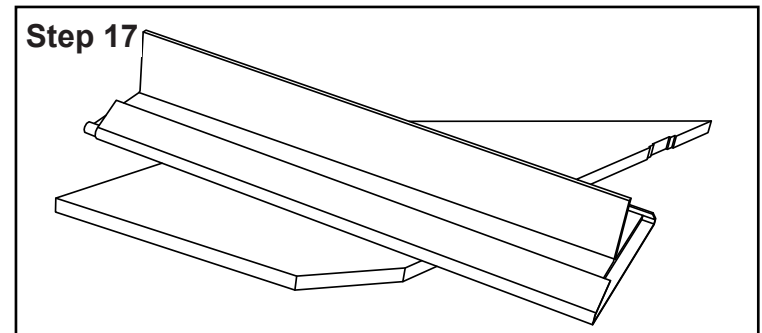


Main Fins

- **16.** Cut the main fins out of the 3/32" balsa wood sheet using a sharp hobby knife, and lightly sand the edges if necessary to remove any remnants of tabs.

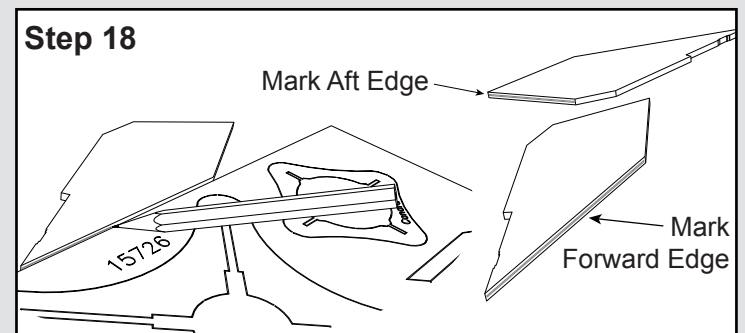


- **17.** Sand the fins smooth using a sanding block and fine grit sandpaper. If a more scale appearance is desired, the following optional steps may be followed to achieve the diamond shaped airfoil of the Black Brant VC fins.

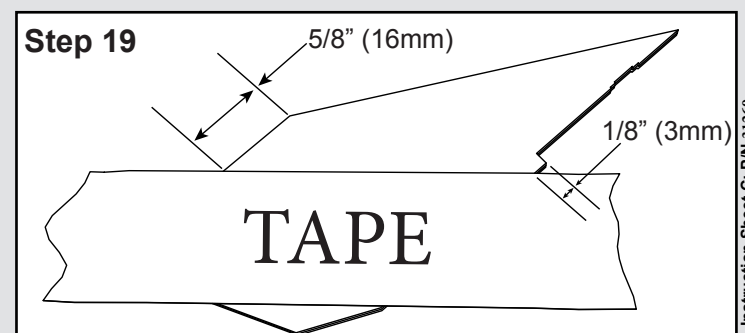


Steps 18 through 25 are optional. They are provided to achieve a more scale look, but not required for the Black Brant VC to fly. These optional steps use more advanced finishing techniques. Proceed to step 26 if you wish to continue the build without completing the optional steps.

- **18.** Mark the centerline of the forward and aft edges of the fins by using the cardstock sheet and a sharp pencil. Place the fin and the cardstock sheet flat on a surface and draw along the fin, using the cardstock as a spacer. As this will actually mark slightly above the centerline, mark the fin once, then flip it over and mark it again to get a better estimate of the centerline. Do this for the forward and aft edges of all four fins.

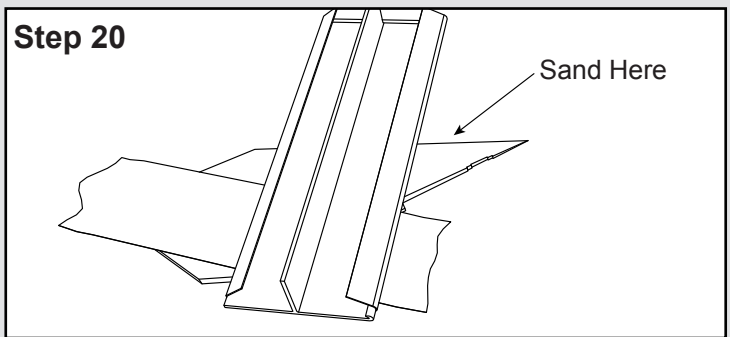


- **19.** Apply masking tape to each of the fins such that the edge of the tape marks a line between a point 1/8" (3mm) behind the step at the root of the fin, and 5/8" (16mm) from the forward edge at the tip of the fin. Apply this tape to all of the fins in the same way. The fin sanding guide in the beginning of this instruction booklet can be used to check that the areas are marked correctly both here and in the following steps.



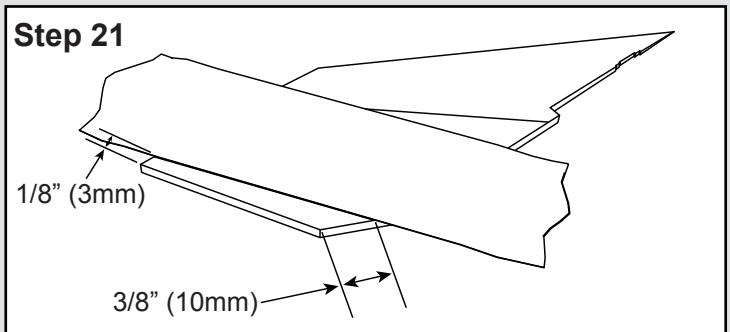
- **20.** Carefully sand from the edge of the tape forward to the centerline at the front of the fin using progressively finer sandpaper either against a flat surface or with a sanding block. Begin with 180 - 220 grit paper to approach the appropriate wedge shape, then finish sharpening the wedge with a 320 - 400 grit sandpaper. Using too aggressive a grit of sandpaper risks overshooting the target shape.

Step 20



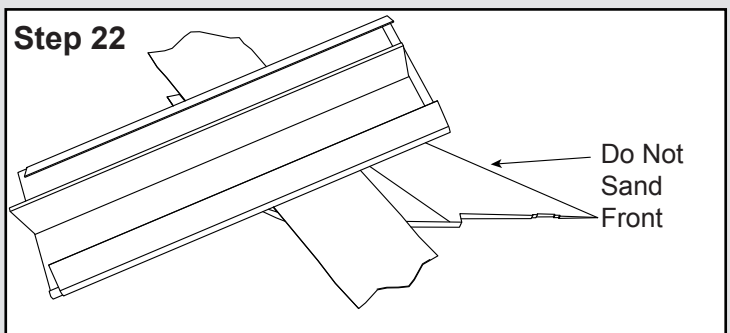
- **21.** Remove the tape from the front edge then repeat the taping process on the aft edge of the fins, placing the tape so that it goes from a point $\frac{3}{8}$ " (10mm) forward of the aft edge near the root to a point $\frac{1}{8}$ " (3mm) forward of the corner at the aft tip of the fin.

Step 21



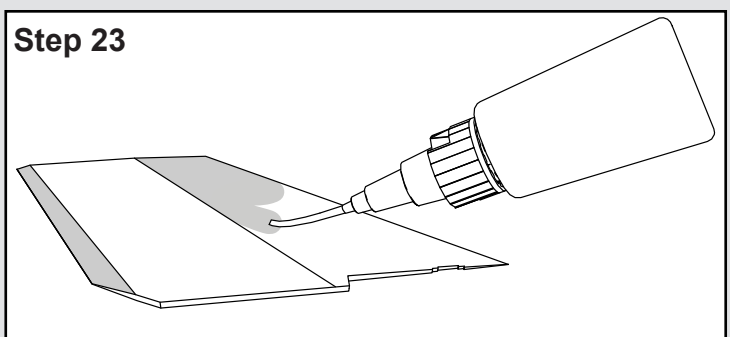
- **22.** As with the forward edge of the fin, sand from the marked centerline at the aft edge of the fin to the tape. Do the sanding in steps, beginning with a medium grit sandpaper and ending with a fine sandpaper.

Step 22



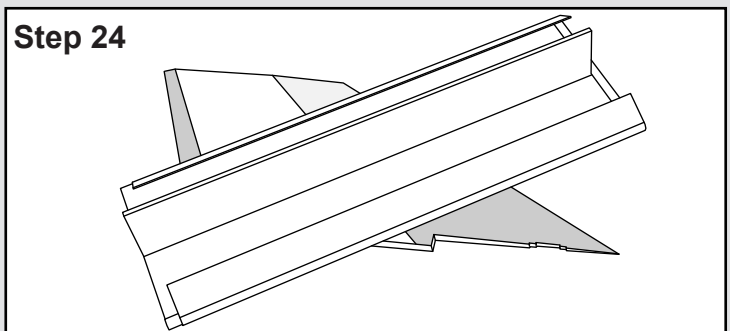
- **23.** Remove the tape from the fins and saturate the forward and aft edges of the fins with thin CyA adhesive. Allow the adhesive to harden.

Step 23



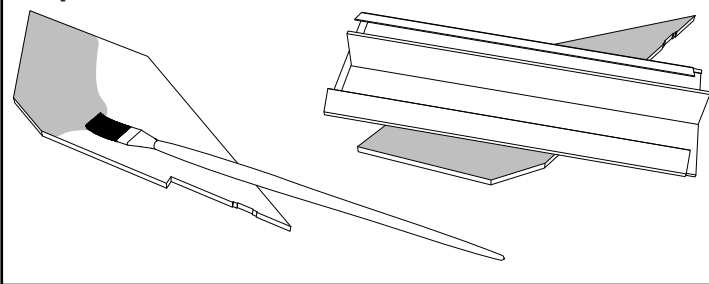
- **24.** Sand the edges once more using a fine sandpaper to produce a smooth surface where the CyA adhesive was applied. *The rest of these instructions represent the standard – flat – fins for visual clarity. The steps are the same whether the fins have been airfoiled or not.*

Step 24



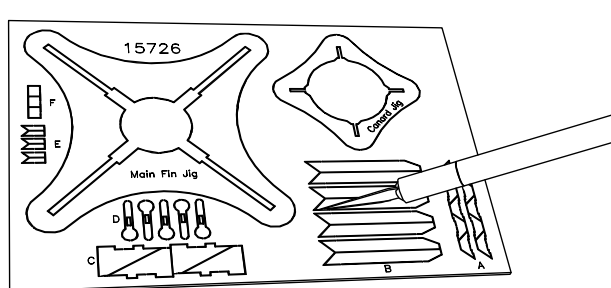
- 25. Apply wood filler to the fins and once it has dried, sand the fins smooth with a fine grit sandpaper to reduce visible wood grain.

Step 25



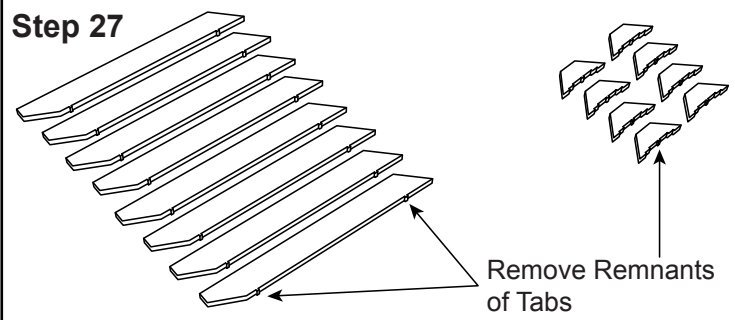
- 26. Cut out eight of each of the main fin detail pieces - parts marked "A" (angle adjustment blocks) and "B" (mounting flanges) - from the cardstock sheet using a sharp hobby knife (two extra of the smaller "A" details are provided on the sheet).

Step 26



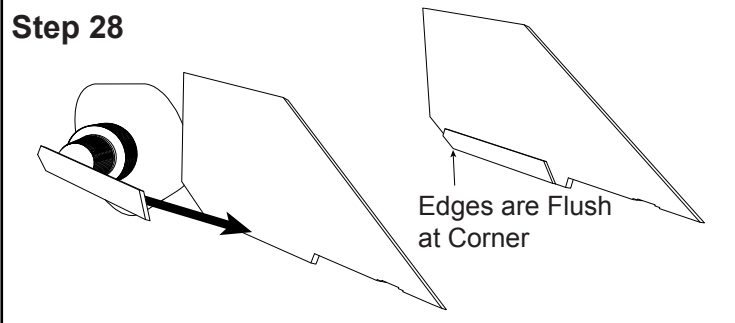
- 27. Clean up each detail piece by sanding the remains of any tabs off of the edges using a fine grit sandpaper. Aggressive sanding can cause the cardstock to split and lead to soft edges, so a 400 grit sandpaper and minimal pressure is recommended.

Step 27



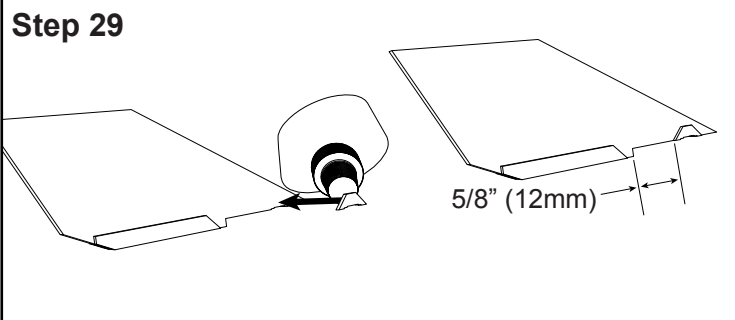
- 28. Apply a thin film of wood glue to each of the "B" detail pieces and glue them into place flush with the root and back slope of the fin on each side of the fin. Repeat for the remaining 3 fins, applying the remaining six "B" detail pieces in this way.

Step 28



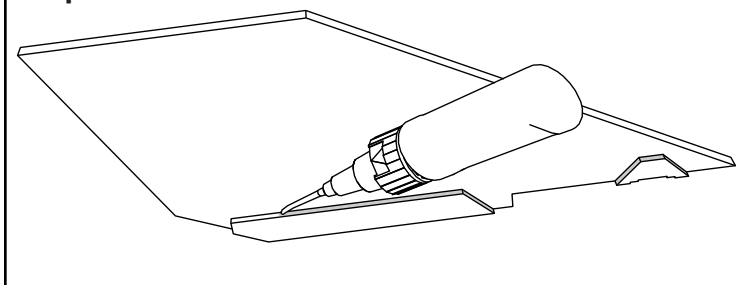
- 29. As in the last step, apply wood glue to the "A" detail pieces to each side. Align the stepped inset of the cardstock piece with the matching steps in the root edge of the main fins. The aft corner of the "A" pieces should end up roughly 5/8" (12mm) from the step in the root edge of the fin. Repeat for the remaining three fins. Once all eight "A" pieces have been attached, allow the wood glue to dry.

Step 29



- 30. Apply thin CyA adhesive to the upper edges of the cardstock details. Allow the CyA adhesive to harden. Then gently sand down the surface of the details using a fine grit sandpaper to smooth all the edges.

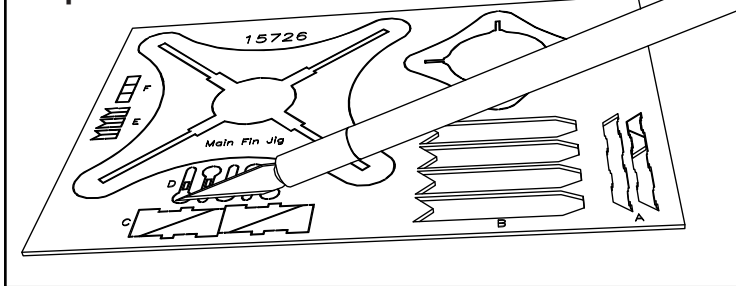
Step 30



Canards:

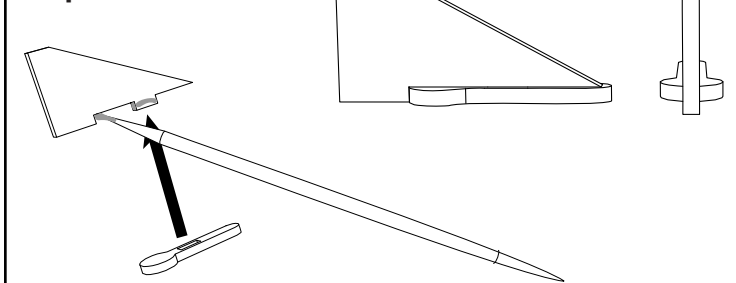
- 31. Using a sharp hobby knife, cut out the four canards (part “C”) and four of the pivot plates (part “D”) from the cardstock detail sheet (one extra pivot plate is provided on the sheet). Sand the edges as required to remove the remnants of the tabs.

Step 31



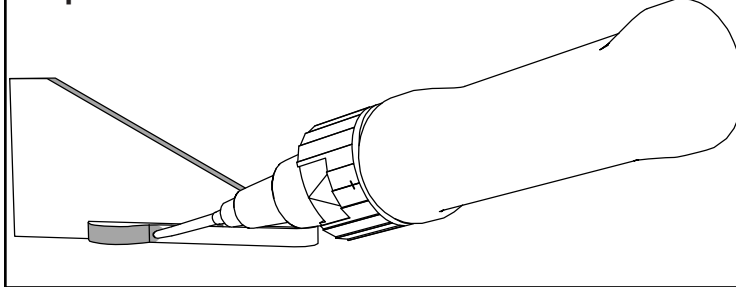
- 32. Apply wood glue to the bottom and tab of the canard (part “C”). Insert the “C” piece tab into the “D” part. Due to the small size of the pieces, it can be easier to apply the glue using a toothpick rather than directly from the bottle. Carefully adjust the two parts of each assembly so that they join at a right angle and allow the canard assemblies to dry. Repeat for the remaining three canard fins.

Step 32



- 33. Apply thin CyA to each of the exposed edges of the canards and allow the adhesive to harden. Once the adhesive has set up, smooth the edges of the parts with fine sandpaper.

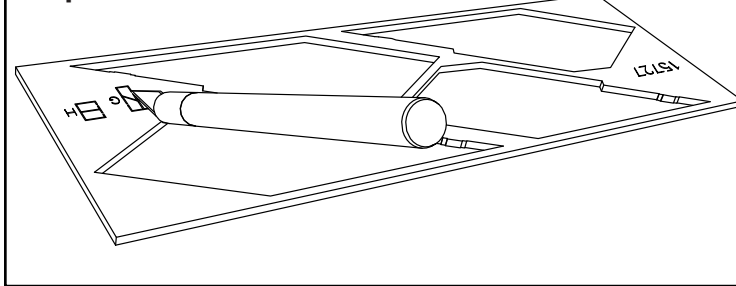
Step 33



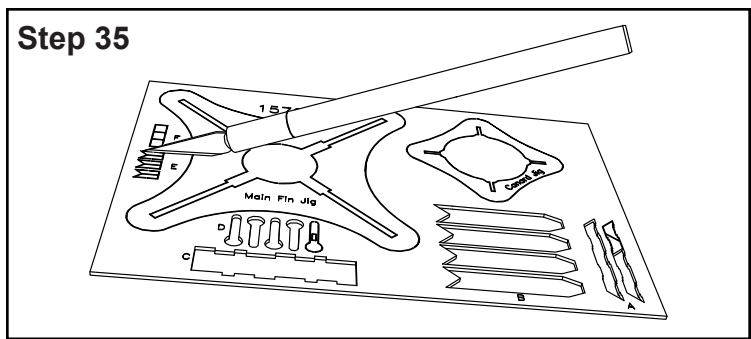
Scale Rail Guides:

- 34. Using a sharp hobby knife, cut out two of the “G” parts (three are provided) and one “H” part (two are provided) from the 3/32” balsa sheet.

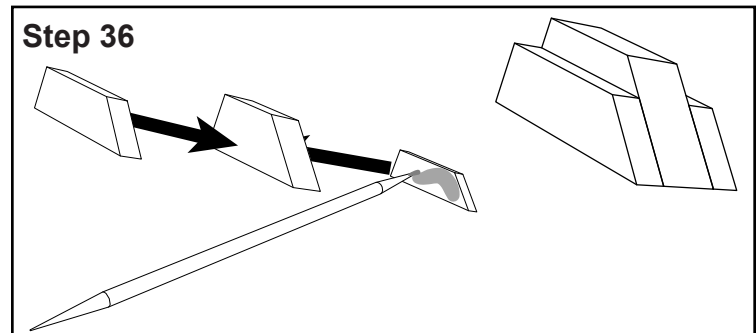
Step 34



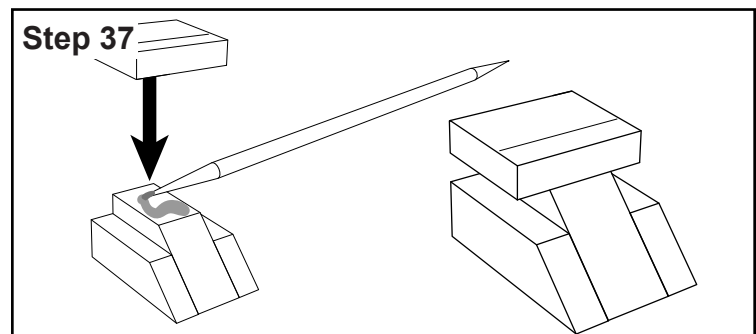
- 35. Cut out four of the “E” parts (six are provided) and two of the “F” parts (three are provided) from the cardstock detail sheet. Carefully sand any tabs off of the parts with fine grit sandpaper.



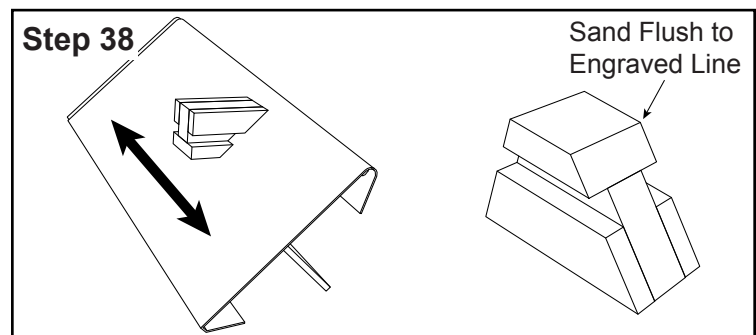
- 36. Using a medium CyA adhesive, attach the “E” cardstock parts to either side of the “G” balsa parts - flush with the bottom, front and back edges. This creates the “rail guides”. This step is easier with the help of a pair of tweezers to place the parts and a toothpick to apply the glue to the side parts “E”. Repeat for the second rail guide and allow the adhesive to harden.



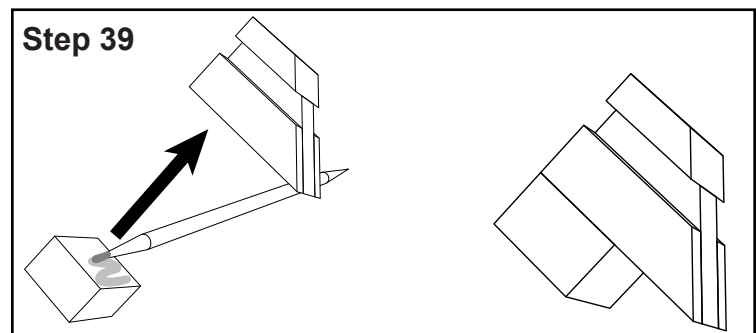
- 37. Again using medium CyA adhesive, attach the “F” part on the top surface of the “G” balsa piece with the engraved line facing up and toward the sloping side of the assembly. There should be a small (<1 mm) gap between the “E” and “F” parts on both sides, and the “F” part should be centered from side to side. Repeat for the other rail guide. Once the parts are placed, allow the adhesive to harden.



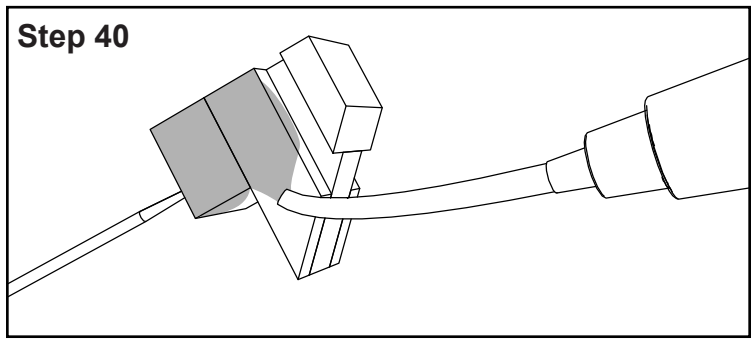
- 38. Using fine sandpaper, sand the front edge of the “F” part on each of the rail guides, between the forward edge of the part and the engraved line on its exposed surface so that the front section is flush with the main body of the rail guide.



- 39. Using medium CyA adhesive, glue the balsa part “H” to the base of one of the assembled rail guides as shown, flush with the back end and sides of the piece. **This will be the aft rail guide**, and part “H” provides a standoff to allow correct mounting at the step in the rocket body. You will not modify the other rail guide.

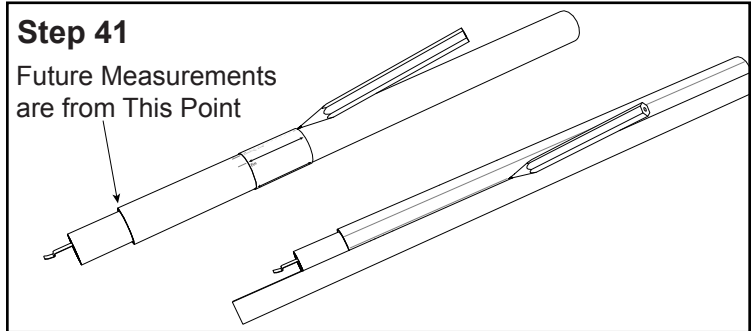


- 40. Holding the rail guide by impaling it on the end of a pin, saturate the entire rail guides with thin CyA adhesive to harden the surface. Set the rail guides aside to allow the adhesive to set completely prior to attempting to remove them from the needle. Once dry, lightly sand the surface smooth with fine sandpaper.

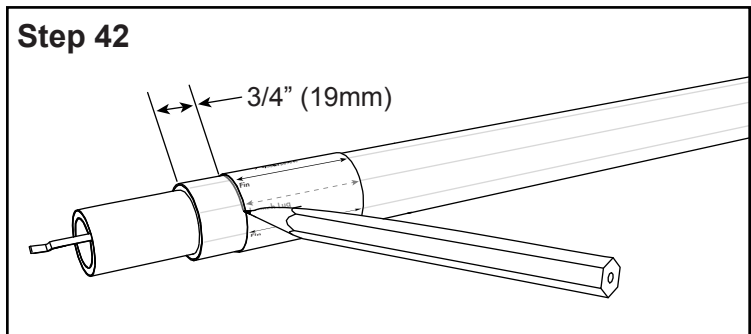


Final Assembly:

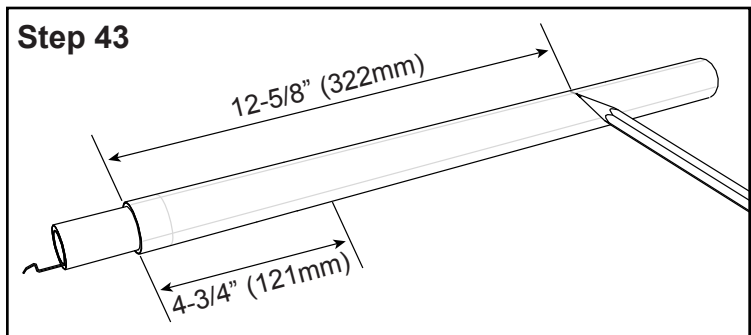
- 41. Route the shock cord back into the motor mount tube so that it is stored properly within the tube. Cut out the fin marking guide, and wrap it around the main body tube. A specific alignment of the lines with regard to the motor mount is unnecessary and any alignment is entirely aesthetic. Mark the locations and extend them along the entire length of the main tube using an extruded aluminum angle or doorframe to maintain alignment. **All position marks in the remaining steps are referenced from the aft end of the main 29mm body tube** (not the motor mount tube).



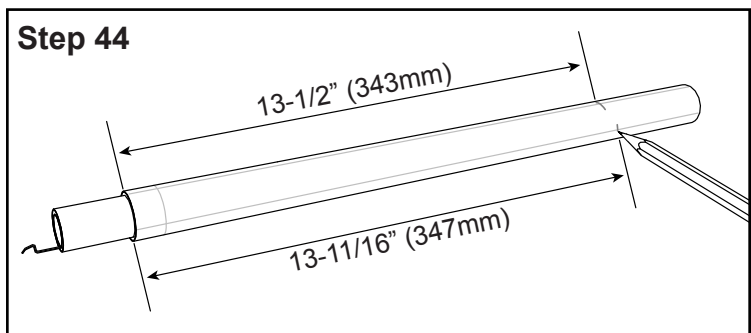
- 42. Mark the position of the motor band at $\frac{3}{4}$ " (19mm) from the aft end of the main body tube. Using the marking guide as a straight edge, draw a line all the way around the tube to provide a guide for the wraps.



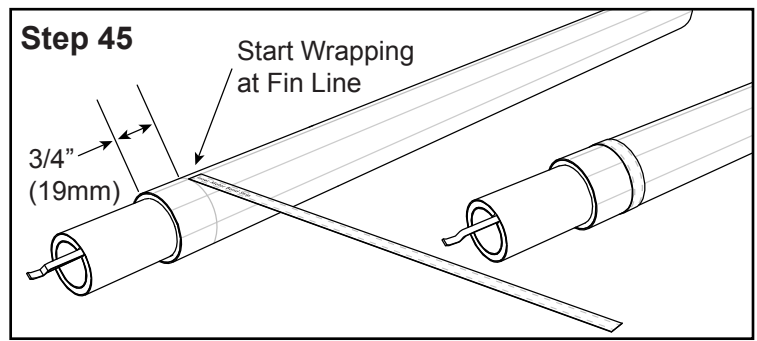
- 43. Mark the position of the forward rail guide at $12\frac{5}{8}$ " (322 mm) from the back end of the main body tube. Also mark the position of the launch lug at $4\frac{3}{4}$ " (121 mm) from the aft edge of the body tube.



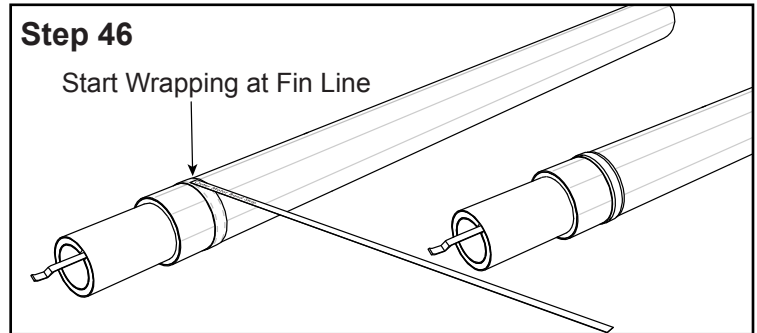
- 44. Mark the position of the canards. They fall on the same lines as the main fins, only further down the tube. The canards on opposite sides of the tube are at slightly different positions. Mark one pair at $13\frac{1}{2}$ " (343mm) and the second pair at $13\frac{11}{16}$ " (347mm) from the back end of the main body tube.



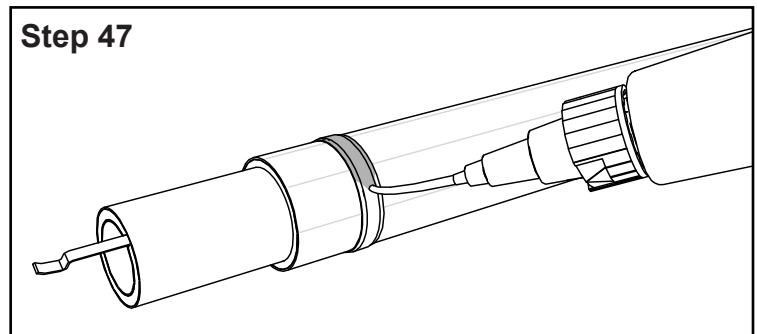
- 45. Using a sharp hobby knife or a pair of scissors, cut the motor band pieces out of the instructions. Spread a small amount of wood glue on the back (the side opposite the dotted lines) of the wider piece and align one end with a fin line, placing the wrap just forward of the line marked previously at 3/4" (19mm) from the back end of the body tube. Wrap the strip around the tube twice and it will end at the same fin line.



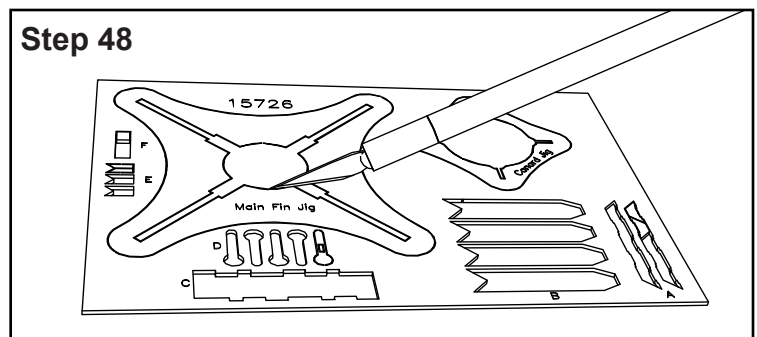
- 46. Apply a thin layer of wood glue to the thinner strip of the motor band piece. Centering it between the dashed lines printed on the first strip, begin wrapping at a fin line and wrap the strip around the tube. Allow the glue to dry.



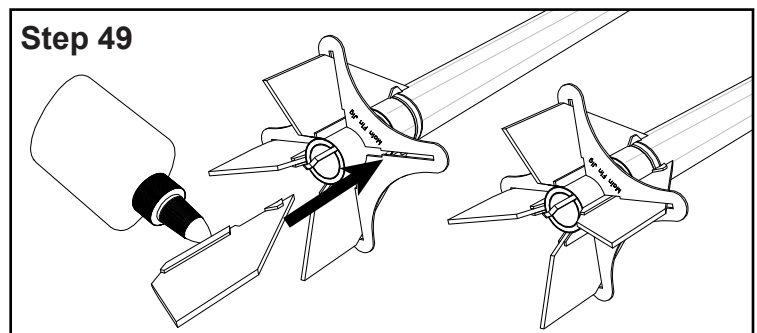
- 47. Saturate the motor band with thin CyA adhesive to harden it and minimize fibers being exposed as the rocket is sanded for finishing. Allow the adhesive to harden before continuing to install the fins.



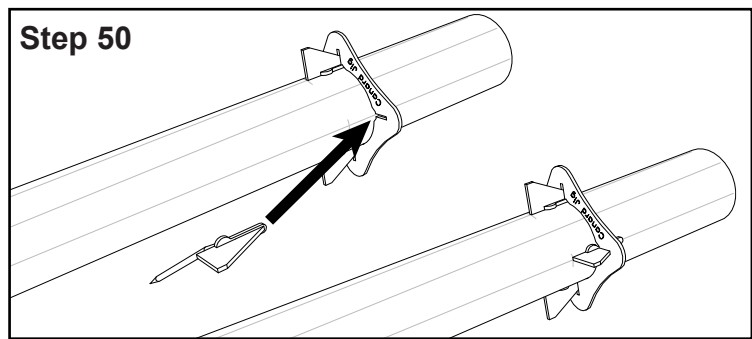
- 48. Using a sharp hobby knife, cut out the two cardstock fin alignment guides.



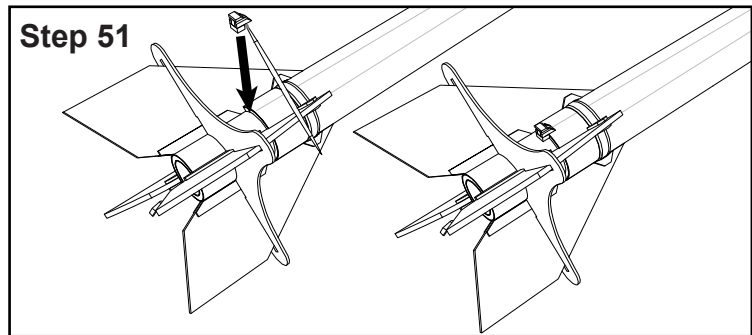
- 49. Slide the main fin alignment guide onto the motor mount tube to approximately the middle and align the fin slots with the fin lines marked on the tube. Test fit each fin and sand or file areas to ensure a tight fit around the motor band as well as against the body tube and step. Apply wood glue to the base of the fin and slide it into place, taking care to align it straight along the length of the tube. Repeat for each of the fins. Allow to dry before continuing.



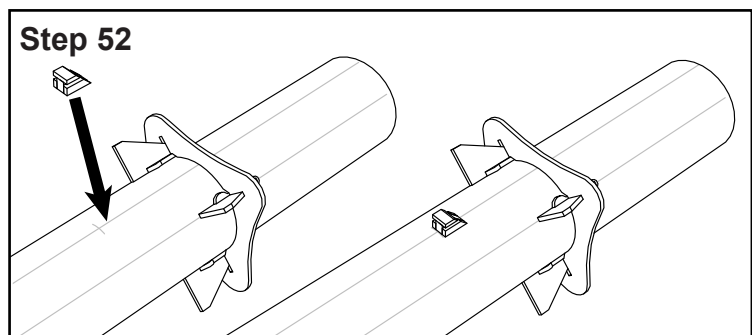
- 50. Slide the canard alignment guide onto the front of the body tube to a position approximately 1/2" (13mm) in front of the front canard position marks, and align the slots with the lines. Apply wood glue to the bottom of each canard and slide into place from the back, aligning the aft edge of the canard with the position mark. As with before, it can be helpful to use a toothpick to apply the glue. Also, take care to align the canard along the fin line. Repeat for each canard and allow to dry before continuing.



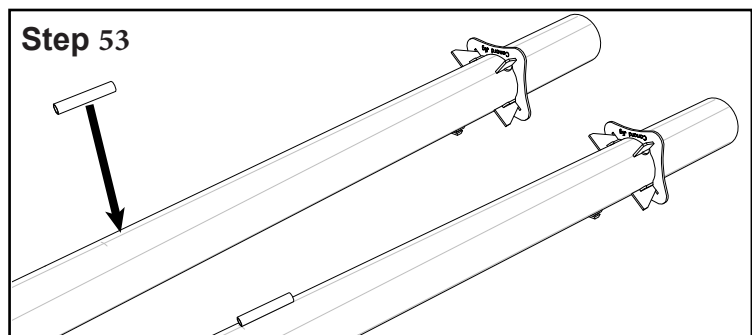
- 51. Mount the aft scale rail guide (completed in step 39) by applying wood glue to the bottom of the rail guide with the standoff attached. Glue the guide into place right at the step in the tube and centered on the rail guide line. Tweezers can be handy for placing the scale rail guides if handling with fingers is difficult.



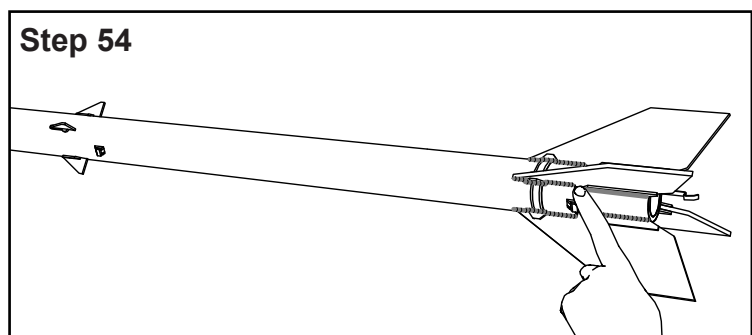
- 52. Mount the forward scale rail guide similarly by applying wood glue to the bottom of the remaining rail guide and attaching it to the rocket centered on the rail guide line with its back edge sitting on the forward rail guide mark.



- 53. Apply glue to the launch lug and attach it on the launch lug line with its back end aligned with the mark made in step 43. Allow the rocket to dry entirely before continuing.



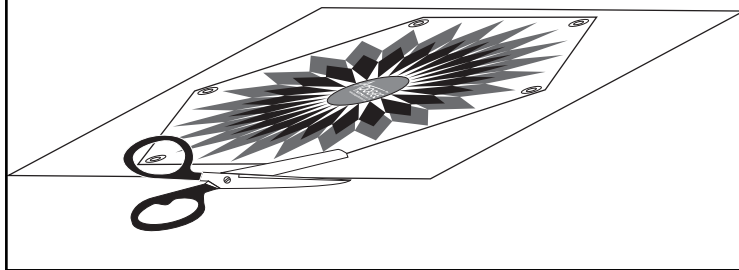
- 54. With all the joints dry, remove the alignment guides from the main fins and canards. Then, apply small fillets to all the fins as well as the scale rail guides and launch lugs. These fillets should be minimal to maintain a scale appearance. Glue can be applied in a thin bead and smoothed with a finger tip. Allow the fillets to dry.



Recovery System:

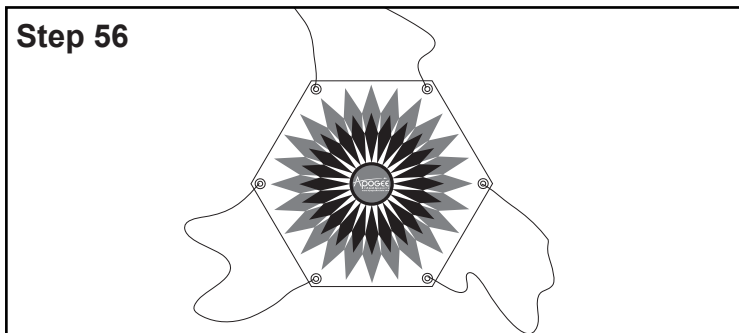
- 55. Cut the parachute out around the outer line so that the parachute is 12" in diameter. Place a reinforcing ring at each of the corners and using a pencil or hobby knife, puncture the center of the ring.

Step 55



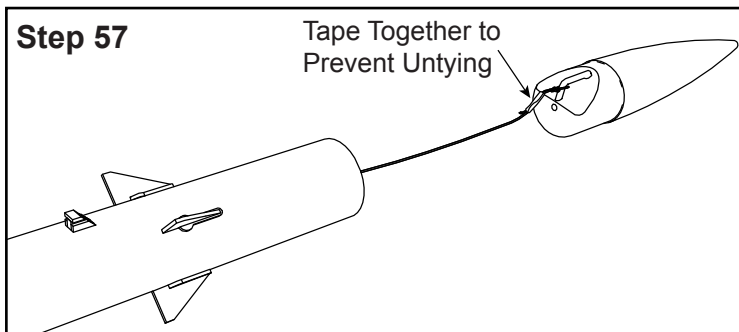
- 56. Cut the shroud lines into three equal sections, as shown. Then tie the shroud lines through the reinforcement rings and around the outside of the parachute as shown. Apply a small dab of glue to each of the knots and allow the parachute to dry before installing in the rocket.

Step 56



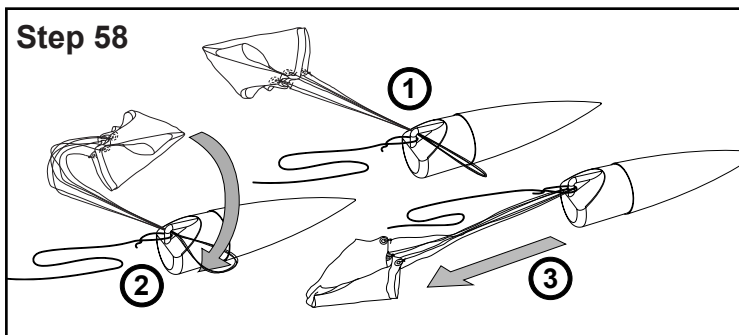
- 57. Once the rocket is completely dry, tie the shock cord to the nose cone and apply tape to the remaining tail to prevent the knot from coming loose.

Step 57



- 58. To attach the parachute, collect the three shroud lines from the parachute, pass them through the loop on the nose cone, and pull the parachute back through the ends, pulling the knot tight.

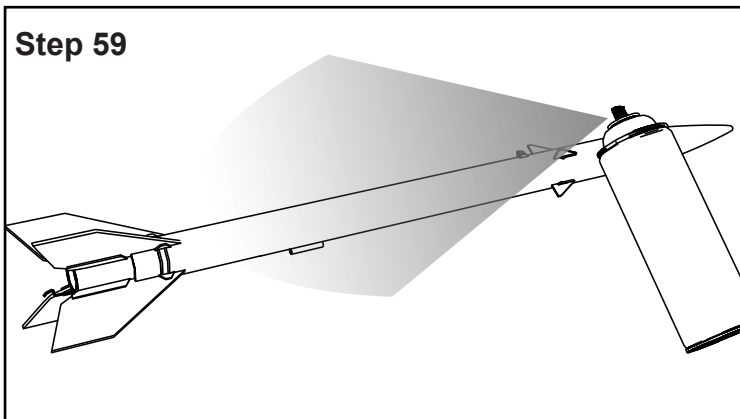
Step 58



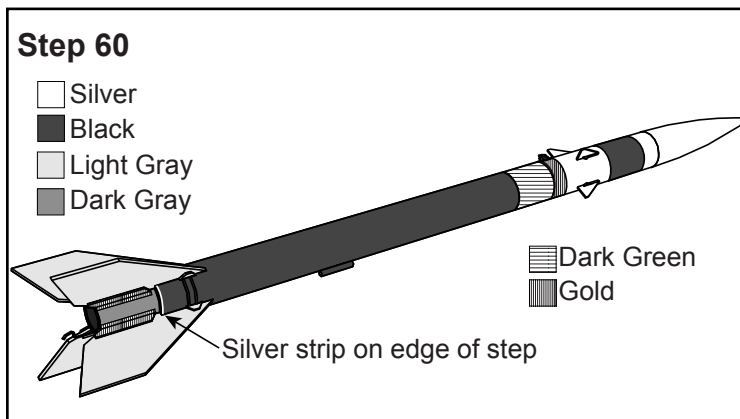
Finishing:

Finishing a scale model can be a complicated process depending upon how exact the modeler wishes to be in duplicating a particular prototype vehicle. The process described here is for a rough approximation of the standard Black Brant VC paint scheme with black, silver, and gray over the majority of the rocket; it does not represent a particular prototype. While the overall process would remain similar for specific prototypes, additional steps may be required depending upon the complexity of masking required.

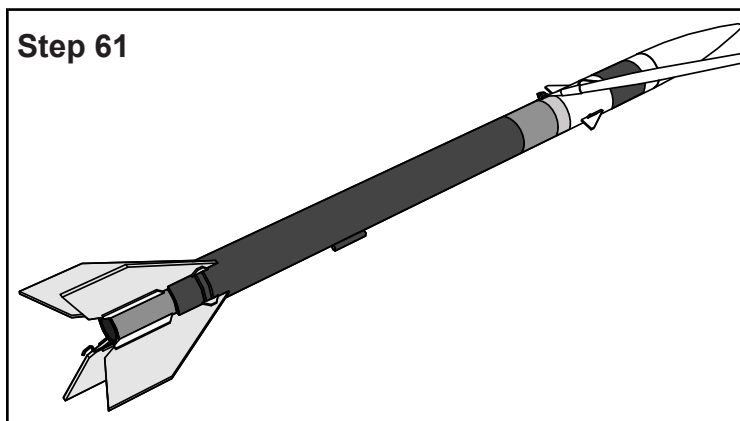
- 59. To preserve the definition of the details which are present on the rocket, apply primer in thin coats and sand until the rocket is smooth and covered with a thin, uniform coat of primer. This can take multiple coats to achieve.



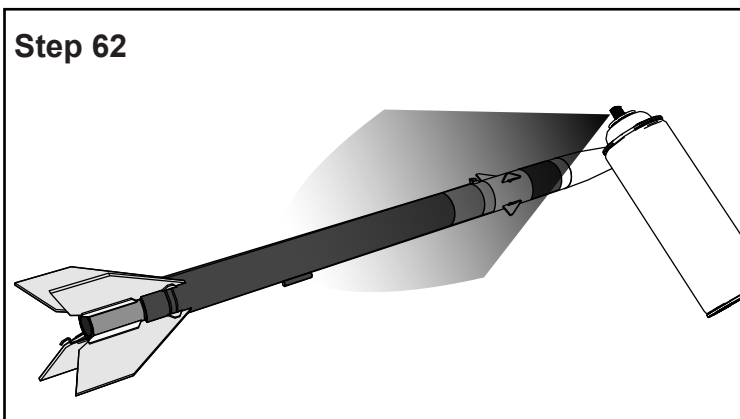
- 60. Apply the primary paint to the rocket. To do so, mask the part of the rocket for the required color on that section, apply the paint, and allow the paint to dry. Once the paint is dry enough to be handled without being marked by touching, the mask can be removed. Ensure that the paint has dried completely between coats however, to prevent damage to the surface of the paint from masking. Darker and more opaque colors can often be layered on lighter colors to reduce the need for masking. Included here is a schematic for a rather general Black Brant VC paint scheme which may not represent a specific prototype.



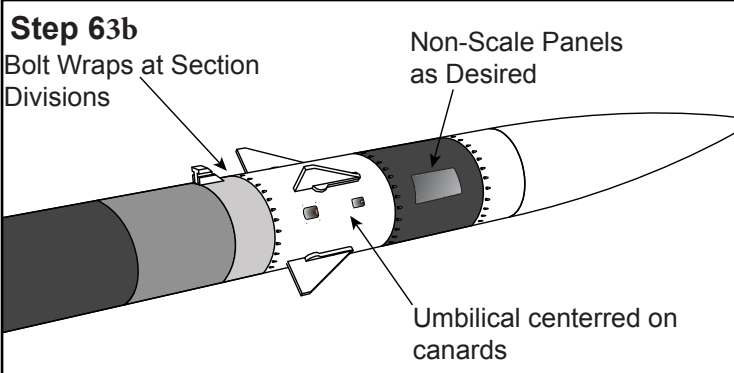
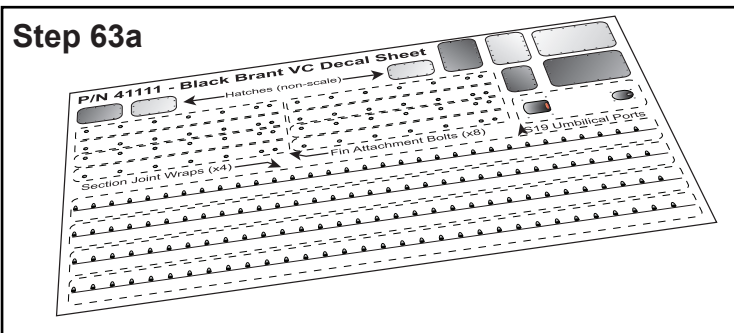
- 61. Using a fine-point paint brush, apply any paint details that cannot be easily masked and painted in bulk. The scale rail guides (which are silver) are a good example of where this is useful. Allow the paint to dry to completely before continuing.



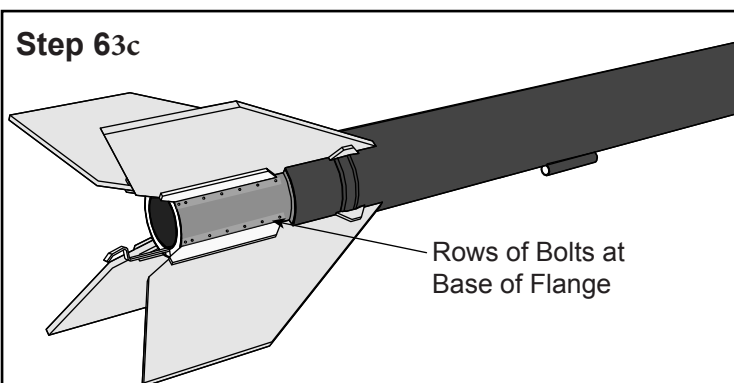
- 62. **Optional:** Apply a gloss clear coat to the entire model to prevent silvering of the decals applied in the next step (the appearance of a gray rather than clear background to the decals). First apply a couple of mist coats which are allowed to dry for 5-10 minutes each, then apply a final heavier coat that fully wets the surface of the model. Allow the clear coat to dry entirely before continuing.



- ☐ 63. Select the waterslide decals to be used on the model. The kit includes decals for bolt heads on the fin flanges, wraps which provide bolts and joint lines to separate payloads on the rocket, umbilical connections for the S19 guidance module, and some sport-scale hatch outlines. The placement of the decals can vary depending upon the specific prototype that you are replicating. To apply the decals, cut them out close to the desired graphic and soak them for 10-15 seconds in warm water. Once soaked, the decal will slide off the paper backing and can be transferred to the surface of the rocket. Ensure that the target area remains wet until the decal is correctly positioned so that it does not end up sticking and tearing, and then smooth the decal down using a soft paint brush. Remove as much water as possible and allow the decals to dry completely before handling the rocket.



- ☐ 64. **Optional:** Apply a clear coat to the entire rocket to achieve a uniform sheen of both the paint and the decals. This will make the decals blend into the finish more naturally and also protect the finish of the rocket.



- ☐ 67. **Congratulations!** Your Black Brant VC is now complete and ready for flight!

Launch Supplies Needed

To launch your rocket you will need:

- ☐ A launch pad with a 1/8" (3mm) launch rod and a launch controller that can handle the selected ignitors
- ☐ Recovery Wadding
- ☐ Engines such as those recommended in the motor chart at: <https://www.apogeerockets.com/Model-Rocket-Kits/Skill-Level-4-Model-Rocket-Kits/Black-Brant-VC#motors>

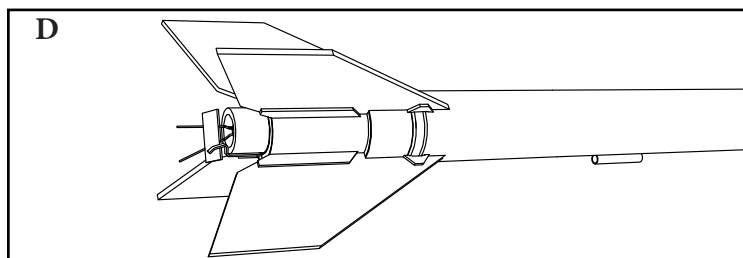
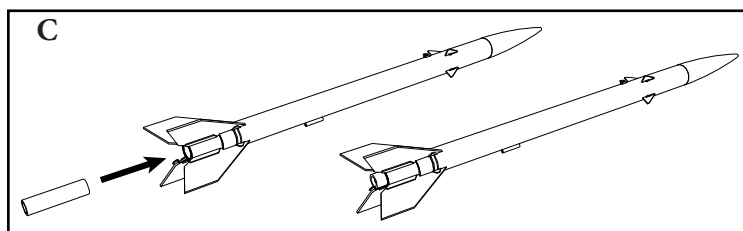
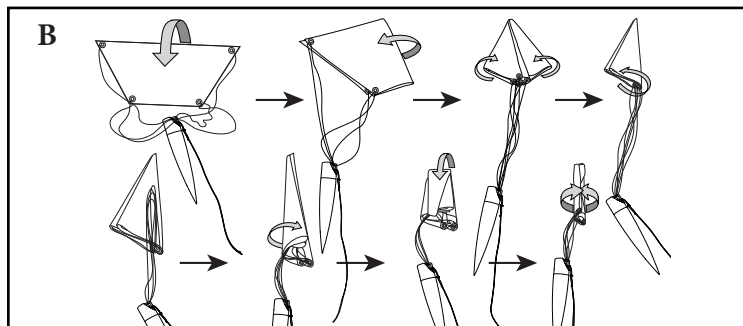
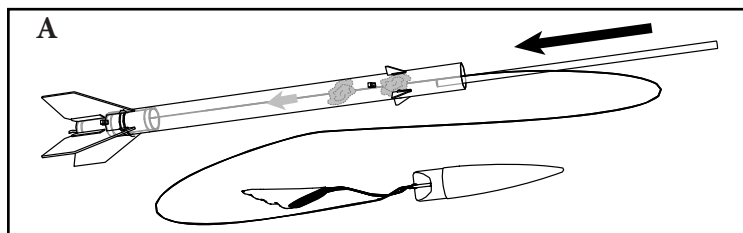
Suggested Motors

Motor	Manufacturer	Est. Altitude		Type
		Ft	m	
A8-3	Estes	160	49	Single Use
B4-4	Estes	413	126	Single Use
B4-4	Quest	480	146	Single Use
B6-4	Estes	424	129	Single Use
B6-4W	Quest	509	155	Single Use
C6-5	Estes	937	286	Single Use
C12-4	Quest	955	291	Single Use
C18-6W	Quest	1026	313	Single Use
D13-7W	Aerotech	1752	534	Reloadable
D16-6	Quest	1218	371	Single Use
D20-6W	Quest	1325	404	Single Use
D24-6T	Aerotech	1656	505	Reloadable

Rocket Preflight:

- ☐ A. Crumple and insert 3 or 4 sheets of recovery wadding into the tube, push them to the bottom with a long dowel.
- ☐ B. Fold the parachute so that the shroud lines all come together, then place the shroud lines onto the parachute in a loop and fold the parachute in half long ways to surround the shroud lines. Fold the parachute again – this time the other way – to shorten the whole package and insert first the shock cord and then the folded parachute into the rocket. Slide on the nose cone.
- ☐ C. Install the motor by sliding it into the motor mount tube and clipping the engine hook around the end to keep it from blowing out.
- ☐ D. Insert and secure the igniters as directed in the engine's instructions.

At this point the assembly of the rocket is complete and the rocket is ready for flight. Continue to follow the countdown and launch procedures.



Countdown and Launch Procedure

The Black Brant VC flies well on a variety of 18mm motors to a wide variety of altitudes. Choose a motor that is appropriate for the available field and winds. The area around the launch pad should be free from dry grass and other fire hazards, and the pad should be as far from trees, powerlines and low-flying planes as possible.

Remove the safety key from the launch controller if it was stored there.

1. Place the rocket on the launch pad. The rocket should slide freely along the rod.
2. Attach the clips to the igniter wires. The clips must not touch either each other or the metal blast deflector. Otherwise, a misfire is likely.
3. Stand back from the rocket as far as the launch wire allows (a minimum of 40 feet for motors E or larger).
4. Insert the safety key to arm the launch system.
5. Give a loud countdown! 5... 4... 3... 2... 1... LAUNCH
6. Press and hold the button until the engine ignites. Once the rocket is away, remove the safety key.

Misfire Procedure

A misfire is when an engine does not light after the launch button is pressed. This is sometimes a result of the igniter burning but failing to light the engine. At other times, the igniter will not burn at all (this is often indicative of a short between the clips). To deal with a misfire safely, remove the safety key from the launch controller and wait a full minute (60 seconds) prior to approaching the pad. Check that the igniter wires or clips were not touching, causing a short. If they were, the short can be corrected and a launch attempted again. If the engine simply failed to light, remove the old igniter and install a new one. Make sure that the igniter is installed all the way into the engine and that it is in contact with the propellant. Always follow the NAR (National Association of Rocketry) Model Rocket Safety Code when launching model rockets.

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