



# Wildman Rocketry

## BOOSTER ASSEMBLY INSTRUCTIONS (INJECTED INTERNAL FILLETS)

Congratulations on buying a Wildman kit! You’ve just purchased one of the finest fiberglass rocketry kits on the market. Follow the build instructions below to make sure that your Wildman Rocket lasts flight after flight. Build it right, and you can be sure that the rocket will take any motor you can cram in the tailpipe.

If this is your first time building with fiberglass, you’ll be glad to have a resilient rocket that can take most of the usual abuse that we dole out at the field. Bonding fiberglass requires bonding prep; parts should be sanded with 60 or 80 grit sandpaper and cleaned with acetone to remove dust and oils. Be sure to read all the instructions first so you’ll know what to do. The order of the steps matters! You may not be able to do something once the next step is done, so be sure to follow the order of steps.

In the parts list below, the Kit you’ve ordered should have the listed parts. In order to complete the build, you’ll also need the “Necessary Parts.” “Optional Parts” are recommended, but not necessary to complete your rocket. Then, we’ve included a list of some tools you’ll want to have on-hand.

Your kit may vary slightly, depending on which kit you have purchased, but the build steps and methods should be the same. Be safe and happy flying!

### Parts list:

<u>Kit:</u>	<u>Necessary Items:</u>	<u>Optional Items:</u>	<u>Needed Tools</u>
Body Tube Centering Ring Motor Mount Tube Fins	Recovery Harness Y-Harness or eyebolts Parachute Nomex® Chute Protector Epoxy CA (superglue) Chopped Carbon Fiber Rail Buttons	Quicklinks AeroPack Motor Retainer	Paper cups to mix Epoxy Popsicle sticks Sandpaper (60 or 80 grit) File Masking Tape Drill or Drill Press Clamps Dremel tool 10mL syringes Acetone

### CONTENTS

<b>Step 1: Prepare All Parts</b> .....	2	<b>Step 4: Injected Internal Fillets</b> .....	8
1.1: Wash all fiberglass parts .....	2	4.1: Mix Epoxy .....	9
1.2: Sand surfaces to be bonded .....	2	4.2: Inject epoxy mixture .....	9
1.3: Use Fin Slots to mark Couplers .....	3	4.3: Settling and Cure .....	9
1.4: Drill holes for injected internal fillets.....	3	4.4: Rotate and repeat .....	9
1.5: Dry-Fit all parts .....	3	<b>Step 5: External Fillets</b> .....	10
<b>Step 2: Motor Mount</b> .....	4	5.1: Prepare Fillet area .....	10
2.1: Mark MMT for Fins .....	4	5.2: Make the Fillet .....	10
2.2: Attach Retainer & Aft Centering Ring.....	4	<b>Step 6: Airframe Finishes</b> .....	11
Epoxy-On Retainer.....	4	6.1: Rail Buttons .....	11
Flange-Mount Retainer .....	5	6.2: Vent Hole .....	11
2.3: Prep Y-Harness.....	5	<b>Step 7: Paint</b> .....	12
2.4: Notch top Centering Ring (CR) .....	6	7.1: Remove Rail Buttons .....	12
2.5: Attach Top CR.....	6	7.2: Mark CP location.....	12
2.6: Attach Y-Harness .....	6	7.3: Paint .....	12
<b>Step 3: Fins</b> .....	7	<b>Step 8: Final Assembly</b> .....	12
3.1: Prep MMT for bonding.....	7	8.1: Harness attachment .....	12
3.2: Insert MMT into BT .....	7	8.2: Drogue chute attachment .....	12
3.3: Attach fins.....	8	8.3: Payload or HED Friction Fit .....	12

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## **STEP 1: PREPARE ALL PARTS**

### **1.1: Wash all fiberglass parts**

1.1a) All fiberglass parts should be washed in a mild detergent, like dish soap. This will clean off all the mold-release agent and dust from the cuts. Simply fill a sink or bucket with soapy water and wash the parts like you would wash the dishes. Rinse with clean water and dry them off.



1.1a →

### **1.2: Sand surfaces to be bonded**

1.2a) All fiberglass surfaces that will be bonded should be sanded using 60 or 80 grit sandpaper to create a rough surface area for the epoxy to adhere to.

1.2b) The entire Motor Mount Tube (MMT) should be sanded since the fins, harness, centering rings, and internal fillets will all be bonded to it.



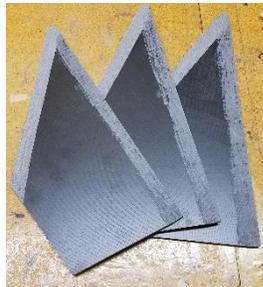
1.2b →

1.2c) The centering rings should be sanded on both sides since internal fillets will bond to them.

1.2d) The “root edge” of the fin is the bottom edge of the fin that will bond to the motor mount. Sand it using 60 or 80 grit sandpaper, again, for bonding. This is also a good time to sand the bottom ½” or so on both sides of the fin which will be bonded with the internal and external fillets.



1.2c →



1.2d →

1.2e) Since the external fillets will adhere to the airframe around the fin slots, now is the best time to sand around them easily. Sand about ½” on each side of the fin slot both on the outside and on the inside of the airframe. Again, use 60 or 80 grit sandpaper as this is for bonding purposes.

1.2f) Be sure to sand inside the BT and around the inside of the BT where the Centering Rings will bond



1.2e →



1.2f →

### **1.3: Use Fin Slots to mark Couplers**

1.3a) Later in the build, you'll want to have an easy way to tell equal distance on the couplers. Now is an easy time to use the fin slots to mark lines on the couplers. Slide the coupler into the aft-end of the booster airframe and draw lines on it using the fin slots as guides.

1.3b) Repeat this using the nosecone/NC coupler for shear pins, as well



1.3a →



1.3b →

### **1.4: Drill holes for injected internal fillets**

1.4a) Depending on the kit, you'll want to drill 1-3 holes for injecting. Drill holes  $\frac{1}{4}$  of the way down the fin slot from the forward end and  $\frac{1}{4}$  of the way up from the aft end.



1.4a →

1.4b) The holes are  $\frac{1}{8}$ ", drilled  $\frac{1}{4}$ " (on center) away from the fin slot. Be sure to drill holes on both sides of the fin slots



1.4b →

### **1.5: Dry-Fit all parts**

1.5a) Now that all bonding surfaces have been prepped, it's time to get everything ready for the build. Test fit the pieces, and sand accordingly if things don't fit. A little tightness is okay as is a little looseness. The parts should fit so that you can move them around as you build, but not so loose that they will slip around once you've set the epoxy. Now is also the point when you'll want to make sure all your pieces are squared off. Sometimes the manufacturing process leaves little tabs on the tubes that you should square off. After all this sanding, it's a good idea to wipe down all the parts with a slightly damp cloth/paper towel to remove all the dust. Once the pieces dry-fit together, you're ready to start building.

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## **STEP 2: MOTOR MOUNT**

The Motor Mount Tube (MMT) acts as the attachment point for the y-harness, the attachment point for the fins, and the motor mount. Be sure to build it well! The y-harness method shown here has flown in rockets small, large, and massive, and it will hold up for flight after flight. The y-harness will be the attachment point for your recover harness. For injected internal fillets, it's important to get the centering rings attached properly so they act as dams for the injected epoxy mixture.

### **2.1: Mark MMT for Fins**

2.1a) You'll need to mark the location of the fins so that when you attach the harness, you don't interfere with the fins bonding to the motor mount. Dry-fit the motor mount (with centering rings) into the aft of the airframe and use a marker, pencil, or other implement to mark a line through the fin slots. You can use a razor or scissors to score a light line if you wish, or pull the tip out of a marker.



2.1a →

2.1b) After marking the fin locations, you can go back over the marks with a marker to make sure they're clear, easy-to-see lines.



2.1b →

### **2.2: Attach Retainer & Aft Centering Ring**

There are two main types of Motor Retainers: Epoxy-On retainers that slide onto the aft-end of the MMT, and Flange-Mounted retainers, which are bolted onto the aft centering ring. Directions below are for both types.

#### **EPOXY-ON RETAINER**

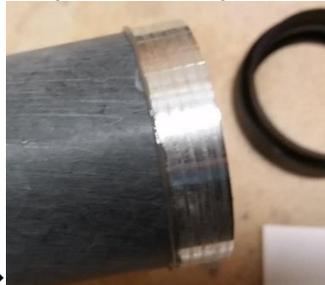
2.2a) Smear a high-heat epoxy (JB Weld is recommended) around the bottom of the MMT. Since this is thin-wall fiberglass, your kit may include a thin metal band to make the Aeropack fit tightly.

2.2b) First, bond the metal ring to the motor mount by smearing high-heat epoxy (JB Weld) on the MMT and sliding the metal band into place.

2.2c) Finally, smear high-heat epoxy around the metal band and on the inside of the retainer, making sure to fill the grooves as best as you can. Then twist the retainer into place. If your kit does not include the thin metal band, just bond the retainer to the MMT. Wipe off any excess epoxy and set aside to cure.



2.2a →



2.2b →



2.2c →

2.2d) Slide the Aft CR onto the MMT to its proper location or as far down the MMT as possible.

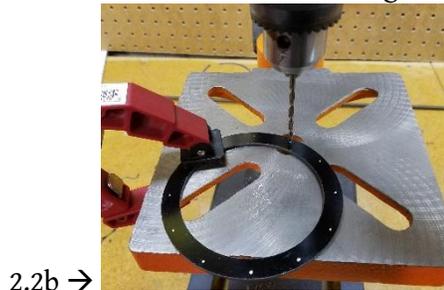
2.2e) Tack the Aft CR in place using a drop or two of CA. It will be bonded more permanently when you inject the internal fillets, so the CA is good enough for now.

FLANGE-MOUNT RETAINER

2.2a) Mark the aft centering ring where you'll need holes

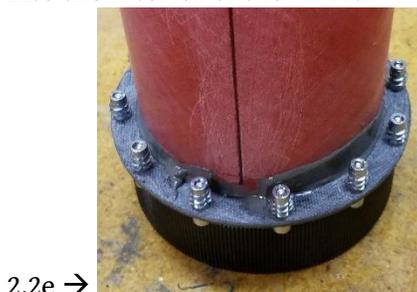
2.2b) Carefully Drill the 12 holes. If you use a 1/8" drill bit, the included screws will self-thread into them with a bit of effort.

2.2c) Thread all the bolts through the retainer into the Centering Ring



2.2d) If the bolts all self-threaded, you don't necessarily need any nuts/hardware on the backside, however, if you feel it necessary, add the nuts to the back side of the bolts (see 2.2e)

2.2e) After making sure the aft-end of the motor mount tube is prepped for bonding (sanding, cleaning), smear some high-heat epoxy (JB Weld) around the bottom of the MMT and twist it into place so that none of the bolts will interfere with the fins. Be sure to wipe clean any epoxy where the fin will be attached and any epoxy that squeezed into the interior of the MMT.



**2.3: Prep Y-Harness**

2.3a) Make a loop of Kevlar strap long enough to go on the motor mount, up to the top of the airframe and back down, with a few extra inches



2.3b) Tie a loop (overhand knot) at the top of the airframe and leave two Kevlar leads that reach down to be epoxied onto the motor mount. Cut the strap to the right length. When attaching this later, be sure that the loop is accessible at the top. Having the knot right at the top of the airframe is best



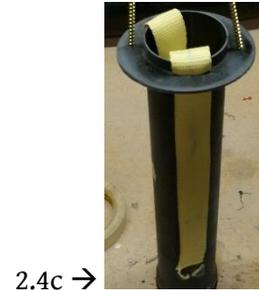
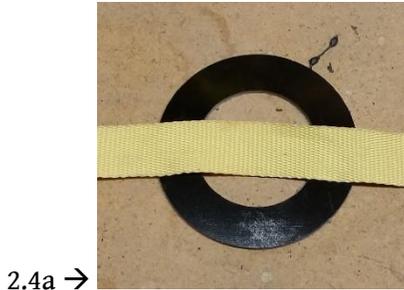
#### **2.4: Notch top Centering Ring (CR)**

The Top Centering Ring will seat over the harness, so you'll need to file notches so that the Kevlar strap can fit under the CR and onto the motor mount tube. You can do the notches 180° apart, but be careful to avoid interfering with fins later. You can also file notches 120° apart, leaving more room for fins.

2.4a) Lay the Kevlar strap over the CR and mark where you need to file

2.4b) File notches just big enough for the Kevlar.

2.4c) Then, test fit the CR on the tube with the Kevlar to be sure the notch is big enough (cord should be able to move, but not loose).

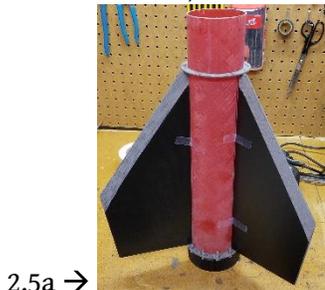


#### **2.5: Attach Top CR**

With the Y-Harness looped through the Top CR, slide the Top CR into place.

2.5a) Tape the fins in place using scotch tape to make sure the top CR is right where it needs to be.

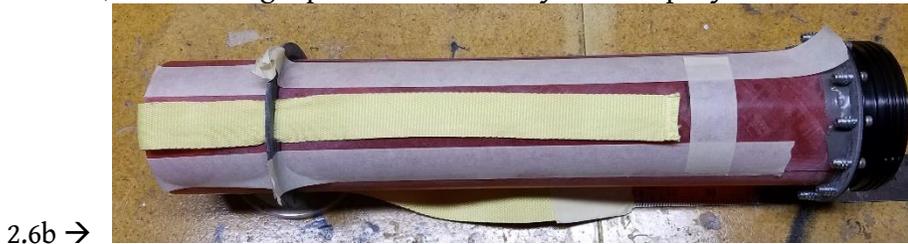
2.5b) Then, tack the CR in place using a drop or two of medium CA. Make sure to not let the Y-harness get any CA on it. Then, remove the fins.



#### **2.6: Attach Y-Harness**

2.6a) Make sure that the knot at the top of the harness pulls evenly on both attachment points and reaches the top of the airframe so you have access to it later. Once the length is just right, tape the Kevlar strap in place using masking tape. You can do this on the top of the inside of the MMT to avoid any issues with the epoxy process in the next step.

2.6b) Use masking tape to set a boundary for the epoxy on the harness attachment point.



2.6c) Mix a batch of epoxy and lay some under the harness, making sure to cover the entire area.



2.6d) Then, press the Kevlar into the epoxy firmly.



2.6d →

2.6e) Put more epoxy over the top. The entire strap attached to the MMT should be encased in epoxy.



2.6e →

2.6f) After the epoxy sets up a little (and before it cures completely!), pull the tape off.



2.6f →

2.6g) Repeat steps 2.6a through 2.6f for the 2<sup>nd</sup> strap.

2.6h) Finally, tuck the harness inside the motor tube, set aside and let the epoxy cure.

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## **STEP 3: FINS**

### **3.1: Prep MMT for bonding**

3.1a) Even though you've previously sanded the MMT, now is a good time to sand a little more, right along your fin-lines. This ensures that the bonding surface for the fin is very ready

3.1b) Clean your sanded fin lines with acetone. This will remove any dust and oil that has built up in the previous steps



3.1b →

### **3.2: Insert MMT into BT**

3.2a) With the y-harness tucked into the MMT, slide the assembly into the aft-end of the rocket. Make sure to align the MMT so that no fins will be mounted on the y-harness.

3.2b) Align the MMT assembly such that neither the bolts nor the harness will interfere with the fins.



3.2b →

3.2c) Align the MMT assembly so that the centering rings are both just visible, allowing the fins to be inserted between them. Now might be a good time to test-fit fins in each of the slots to be sure that they all fit and adjust them, if necessary. If only one of the fins fits in each slot, you can label them.



3.2c →

### **3.3: Attach fins**

3.3a) There's more than one way to attach the fins; some people do one at a time, some people do all fins at the same time using a fin-alignment jig.

3.3b) First, mix a batch of epoxy (JB Weld pictured) then "butter" the root edge of a fin. You can smear a bit on the sides of the fin at the root edge. This will be helpful in sealing the fin slot for internal fillets.

3.3c) Next, slide the fin into the slot and press it down against the motor mount tube. Be sure it is completely in place against the motor tube. If you're doing one fin at a time, let this set until the epoxy is completely cured. Using a fin alignment jig while the epoxy sets is important; you want to be sure that each fin stays aligned precisely and doesn't slide around later when you're attaching other fins.



3.3b →



3.3c →

3.3d) If you're doing all three fins, place the fins then slide your jig into place. Be sure the jig doesn't get epoxied to the airframe by excess epoxy!

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## **STEP 4: INJECTED INTERNAL FILLETS**

Injecting Internal fillets is a great way to get epoxy to fill the gap between the MMT and the BT along the fin root. It does require that you use an epoxy thin enough (West Systems) to inject through a standard 10mL syringe. These syringes can usually be purchased at your local pharmacy, or, if you're lucky and ask for a couple from the pharmacist, they'll probably be willing to give you several. Before injecting, it's a good idea to make sure your injection holes are clear of fibers that may snag the epoxy mixture as you're injecting. *TIP: Injected epoxy will flow around the MMT and out the bottom, so before you begin injecting one set, tape off the other injection holes to prevent epoxy from getting everywhere...*



Tape off the other holes:

#### **4.1: Mix Epoxy**

4.1a) In a mixing cup, mix an appropriate amount of epoxy (for West, 1 pump yields about 20mL total mixture). Mix it well before adding the chopped carbon fiber.

4.1b) Pulverize a small amount of carbon fiber in your hand. The little lumps of carbon fiber will break apart into tiny fibers that work better to strengthen the epoxy and flow better when injected.

4.1c) Add a small amount (a little less than a dime-sized portion per West pump) of chopped carbon fiber to the epoxy mixture



4.1a →



4.1b →



4.1c →

#### **4.2: Inject epoxy mixture**

4.2a) Once the epoxy mixture is ready, pour it into the syringe.



4.2a →

4.2b) Slowly and gently inject the epoxy/carbon mixture into the fillet hole. Going too fast here can create a backslash and it can get all over the MMT. You may have to inject a little, let it settle, inject a little more, etc. until you've injected fully. You can also alternate injection holes, just doing a little in each one, allowing the epoxy to settle out in between each.

4.2c) Don't worry if the injected epoxy comes out of the hole a little bit, you'll be doing external fillets over the top of the holes anyway.



4.2b →



4.2c →

#### **4.3: Settling and Cure**

4.3a) You may need to tilt the rocket back a forth a little to help the epoxy flow. You can hold the rocket up to the light to see where the epoxy is flowing. Once you're done injecting, set the rocket so that the fillets you just injected are level and allow them to cure.



4.3a →

4.3b) Once this set of injected fillets is cured, pull the tape off the other holes. If epoxy has filled them in, you can cut that out using a razor blade or (CAREFULLY) re-drill the holes.

#### **4.4: Rotate and repeat**

## **STEP 5: EXTERNAL FILLETS**

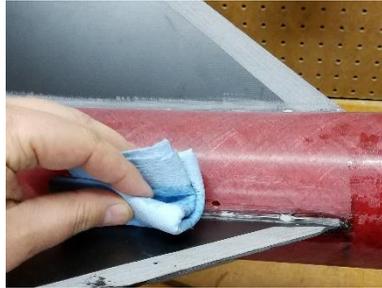
### **5.1: Prepare Fillet area**

5.1a) First, sand the area to be bonded using 60 or 80 grit sandpaper. This is easily done by bending a piece of sandpaper (not folding), holding it in the corner and scuffing back and forth.

5.1b) Clean off all the dust and oils using acetone or other cleaner.

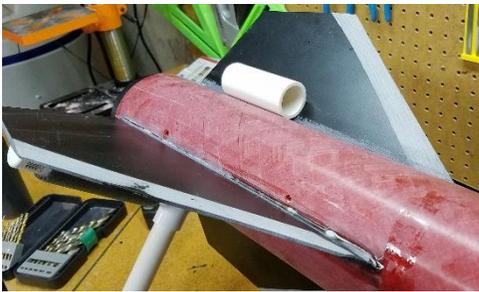


5.1a →



5.1b →

5.1c) Tape off the area of the fillet. You can mark the lines of the fillet by rubbing the fillet tool (Pictured is a small chunk of 1" PVC) along the airframe. If you color it heavily with a marker beforehand, it should leave enough of a line to see where the fillet will be.



5.1c →



### **5.2: Make the Fillet**

5.2a) Mix a large enough batch of epoxy and pour it into the fillet area. Better to have a little too much than not enough. When shaping the fillet, excess epoxy will be pulled off. While settling, be sure to keep the rocket level.

5.2b) Depending on the type of epoxy you use, you'll want to let it set up a bit (30 to 45 minutes) before you shape the fillet. To shape the fillet, use a rounded tool (1" PVC pictured) and start from one end of the fin, pull straight along the fillet without stopping, allowing the excess epoxy to flow out onto the tape.



5.2a →



5.2b →

5.2c) As soon as you've shaped the fillet, pull off the tape right away. Be sure to pull the tape at a sharp angle so as not to leave drips.

5.2d) Set aside until the epoxy fillet cures completely. Be sure that the rocket is level while the epoxy cures. Then rotate and repeat for each set of fins.



5.2c →



5.2d →

## STEP 6: AIRFRAME FINISHES

### 6.1: Rail Buttons

6.1a) Measure the location for the rail buttons. You can use masking tape to cover your marks since permanent marker will show through several layers of paint. The aft rail button can be located just above the aft Centering Ring. The forward rail button placement should be located several inches forward of the aft rail button, but it depends on the size of your rocket.



6.1a →

6.1b) Drill holes using a 1/8" bit for standard 1010 rail buttons (which use 8-32 screws).

6.1c) Screw the buttons into the holes, allow them to self-tap the holes. You'll be removing the buttons for paint, so do not epoxy or glue them in. Even after paint, epoxy or glue on the buttons is not necessary for rail buttons.



6.1b →



6.1c →

### 6.2: Vent Hole

6.2a) Find the distance between the top centering ring and the bottom of the av-bay bulkhead.

6.2b) Mark a spot for a vent hole in the middle of this distance

6.2c) Drill a 1/8" vent hole in the airframe. Placing tape on the inside of the airframe will help prevent the fiberglass from separating. If you do have some fiberglass separation, just sand it off using rough sandpaper.



6.2a →

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## **STEP 7: PAINT**

### **7.1: Remove Rail Buttons**

Since you've simply threaded the rail buttons directly into the airframe, they should be easy to remove. While you're painting, some paint will get into those holes, and that's fine. After painting, simply screw the buttons back into the holes, and let them self-thread the painted holes. You'll find that the painted hole will "grab" the screw quite tightly.

### **7.2: Mark CP location**

Find the Center of Pressure on your rocket using simulator software or the appropriate formulas. In your paint scheme, you'll want to include something that clearly marks the CP or the minimum CG location. That way, no matter what motor you use or what other gadgets you end up adding, you'll always know, on-site, whether your rocket will be stable.

### **7.3: Paint**

Painting fiberglass is really simple. Before you start painting, a light sanding will help the primer and/or paint adhere better. Use 400 grit or higher sandpaper, and lightly sand the entire surface to be painted. Then, before painting, be sure to clean off all the dust using a slightly damp rag or paper towel. Using acetone for this ensures that any residue or oils will also be removed for the best possible finish.

Another option is to just use Enamel Gloss Clear Coat paint on the bare fiberglass tubes; it really brings out the shine/candy-apple color of the red tubing. If you want to even out the black for this option, you can just use some black primer before using clear coat over the whole thing. Just a basic enamel flat black primer, wait 30 minutes, then shoot the clear coat, and BAM, done.

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## **STEP 8: FINAL ASSEMBLY**

### **8.1: Harness attachment**

8.1a) Attach one end of the recovery harness to the loop you made in the y-harness. This can be done using a quicklink, or it can be knotted directly to the y-harness.

8.1b) Attach the other end of the recovery harness to the bottom av-bay eyebolt. This can be done using a quicklink, or it can be knotted directly to the eyebolt.

### **8.2: Drogue chute attachment**

8.2a) The appropriately sized drogue parachute can be attached directly to the av-bay eyebolt. If you've got a 3-loop harness, your drogue should be attached to the 3<sup>rd</sup> loop.

8.2b) The Nomex chute protector can be attached directly to the av-bay eyebolt as well, or attached to the same 3<sup>rd</sup> loop as your drogue parachute.

### **8.3: Payload or HED**

8.3a) The Payload Tube or HED assembly can now be friction fit into the booster. Masking tape should be used to get a fit tight enough that when the rocket is picked up by the Payload/Nosecone that the booster does not slide out, even with shaking. It should NOT be so tight that the booster is not easily separated. If masking tape is too thick to achieve the proper fit, scotch tape will suffice. Tape should be placed as equally-spaced strips vertically on the bottom of the av-bay until the proper fit is achieved.

# SEMPER FLY

## THE WILDMAN OATH

UPON COMPLETION OF THIS ROCKET, AT THE FIRST FULL MOON, YOU MUST PLACE YOUR WILDMAN OUTSIDE IN THE MOON LIGHT AND CHRISTEN IT WITH A BEER OR A SHOT (OR SODA POP, IF YOU'RE UNDER AGE OR SOBER). THEN REPEAT THE FOLLOWING WORDS ALOUD WITH PRIDE AND DIGNITY WHILE WATCHING THE MOONBEAMS DANCE ON YOUR FINS:

1. THIS IS MY WILDMAN ROCKET, THERE IS NO OTHER LIKE IT, FOR I HAVE BUILT THIS ROCKET AND PART OF ME LEAVES THE EARTH EVERY TIME IT FLIES.
2. OTHERS MAY POSSESS ONE, BUT NONE ARE LIKE THIS ONE; IT WILL FLY HIGHER AND FASTER THAN ANY OTHER.
3. I HAVE MET THIS CHALLENGE, BUILT THIS ROCKET; I AM NOW ONE OF THE ELITE FEW. I WILL WALK TO THE PADS WITH MY HEAD HELD HIGH, A NEW SPIRIT IN MY STEP, AND CONVICTION IN MY HEART.
4. I WILL ALWAYS STRIVE TO STUFF IN THE PIPE THE LARGEST MOTOR THAT I CAN.
5. I WILL FLY WITH OUT FEAR AND NEVER REFUSE THE CHALLENGE
6. I WILL DANCE WITH DELIGHT AT THE OPPORTUNITY TO DRAG RACE MULTIPLE WILDMAN BROTHERS & SISTERS AT ANY AND ALL EVENTS.
7. I AM FREE FROM THE FEARS OF SCRATCHED PAINT, DIRTY FINS, ROAD RASH ON AIRFRAMES, CATCHY PHRASES, AND FUNNY NAMED ROCKETS.
8. I SHALL NOT FRET OVER WHAT OTHERS MAY THINK FOR NOW I AM A WILDMAN/WILDWOMAN.
9. I HAVE MY WILDMAN ROCKET AND I WILL ... "JUST FLY IT." ALTIMETER OR CAVEMAN STYLE, IT MATTERS NOT. I WILL ... "JUST FLY IT." NAKED OR PAINTED, I WILL ... "JUST FLY IT."
10. IF I SEE ANOTHER WILDMAN BROTHER OR SISTER, I WILL TREAT THEM WITH RESPECT BUT WILL BE COMPELLED TO THEM WITH THOSE HOLY WORDS PASSED DOWN THROUGH TIME, TEMPERED FROM THE SPARKS AND FIRE OF COUNTLESS SKIDMARK MOTORS, UTTERED AT THE HOLIEST OF EVENTS BY OUR FEARLESS LEADER... THE WILDMAN HIMSELF:

"WANNA DRAG RACE IT?"

YOUR FLYING SPIRIT HAS NOW BEEN FREED.

..... WARNING DISCLAIMER .....

FAILURE TO COMPLY WITH THE ABOVE AFTER TAKING SAID OATH SHALL RESULT IN IMMEDIATE  
REMOVAL OF WILDMAN STATUS AND RETURN TO MILDMAN STATUS.