

Building the Minnie-Magg-XL-DD (Extra Long – Dual Deploy)

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This rocket kit will have five components. Starting from the bottom of the Rocket, they are the (1) Fin Section Body tube, (2) the Body Tube Extension, (3) the Avionics Bay (AvBay), (3) the Payload Section and (4) the Nose Cone.

This architecture is called "Three Tube Dual Deploy". In this case, separation is downward at the Fin Section and upward at the Nose Cone.

Materials List	Fin Section and Body Tube Extension
	(1) 27" long x 5.5" LOC Precision Body Tube
	(1) 18.75" long x 5.5" Body Tube Extension
	(1) 11" long x 5.38" ID Coupler
	(1) 10.5" long x 5.38" OD "Stiffy" Coupler Liner
	(1) 5.29" OD x ¼" thick Plywood Bulkhead disk (Fits inside Coupler)
	(1) 21.5" long x 54mm Motor Tube
	(2) 5.38" to 54mm MMT Centering Rings
	(1) 5.29" to 54mm MMT Centering Ring (Fits inside Coupler)
	(1) Aeropack, PML or Giant Leap 54mm Motor Retainer Assembly
	(3) Plywood or G10 Fins
	(2) 1.5" x 1.5" "Extreme Rail" Rail Buttons, ¼" Bolts, Fender Washers & Hex-nuts, Nylon Spacers
	(1) ¼" U-Bolt with washers and hex-nuts
	(1) Large Swivel
	(2) 12" x ¼" All-thread rods, (2) Fender Washers and (2) Hex-Nuts
	Avionics / Electronics Bay
	(1) 11" long x 5.38" ID Coupler
	(1) 10.5" long x 5.38" OD "Stiffy" Coupler Liner
	(2) 5.38" OD x 1/4" thick Bulkheads
	(1) 1.5" long x 5.38" ID Body Tube Ring
	(2) ¼" x 12" Long All-thread rods
	(2) Sets of ¼" Hex-Nuts and Fender Washers
	(2) Sets of wing Nuts and Fender Washers
	(8) 8-32 x ½" Machine Pan-Head Screws (Phillips Head preferred)
	(2) Aerocon Systems "Key-Out-Power-On" ¾" Round Switches
	(2) 6" Long x 1" wide "Remove Before Flight" Flags
	(4) Sets of Charge Canisters (PML, Al., PVC, Cardboard, etc...)
	(4) Electrical Terminal Blocks (Cut long strip and create 4 blocks with 2

terminals on each – available at Radio Shack)

- (1) Package Rubber “Heat-Shrinking Insulator Tubing”
- (1) Electronics Sled (G10 Sheet, HW and 6” x ¼” Mounting Lugs)
- (2) ¼” U-Bolt with washers, flat plate, and hex-nuts
- (2) Different Colored 22-Gauge “hook-up” electrical wire (available at Radio Shack) (Red and Black are Recommended)

Recovery

- (1) 78” Main Parachute (6” spill hole)
- (1) 18” Drogue Parachute (4” spill hole)
- (2) 25’ Tubular Nylon Straps with Sewn Loops at ends
- (1) Large Swivel
- (1) Small Swivel
- (4) 3/16” Large Steel Quick Links
- (2) 1/8” Small Quick Links
- (1) 2-56 STEEL Pan Head Screw (for tapping sheer-pin holes)
- (8) 2-56 NYLON Pan Head Screws (4 at Nose and 4 at Fin Section)
- (2) 14” Nomex Blankets

Payload and Nose Cone

- (1) 24” x 5.5” Payload Body Tube
- (1) 5.38” x 13” molded plastic Nose Cone
- (1) 3/8” Screw Eye and Expanding V-Backside Nut

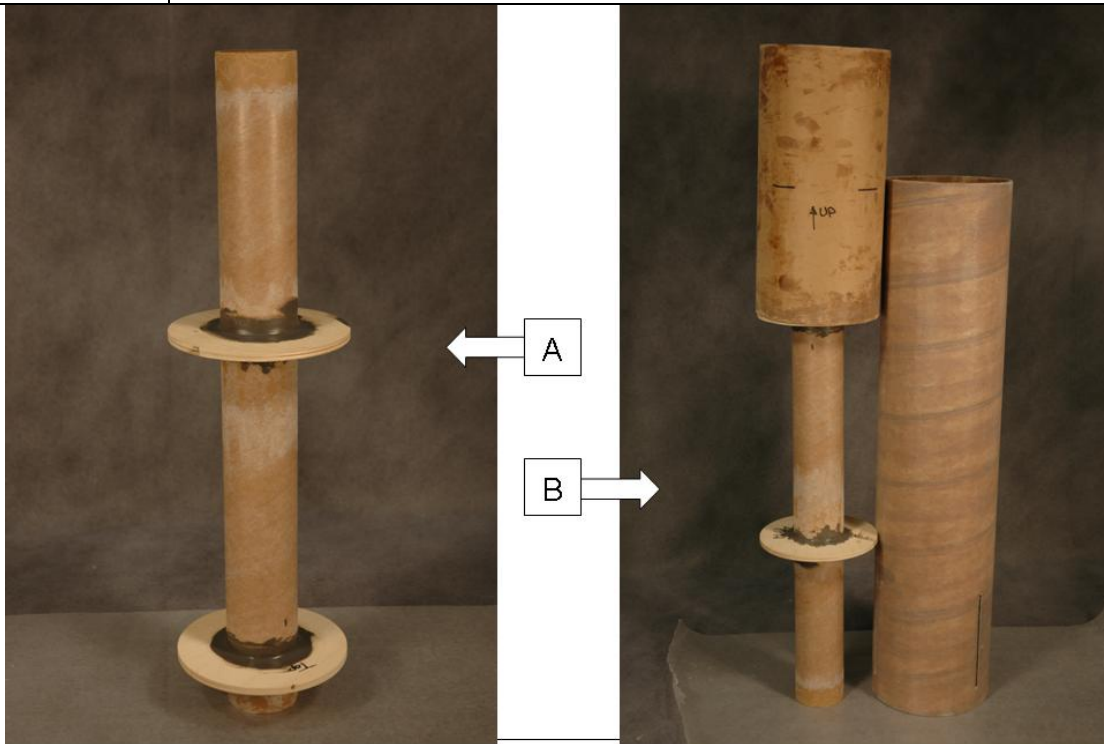
<p>Step 1: Fiberglass Body Tubes</p>	<p>(Optional) Apply fiberglass cloth or GLR Easyglas™ Sock to the Body Tubes. Sand with 100-grit paper to take away edges and then 150 and 220 to prepare for finishing. See www.astralisrocketry.com "InfoBase" for detailed procedures on this technique.</p>
<p>Step 2: Fiberglass Fins and Disks</p>	<p>(Optional) Apply fiberglass (with vacuum bags, if available) to each individual Fin, the Bulkhead Disks and the Top Centering Ring. Sand with 100-grit paper, and then 150 and 220 to prepare for finishing. See www.astralisrocketry.com "InfoBase" for detailed procedures.</p>



All parts in the kit ready to build after fiberglassing Body Tubes, Couplers, Fins and Bulkplates (Couplers are fully assembled in this photo).

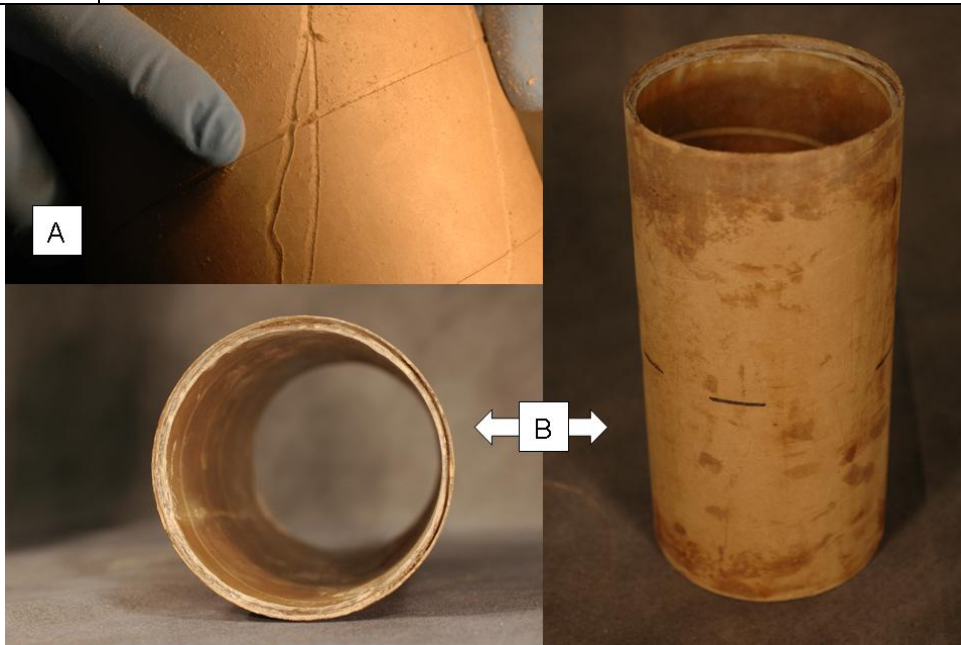
<p>Step 3: Build the Fin Section Bulkhead</p>	<p>Take a Bulkhead Disk, a U-Bolt, a Drilled Flat Plate, 4-Hex Nuts, 2-Fender Washers, and a Large Swivel. This Bulkhead will be supported with all-thread rods fixed permanently to it and to the Top Centering Ring.</p> <p>To support the all-threads, drill the Bulkhead and Top Centering Ring by taping them together and drilling 2 holes on a straight line through both disks.</p> <p>Center the U-Bolt on the Disk, perpendicular to the line made by the last two holes drilled. Then, drill a 9/32" hole for each U-Bolt post.</p> <p>Take the Large Swivel and cover its body with Masking Tape for the duration of the Build. Install it on the U-Bolt so the swivel hangs down.</p> <p>Install a Hex-nut 1" on each U-Bolt post and place the Drilled Flat Plate on top. Install into the Bulkhead and place a Fender Washer and Hex-nut on each bolt. Before tightening, coat the surfaces with JB Weld. After tightening, wipe away excess and allow the assembly to dry.</p>
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<p>Step 4: Build the Lower MMT CR</p>	<p>Take a MMT CR and drill three spaced holes in a triangle pattern around the motor tube opening about ½” outside its circumference. SIZE of holes should match to size of threaded inserts, t-nuts, etc.</p> <p>Even if you are using a Motor-Tube-Adhered Retention “Ring” System these threaded inserts are a good backup motor retention system and are handy during and after building.</p> <p>Install each threaded insert so that the open end is flush with the surface of the ring. Before applying epoxy, fill the internal threads with Lithium Grease so that no epoxy adheres to the threads. Epoxy inserts in place from behind.</p>
<p>Step 5: Prep MMT & CR's for MMT assembly</p>	<p>Sand the outside of the motor tube using 80-grit sandpaper to remove the glassine wrap and roughen the Tube surface. Sand the inside edges of all three Centering Rings. Brush away dust from all surfaces.</p> <p>Take the Top Centering Ring and install two all-thread rods permanently with JB-Weld. The loading sequence is: Hex-nut, Fender Washer, Bulkhead Disk, Fender Washer, Hex-nut. Tighten Assembly and allow it to dry.</p>



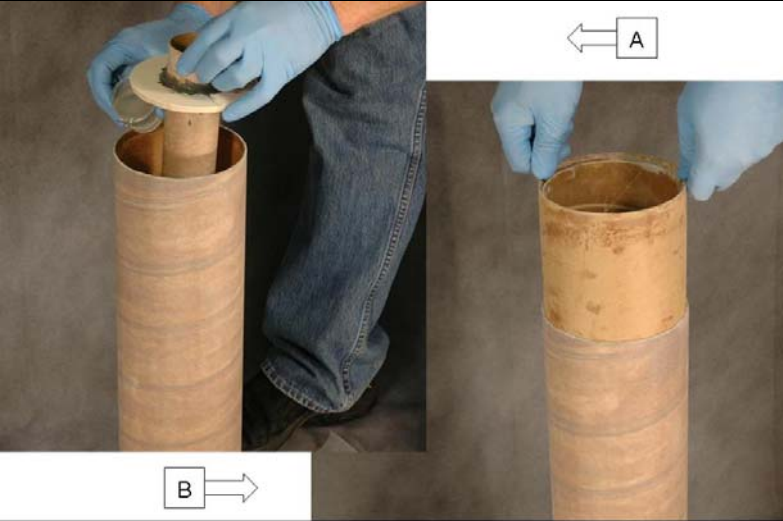
(A) Motor Mount Tube with JB-Weld, drying Top-side down
 (B) Dry-fitting MMT for inserting into Coupler and Fin Section Body Tube

<p>Step 6: Assemble MMT with Upper Two CR's</p>	<p>Place the Upper and Middle Centering Rings on the Motor Tube so the Upper Ring is ¼" below the top of the Motor Tube. The Middle Ring should be 10" from the bottom end of the Motor Tube.</p> <p>Stand the tube so that the Top CR is up. Place 1" masking tape in a straight horizontal line on the Tube <u>below each Ring</u> to hold the ring perpendicular to the Tube. Rest the Rings on the tape.</p> <p>Epoxy the top surface of both Centering Rings to the Motor Tube and allow it to dry. JB-Weld is recommended for high heat applications.</p> <p>Remove the masking tape and turn over the assembly. Use JB-Weld on both up-facing Centering Ring surfaces (the <u>bottom</u> surfaces of the CR's) and allow the assembly to dry.</p>
<p>Step 7: Create the Coupler Tube and the AvBay Body</p>	<p>Take a Coupler Tube and a 10.5" Liner ("Stiffy"). Use a Dremel Tool to grind small channels into the outside surface of the Stiffy Tube, going in a spiral from the top edge of the tube to its bottom edge. These channels will allow the epoxy to collect between the tight-fitting tubes.</p> <p>Use Slow Cure epoxy. Before mixing the epoxy, warm the containers in hot water for a few minutes to make the epoxy run thinner. Prepare paper towels, protective gloves and a garbage bag. Also, put down two 24" lengths of wax paper and a disposable tray to allow excess epoxy to collect. Be in a well-ventilated room. Now, mix the epoxy.</p>



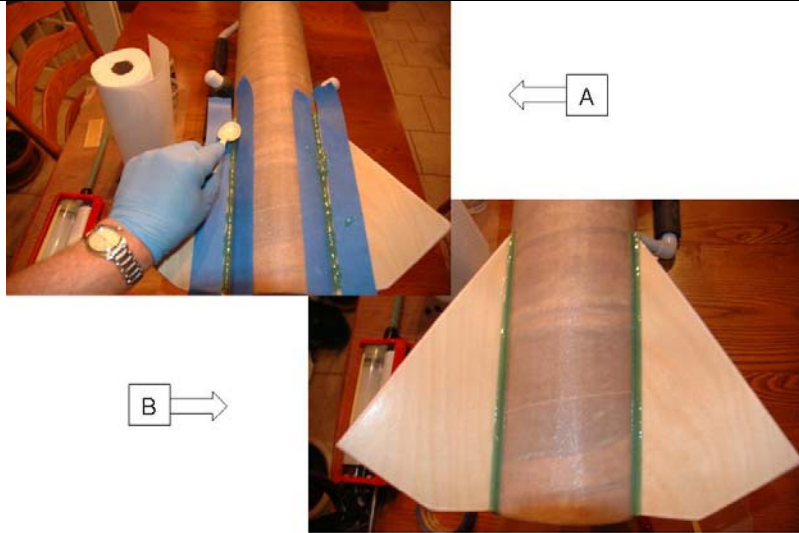
(A) Stiffy Tube with grooves for epoxy ground by Dremel Tool
 (B) Fin Section Coupler Tube finished and marked for installation

<p>Create AvBay Continued...</p>	<p>Use a foam roller to spread epoxy inside of the Coupler Tube and outside the Stiffy Tube. Get epoxy into all the grooves. Rest the pieces on wax paper and allow the cardboard to absorb the epoxy for 3 minutes. Apply 1 or 2 more thin coats of epoxy until the surfaces remain wet & shiny for 2 minutes.</p> <p>Slowly, insert the Stiffy Tube into the Coupler Tube, twisting repeatedly to spread the epoxy evenly. Do this over wax paper, as epoxy will pour out of the tubes as you push one into the other.</p> <p>Use a roller to spread epoxy over the outside surface of the Coupler. After drying, this will harden the tube surface.</p> <p>Repeat this process so that you have (2) identical Coupler / Liner Assemblies. Make sure they do not touch each other while resting on wax paper.</p> <p>At this point (or later), fiberglass can be applied to the inside of the Coupler Tube to make it even stronger.</p> <p>After 24 hours, grind excess epoxy off the inside of the ¼” Lips with a Dremel Tool and sand the outsides of the Tubes smooth.</p>
<p>Step 8: Mark the Coupler Tube</p>	<p>With <u>NO Epoxy</u>, install the MMT into the Fin Section. Stand the Fin Section with the Motor Mount Tube resting on a flat surface.</p> <p>Take one Coupler Tube and slide it into the Fin Section from the top. The Top Centering Ring should fit very easily inside the Lip of the Coupler Assembly. If not, grind epoxy away from the Lip. Then, grind the plywood CR one layer at a time, fitting it in the Coupler between grinding each layer, until there is an <u>easy</u> fit of CR into the coupler.</p> <p>Using a pencil, mark the Coupler Tube around its circumference at the edge of the Fin Section Body Tube, using the BT as a guide.</p> <p>Remove the Coupler Tube and set the Fin Section assembly aside.</p>
<p>Step 9: Prepare Fin Section Tube Edges</p>	<p>Remove the Motor Mount assembly. Use thin CA to coat the top flat edge of the Fin Section Body Tube. Let it dry overnight. This will harden the edge so that it doesn't split or fray. Sand it with 150 grit paper after 24 hours.</p>
<p>Step 10: Prepare Fin Section</p>	<p>Take the Fin Section and roughen its inside surface from one end to the other with 80 grit sandpaper. Brush away all dust.</p>
<p>NOTE: Slow-cure epoxy is recommended and warm your epoxy containers in hot water before mixing to make the epoxy run thinner.</p>	
<p>Step 11: Install the MMT in the Fin Section</p>	<p>Prepare 2 – 4 ounces of slow cure epoxy. Slide the MMT into the Body Tube from the top until the Middle Centering Ring is inside and the Top Centering Ring is still outside. Now, stop sliding.</p> <p>Pour the epoxy on top of the Middle Centering Ring, making sure to not get epoxy inside the upper Body Tube Wall. Rotate the tube on an angle to spread the epoxy and then slide the MMT down and rest it <u>on wax paper</u> on</p>

	<p>a flat surface. Epoxy WILL drip out the bottom.</p> <p>Immediately, make sure there is no epoxy on the inner wall and dry-fit the Coupler Tube into position so that the Centering Ring sits into the Coupler Tube Lip, holding it in proper position during drying overnight.</p>
	 <p>(A) Install Motor Mount Tube $\frac{3}{4}$ of the way and pour epoxy on Middle CR (B) Dry Fit (No Epoxy) Coupler Tube in place to center Motor Mount Tube</p>
<p>Step 12: Attach the MMT to the Coupler Tube</p>	<p>Spread epoxy on the outside surface of the Coupler Tube and the inside surface of the Body Tube. Make sure to get epoxy inside the Coupler Lip and on the edges of the Top Centering Ring inside the Fin Section. Allow the tubes to absorb the epoxy for 3 minutes. Apply again and allow to absorb as needed until the surfaces remain wet and shiny for 2-3 minutes.</p> <p>While rotating, slide the Coupler Assembly into the Fin Section so that the Top Centering Ring sits into the $\frac{1}{4}$" Lip. Do this over wax paper, as epoxy may pour out the top. Wipe away excess epoxy from the outside wall, and press the assembly together to ensure proper placement. Allow the assembly to dry overnight on a level surface.</p>
<p>Step 13: Strengthen the Top CR Joint</p>	<p>Apply Epoxy generously to the top of the Upper Centering Ring at the joint between the Ring and the inside Coupler wall. Allow to dry.</p>
<p>Step 14: Strengthen the Middle CR Joint</p>	<p>When the Assembly is dry, stand it upside down and apply Epoxy to the bottom surface of the Middle Centering Ring at the joint between the Ring and the Body Tube wall. Allow to dry.</p>
<p>Step 15: Install the Loc-n-Fin™ Fins and Build Fin Fillets</p>	<p>The Body Tube Fin Slots and may need grinding with a Dremel Tool or file to fit. Dry-fit all Fins and Plates before installing with epoxy.</p> <p>Use 5 minute epoxy on the outside surface of the Body Tube to attach each fin in its slot. After inserting the fin, use a nitrile-gloved finger to smooth epoxy into the Fin-Body-Tube-Joint. Allow to dry completely.</p>

Use Structural Adhesive epoxy to create fin fillets outside and inside each fin. On the inside fillet, make sure to not block the Fin Tab Slot where the Loc-n-Fin Plate is inserted.

Secure each Loc-n-Fin Plate in each Fin and secure to the Body Tube Wall and to the Fin Tab. Use epoxy generously and let dry completely.







(A) Fins taped for applying epoxy and smoothing fillets with spoon
 (B) Fillets after tape is removed

**Step 16:
 Fiberglass Fins
 "Tip-to-Tip"**

Optional – Roughen the surface of the Fins, Fin Fillets and Outer Body Tube between the Fins. Apply fiberglass to the fins "Tip-to-tip", using one layer of 6 oz. Fiberglass or Carbon Fiber and one layer of 2 oz. 'Glass.



(A) Fins with 1 layer 6 oz. Carbon Fiber covered by 1 layer 10 oz Fiberglass
 (B) Fins after epoxy cures and surface is sanded (surface is wet for sheen)

<p>Step 17: Foam MMT Tube in Fin Section</p>	<p>Expanding foam from PML, Giant Leap, or other may be used. With the Fin Section upside down, foam the inside of the Fin Section from the Middle Centering up to the end of the fins. Grind / Clean.</p>
<div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%; text-align: center;">  <p>A</p> </div> <div style="width: 50%; text-align: center;">  <p>B</p> </div> <div style="width: 50%; text-align: center;">  <p>C</p> </div> <div style="width: 50%; text-align: center;">  <p>D</p> </div> </div> <p>(A) Foam expanded and cooled. (B) Cut away extra with coping saw (C) Ring of expanded foam (D) Bottom view after grinding with Dremel</p>	
<p>Step 18: Install the Bottom Centering Ring</p>	<p>JB Weld the Bottom Centering Ring in place with the threaded inserts facing outward. Make sure at least 3/4" clearance is left for the Rail Button mounting hardware and the Motor Retention Ring.</p>
<p>Step 19: Attach Lower Rail Button</p>	<p>Stand the Fin Section upside down. Find the mid-point between two fins at a point vertically 1/2 the distance between the Bottom Centering Ring and the bottom end of the Fin Section. Mark it, and drill a 9/32" hole through the Fin Section Body Tube wall. Clean away all shavings and dust.</p> <p>Install the Rail Button here using the 1/4" bolt, a Fender Washer and either a Wing-nut or a Hex-nut. Always check tightness BEFORE EVERY FLIGHT.</p>
<p>Step 20: Install Fin Section Bulkhead Disk</p>	<p>Take the Bulkhead Disk with the U-Bolt and Swivel. Apply epoxy to the Coupler Tube "Lip" and the all-threads. Install the Bulkhead Disk, followed by the Fender Washers and Hex-nuts. See final photo next page.</p>

Fin Section With Zipperless Coupler

Fin Section (24" Body Tube) with "Zipperless" Coupler extension for Dual Deploy. Coupler coated with epoxy for later sanding.


¼" U-Bolt and Swivel for Drogue 'Chute.

1/8" Plywood Fins with 1-Layer Fiberglass vacuum bagged on each fin individually. Green fin fillets made with Gugeon Bros. Pro-set epoxy

Body Tube has glassine removed and one wrap GLR Easy Glass sock. 9 ounces of epoxy were applied with a foam roller and sanded down after 24 hours curing.

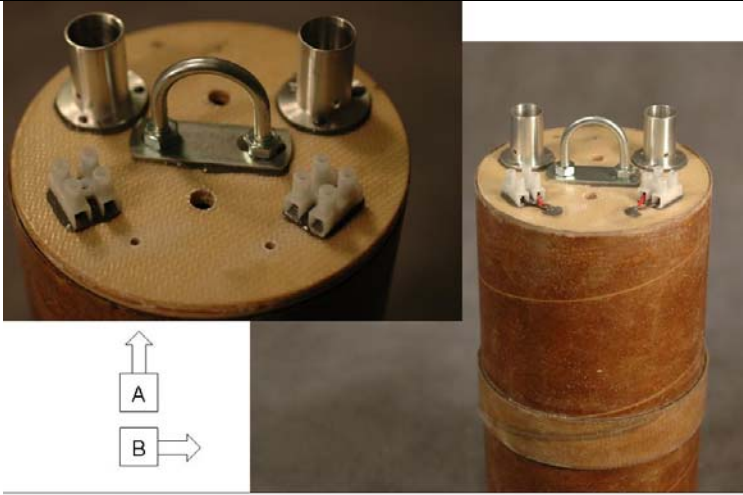



<p>Step 21: Avionics Bay</p>	<p>The Avionics Bay (AvBay) will be assembled so that the bottom bulkhead has all-threads fixed permanently to it and the top has a removable bulkhead.</p>
<p>Step 22: Prep AvBay Center Body Tube Ring</p>	<p>Take the AvBay Assembly and the 1.5" Body Tube Ring. Center the Body Tube Ring on the AvBay vertically. Mark the AvBay all the way around at both edges of the Body Ring. Remove the Body Ring.</p> <p>Roughen the outside of the AvBay between the marked lines with 80 grit sandpaper. Roughen the inside surface of the Body Tube Ring.</p> <p>Use a Dremel Tool or a file to grind small grooves in the outside surface of the AvBay and the inside surface of the BT Ring, running from the top of the BT-Ring to the bottom. Brush away all dust.</p>
<p>Step 23: Epoxy AvBay Center Body Tube Ring</p>	<p>Use slow-cure epoxy, warmed in hot water to make the epoxy run thinner and do this step over wax paper to catch dripping epoxy.</p> <p>Spread epoxy on the outside surface of the AvBay Assembly between the marked lines. Let the cardboard absorb the epoxy for 3 minutes. Repeat this process until the surface remains wet & shiny for about 3 minutes.</p> <p>Slide the Body Tube Ring onto the Coupler Tube. Work it slowly over the epoxy and twist it to work the epoxy under the Ring. Once it is centered, wipe away the excess epoxy with a paper towel.</p> <p>After drying overnight on wax paper, test-fit the Assembly in the body tube. Sand off excess epoxy with 150-grit sandpaper.</p>
<p>Step 24: Drill Holes in AvBay Center Body</p>	<p>The tape in this step aligns drilled holes along a straight line and spaces them evenly. <i>Perfect</i> alignment and spacing are for appearance only.</p>

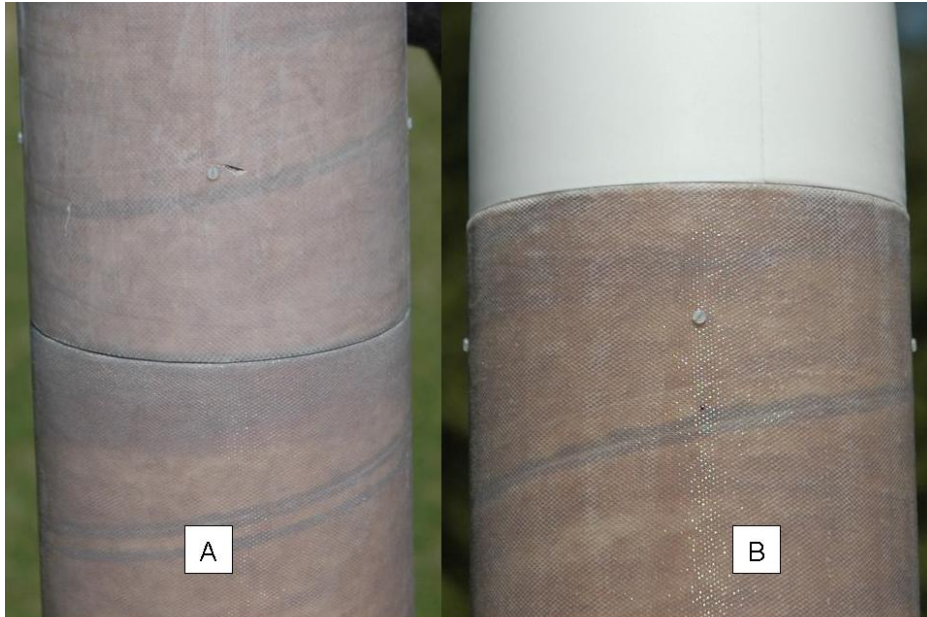
<p>Tube Ring...</p>	<p>For the 5.5" diameter Tube, lay out 18" of ½" masking tape in a straight line on a cutting board. (Circumference = Pi (3.14) * Diameter).</p> <p>Starting at one edge of the tape, mark 8 evenly-spaced lines going vertically from the tape's top edge to its bottom edge (about 2.16" apart). There will be extra tape and it will be removed later.</p> <p>Wrap the tape around the Body Tube Ring so that its Top Edge is at the vertical center of the Ring. Trim excess tape where the ends meet.</p> <p>Mark the Body Tube Ring at each of the 8 lines on the tape's Top Edge. Drill a 5/64" hole on each drill mark & remove the tape.</p>
	 <p>(A) KeySwitch side (front) of AvBay in Payload and Tube Extension (B) Rail Button side (back) of AvBay in Payload and Tube Extension</p>
<p>...Drill Holes in AvBay (Continued)...</p>	<p>One hole will house a Rail Button. Two holes will house ¾" power switches. Five holes will pressurize the Avionics Bay during flight.</p> <p>(1) Choose one hole and mark it with a pencil. Drill it to 9/64" – this will house the Rail Button and hardware.</p> <p>(2) Turn the AvBay and find the hole opposite the Rail Button. Mark each of the two holes on its sides and drill the marked holes with a ¾" speed-bore bit. As you drill with a ¾" speed bore bit, stop periodically to remove a cardboard "disk" as it gets cut away from the tube.</p> <p>Even if you are flying now with one altimeter, it is wise to install two switches to support redundant electronics.</p> <p>(3) Smooth all of holes with 150 grit sandpaper and apply Thin-CA to the hole edges. After drying overnight, re-sand the holes.</p>
<p>Step 25: Attach Altimeter Mounting Rods</p>	<p>Take the two AvBay all-thread rods or cut all-thread rods so they are 1" longer than the total length of the AvBay. On the Rods, the bottom Bulkhead will be permanent and the top Bulkhead will be removable.</p> <p>Take a Hex Nut and a Fender Washer. Install the Hex Nut about 1/2" down the rod. Install the Fender Washer flush against the Hex Nut on the short</p>

	<p>end of the rod. Hold it up so the Fender Washer is on top.</p> <p>Slide the rod upward through one hole of the Bottom Bulkhead and rest it on the Washer. Install a Washer and another Hex-nut on the short end of the rod and hand tighten it so that the Hex-nut is flush to the end of the rod.</p> <p>Repeat the procedure for the other all-thread rod.</p> <p>This side of the assembly will be epoxied in place. Loosen the assemblies, and work JB-Weld into all the surfaces. Then, tighten them again with pliers. Wipe away excess epoxy and let dry.</p> <p>The other side will be removable, with a wing nut and Fender Washer on the outside, while the Bulkhead sits in the Lip of the Coupler.</p>
<p>Step 26: Altimeter Mounting Sled Suggestions</p>	<p>Build an altimeter mounting sled. Examples can be found in a variety of sources, including the www.astralisrocketry.com Photos section.</p> <p>Some key suggestions:</p> <ul style="list-style-type: none"> • KEEP IT SIMPLE. “Elegance” is meaningless if the rocket crashes! • Use 6” x ¼” launch lugs as backside mounts to your all-thread rods. Use a Dremel tool to flatten one side of the launch lug. • (*) Mount your 9V batteries with <u>top end down</u>. • (*) Use “Electric Tape” or Wire Straps to hold the batteries in place. Create holes or slots in the G10 for this purpose. • Use stand-offs to hold the altimeters away from the board. • Mark the top of the Board with “UP Arrows” to show orientation. • Use hex-nuts at the tops and bottoms of the all-thread Rods to secure your Sled when it is mounted for flight inside the AvBay. • <u>Always face loaded charges away from face and hands.</u> • At the Pad, power on your altimeter(s) before inserting igniters.
<p>Step 27: Drill Pressure Release Holes</p>	<p>The two holes below will allow pressure to vent in & out as parts are installed or separated. This allows easy assembly and disassembly of the rocket and easy separation during recovery deployment.</p> <p>Drill one 13/64” hole in the Payload Section 6 inches from the top and on the same vertical line as the Rail Button.</p> <p>Drill one 13/64” hole in the Body Extension Tube 6 inches from the top and on the same vertical line as the Rail Button.</p>
<p>Step 28: Secure Payload and Body Extension to AvBay</p>	<p>The Payload Section and Body Extension are secured to the AvBay to stay with the AvBay when the Drogue and Main Chutes are deployed. 8-32 Screws will hold them in place during flight (see photo at Step 24).</p> <p>Assemble the rocket and stand it level. Carefully align the Pressure Release</p>

	<p>Holes and the Rail Buttons vertically. Masking tape the Payload and Body Extension tubes to the 1.5" Body Tube Ring.</p> <p>For the 5.5" diameter Tube, lay out TWO 18" pieces of 2" masking tape in a straight line on a cutting board.</p> <p>Mark 4 evenly-spaced lines vertically from the top edge of the first tape to the bottom edge of the second tape. Space the lines by 4.32".</p> <p>Align the tape horizontally with the edge of the Body Tube Ring where it meets the Payload and Extension Tubes above and below it. Align the vertical marking lines with 4 of the 8 holes in the Body Tube Ring.</p> <p>Use a pencil to mark the two Body Tubes at each of the 4 lines on one tape's Top Edge and the other tape's Bottom Edge.</p> <p>Drill a 5/32" hole (match 8-32 screw) on each drill mark through both the Body Tubes and the AvBay Coupler. Remove the tapes.</p> <p>Now, take a permanent black magic marker in one hand, maintain the vertical alignment of the tubes and slide the Payload Tube off the AvBay. Mark a vertical line on the AvBay and inside the Payload Tube. This will be your alignment point for reassembly in the Field.</p> <p>Repeat this step with the AvBay and the Body Tube Extension.</p>
<p>Step 29: Harden the Edges of the AvBay Holes</p>	<p>Remove the Payload and the Extension Tubes. On each 8-32 screw hole, apply Thin-CA to the edges both inside and out, to harden them for use. After they dry, sand away excess, reassemble the rocket and "re-tap" the holes with 8-32 screws.</p>
<p>Step 30: Wire the Altimeter Power Switches</p>	<p>Aerocon Systems "Key Out – Power On" ¾" switches are used here.</p> <p>Select two colors of 22-Gauge "hook-up" electrical wire and "shrinking rubber insulation" (both available at Radio Shack).</p> <p>Cut two pieces of each color wire to 10" length and cut four pieces of ¼" – ½" pieces of shrinking insulation.</p> <p>Using the altimeter, test-connect the wires (no solder) to the switches to find the 2 poles which set "Power On" when "Key is Out".</p> <p>For each switch, solder the wires and apply shrinking insulation collar to the connections to protect against breakage and short circuits. The switches will be installed AFTER painting.</p>
<p>Step 31: Build the AvBay Bulkhead Disks</p>	<p>Repeat the procedure below for both AvBay Bulkhead Disks. They are identical, except that the lower Disk has the all-thread rods permanently attached (completed earlier).</p> <p>Take (1) Bulkhead Disk, (1) U-Bolt and Hardware, (4) 2-Terminal Blocks, (2) Charge Canisters, (2) 10" (+/-) pairs of wire and (2) 18" (+/-) pairs of wire (consistent colors as above).</p> <p>On each Bulkhead Disk, arrange (2) Charge Canisters and (2) Terminal</p>

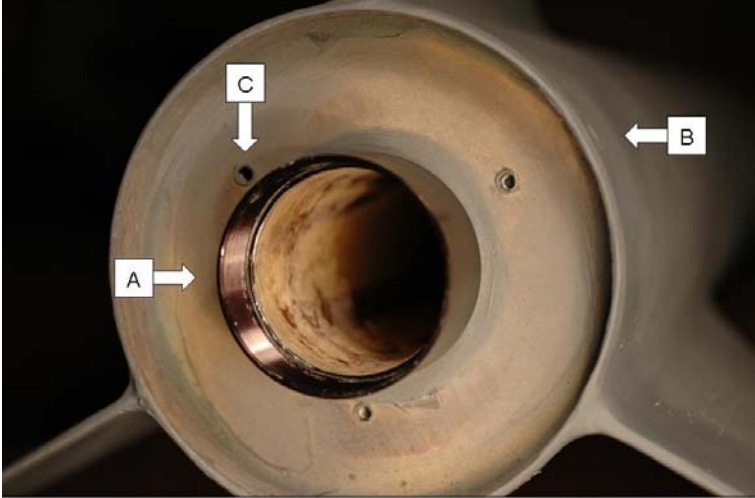
	<p>Blocks. Trace the outside edge of each object at its location and remove all. Sand the surface with 80 grit and brush away dust.</p> <p>Drill a 7/64" hole in the side of each Charge Canister at the bottom.</p>
	<div style="text-align: center;">  </div> <p>(A) Top Bulkplate with Charge Canisters and Wire Holes at Terminal Blocks (B) AvBay assembled with Center Body Tube Ring mounted but not drilled</p>
<p>...Build the Bulkhead Disks (Continued)...</p>	<p>Install the U-Bolt permanently in each Bulkhead Disk with JB-Weld.</p> <p>Drill a 1/8" hole through each Bulkhead Disk away from the Terminal Block. A pair of wires will come up from inside through each hole.</p> <p>Onto each Bulkhead Disk, epoxy two Terminal Blocks so that the wire openings face the hole just drilled and the Charge Canister.</p> <p>Onto each Bulkhead Disk, epoxy two charge canisters so that the hole drilled in the side faces each Terminal Block.</p> <p>In the Field, an ematch runs from inside the canister through the hole to the Terminal Block. You must seal the canister hole so charge powder doesn't leak. Use fireproof wadding inside the canister and electrical tape outside.</p>
<p>...Build the Bulkhead Disks (Continued)...</p>	<p>For each Bulkhead Disk, take two (+) and (-) wire pairs. For the Top Bulkhead, use the 10" length. For the Bottom Bulkhead (all-threads installed), use the 18" length. Strip both ends to expose 1/4" of wire.</p> <p>Run each wire pair up through the hole in the Bulkhead and attach the leads to the Terminal Block away from the Charge Canister. Firm up the wire so that little or no slack is on the Terminal Block side.</p> <p>Now, use JB-Weld from both sides of the Disk to fill the holes completely and secure the wires in place. No air should be able to pass through the hole.</p> <p>Finally, take the bulkhead disk with the 18" wires installed. This will be the Bottom Disk. Install the All-threads and hardware permanently.</p>
<p>Step 32: Install</p>	<p>Steel hardware is used to provide a stronger connection than plastic.</p>

<p>Nose Cone Hardware</p>	<p>Take the Eye Bolt and expanding locknut. Use a hacksaw to cut the plastic “collar” extending from the Nose Cone. Drill a 1/2” hole in the end of the Nose Cone. Install the steel hardware and epoxy it in place.</p>
	
<p>Step 33: Drill Shear Pin Holes</p>	<p>Take the assembled rocket and a permanent marker. Vertically align the tubes to “flying position”. Maintain vertical alignment while sliding the Nose Cone off the Payload Tube. Mark a vertical line on the NC shoulder and another one aligned with it, inside the Payload Tube. Repeat this step, making matching lines inside the bottom of the Body Tube Extension and outside the Fin Section Coupler Tube shoulder.</p> <p>Reassemble the rocket in vertical alignment and put masking tape outside the tube joints to hold them in place. Place tape horizontally 2.5” down from the Nose Cone edge and 2.5” up from the top of the Fin Section Body Tube. On each horizontal line, aligned with the four 8-32 holes you drilled in Step 28, drill four 5/64” holes. These will house 2-56 nylon pan head screws, which will be “shear pins” at the separation points.</p> <p>These holes will be too tight for nylon screws to tap, so tap the holes with a <u>steel</u> 2-56 machine screw, or a Reamer. As an alternative, the sheer-pin does not need threading, and can slide into place and be taped in. For this, drill a 3/32” hole and the shear pins will fit loosely.</p>



(A) Shear Pins at bottom for downward separation (Drogue)
 (B) Shear Pins at top for upward separation (Main)

<p>Step 34: Fill and Prep Body and Nose for Painting</p>	<p>Sand the Nose Cone surface at the seam and on any marks from the manufacturing mold. Use filler to smooth the surface and sand.</p> <p>Mask the Nose Cone Shoulder, AvBay Shoulders, Fin Section Coupler Shoulder, and Motor Mount Tube. Mask all holes from the inside.</p> <p>Assemble and stand the rocket, resting the parts on the tape.</p>
<p>Step 35: Apply Primer</p>	<p>Use one manufacturer's paint, as certain paints will cause others to bubble or peel (some won't, some will – don't find out the hard way!).</p> <p>If you plan to paint the rocket a light color use white primer. This assumes you are using a quick-dry product like Krylon or Kilz.</p> <p>Apply a veil-thin coat of primer over the whole body. Wait 15 minutes and repeat until satisfied. 5 – 10 <u>ultra-thin</u> layers are recommended.</p>
<p>Step 36: Paint Suggestions</p>	<ul style="list-style-type: none"> • Keep spray can upright and moving, and apply veil-thin (translucent) coats. Wait 15 minutes and repeat. If you are not using spray-paint, use a foam roller. • Before masking for 2nd & 3rd colors, allow paint to dry in a warm, vented room for 36 hours, or the tape will deform the paint. • Use Professional Painter's masking tape. Cut plastic garbage bags to mask the body or fins when using multiple colors. • Create polished finishes with wet-sand papers as fine as 2,000.

	<ul style="list-style-type: none"> • Have patience!!! Plan 36 hours per coat or color.
<p>Step 37: Install Motor Retention</p>	<p>After all masking tape is removed, roughen the Motor Tube end and dry-fit your Motor Retainer. Then, separate the Base Ring from the Closure Ring. Set aside the Base and Closure Rings.</p> <p>Use JB-Weld and coat the Motor Tube. Now, coat the ridges inside the shoulder of the Base Ring with JB-Weld. Install the Base Ring, while twisting to spread the JB-Weld. Push to final position and wipe away excess JB-Weld inside and outside the assembly. Allow to dry completely.</p> <p>Now, test a motor in the MMT. Make sure it slides all the way in and no epoxy is blocking its path. Sand, Dremel, or file as needed.</p>
	 <p>(A) Motor Retention Base Ring (B) Rail Button Hole (C) 3 Backup Motor Retention Holes in a triangle pattern</p>
<p>Step 38: Secure the Recovery System</p>	<p>Slide a small Quicklink about 5' down a 25' Shock Cord. Tie a knot in the cord around the Quicklink. Attach a Small Swivel to the Quicklink for the Droque parachute.</p> <p>Attach a Large Quicklink to the Shock Cord end close to the swivel, install a Nomex Blanket on the Cord, and attach the Quicklink to the bottom of the Avionics Bay. Attach a Large QuickLink to the other end of the Shock Cord, and attach it to the top of the Fin Section.</p> <p>Take the (18") Droque Parachute and attach it to the Quicklink.</p> <p>Now, slide a small Quicklink about 5' down the other 25' Shock Cord. Tie a knot around the end of the Quicklink. Attach a Large Swivel to the Quicklink for the Main parachute.</p> <p>Attach a Large Quicklink to the Shock Cord end close to the swivel and attach the Quicklink to the Nose Cone. Attach a QuickLink to the other end of the Shock Cord, install a Nomex Blanket on the Cord and attach the QuickLink to the top of the AvBay.</p>

	Take the (larger) Main parachute and attach it to the Quicklink.
Step 39: Mark the Center of Pressure	Assemble the rocket and stand it up. Otherwise, use a tape measure, to find 57.75" down from the top. Mark this spot permanently as the Center of Pressure (CP).
Step 40: Field Flight Prep Suggestions	<ul style="list-style-type: none">• Safety is the <u>Number One Priority</u>. Follow all National and Local Club guidelines and make Flight <u>and</u> Recovery safe.• <u>FOR EVERY FLIGHT</u>, take the fully loaded, "<u>with-motor-ready-to fly</u>" rocket and find Center of Gravity. Check to ensure that CG is at, or above, one body caliber (5.5") from CP.• Have a written check-list for the activities you will do at your Work-Table and at the Launch Pad.
<p>See last page for photo of built rocket...</p>	

