

3000 CPR EQUIPMENT HIGH POWER ROCKET KIT

Parts list:

- Pre-slotted airframe
- Pre-slotted Fore Recovery airframe 21-1/2" long
- Aft Recovery Airframe 18" long
- Nose cone
- (4) Main fins
- (4) Upper fins
- Tailcone
- Motor mount tube
- Notched centering ring
- CPR-3000 system:
- Aluminum Threaded Airframe Coupler
- Aluminum Threaded Sleeve
- Fore Altimeter Mount
- Aft Altimeter Mount
- (2) Charge Cylinder Holders
- (2) Charge Cylinder Canisters
- (4) Vinyl Charge Canister Caps
- Slotted Altimeter Mounting Tube 1.5" x 7"
- Mounting Tube 1.5" x 4" long
- Coupler Tube 1.5" x 2" long
- Airframe Coupler 1-7/8" long
- Airframe Coupler Tube
- O-ring for Airframe Coupler
- Small O-ring 1-1/2" dia.
- Small O-ring 1-3/8" dia.
- (2) Standard Centering Rings
- (2) Notched Centering Rings
- (2) Piston Systems including:
Piston Body (tube)
Piston Plate
- D-ring
- Piston Strap (red or black)
- Strap for fin unit (16" long)
- D-ring (for strap above)
- Slotted Bulk Plate (for airframe coupler)
- (4) Small Socket Head Screws
- Allen Wrench
- Safety Switch
- Safety Switch Wire
- Safety Switch Stand-off
- (2) Safety Switch Mounting Screws
- Drogue Parachute
- Main Parachute
- (2) Launch lugs
- (2) Shock Cord (Tubular Nylon)
- (2) Kwik-Links
- Instruction manual (this one)
- CPR-3000 Logo Decal
- Red Vinyl decal

Please read and understand all instructions before building!

The center of pressure (CP) of this rocket is 48 inches from nose tip. After finishing your rocket, permanently mark the center of gravity on the airframe. After loading the rocket with a motor, make sure that the center of gravity (balancing point) is at least one body diameter forward of the center of pressure mark. The center of gravity can be moved forward by adding weight to the nose cone.



Basic Construction FAQ

The major parts involved in each step are shown shaded at the beginning of that step. Areas where epoxy should be applied are shown as well.

PREP & ASSEMBLY

- ⊗ Read and understand the instruction steps fully before you begin the step.
- ⊗ ALWAYS sand the parts to be bonded with 100-120 grit sandpaper.
- ⊗ We strongly recommend you dry-fit (assemble without gluing) all parts in each step BEFORE epoxying them together. Sand or adjust fit as needed before gluing.
- ⊗ Most epoxies work fine. Use 5 or 15 minute depending on how quickly you feel you can complete the step. Use longer set-time epoxy if you're unsure.
- ⊗ To make internal fillets to the fins deep up into the airframe, "load up" the end of a dowel with a blob of epoxy, then stick the dowel into the airframe and onto the fin joint you're working on. After depositing enough epoxy in this fashion, you can pull the dowel toward you, making a fillet with the rounded edge of the dowel.
- ⊗ Fins do not need to be "shaped". Lightly sand the edges to remove any manufacturing burrs.

PAINTING/FINISHING

- ⊗ Before you paint the fins, scuff the entire surface with 220 grit sandpaper. This is easiest to do before mounting the fins.
- ⊗ Plastic nosecone imperfections can be filled with plastic model kit putty.
- ⊗ Stay with the same brand of paint throughout the process; primer, base color, accent colors, and clear coat. DO NOT skimp on the "shake the can for at least two minutes after the ball rattles" step! For the best finish, let each coat dry overnight and sand lightly with 320 or 400 grit sandpaper.
- ⊗ Apply the last color coat as heavy as possible without running or sagging. Let the paint cure for at least 48 hours before handling!
- ⊗ We recommend a clear coat of some sort to help protect the decals as well as "seal" their edges to help prevent them peeling off. When using any clear coat, put on only VERY thin, light coats, and wait at least 5 minutes between coats. The clear coat can damage your decals or paint if you put it on too heavily or don't wait long enough between coats!

FINAL FITTING/PREPAREATIONS FOR FLIGHT

- ⊗ The piston should be a smooth slip-fit in the airframe; this is critical. Sand the piston as needed so it can be easily inserted, and pulled out with just a gentle tug on the shock cord. Keep sandpaper in your range box in case you need to adjust the fit the first few times at the field to deal with differing temperature and humidity.
- ⊗ Couplers should also be sanded to allow easy separation of the rocket.
- ⊗ If the coupler or nosecone is too loose, use masking tape to build it up to a good fit. If the nosecone is too tight, sand the ribs on the shoulder until it fits well. The parts fit properly if the rocket can be held upside down and gently shaken with nothing moving or coming apart.
- ⊗ Ejections will leave a black, gritty residue inside the airframe. Occasionally wipe the tube interior with a damp cloth wrapped around a dowel or broomstick; allow to dry.
- ⊗ See our website FAQ for information about thrust rings and motor retention. Motor recommendation information is available on our website on the Specs Page.

For our complete FAQ, see the FAQ Page on our website at www.publicmissiles.com.

Other items you will need:

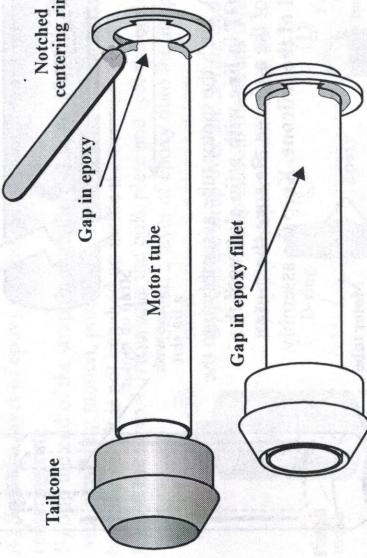
- Masking tape
- Cellophane tape
- One set of epoxy
- One sheet each 120 and 220 sandpaper
- Ruler and pencil

**Please read and understand all instructions before continuing!
All surfaces to be bonded must be scuffed with 120 grit sandpaper.**

Step 1

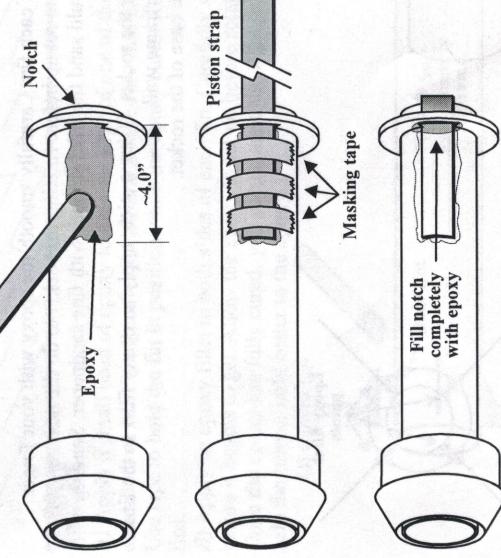
Dry fit the notched centering ring into the airframe and over the motor mount tube. The notched ring can be a little snug in the airframe and on the motor tube. If it is tight, sand the ID and/or OD for a better fit. Dry fit the tailcone. It should be a little looser in the airframe and snug, but not tight over, the motor mount tube to aid in later removal. Sand the ID and/or OD (of the shoulder area) for a looser fit if necessary.

Spread a bead of epoxy around the circumference of one end of the notched centering ring leaving a 1" gap in the bead for the notch in the centering ring. Slip the notched centering ring over the motor tube with the notch aligned with the gap in the epoxy bead. Be sure the notch in the ring remains clear of epoxy. Locate the ring 1/2" from the end of the motor tube and allow the epoxy to set. Apply an epoxy fillet to each side of the ring still keeping the notch clear.



Slide the tailcone over the motor tube until it is flush the motor tube. Do not use any glue at this time, this tailcone will be removed in a subsequent step.

Step 2



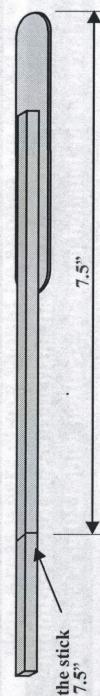
Spread a layer of epoxy about 1" wide and 4" long on the motor tube just below the notch in the upper centering ring. Slip one end of the piston strap (the widest strap in the kit) through the notch in the centering ring. Pull through about 4" of this strap through the notch and press it firmly into the epoxy on the side of the motor tube. Hold the strap in place against the tube with masking tape until the epoxy cures. Remove the masking tape. **Fill the entire centering ring notch with epoxy.** Stuff the free end of the strap into the motor tube to keep it out of the way for the next step.

www.publicmissiles.com

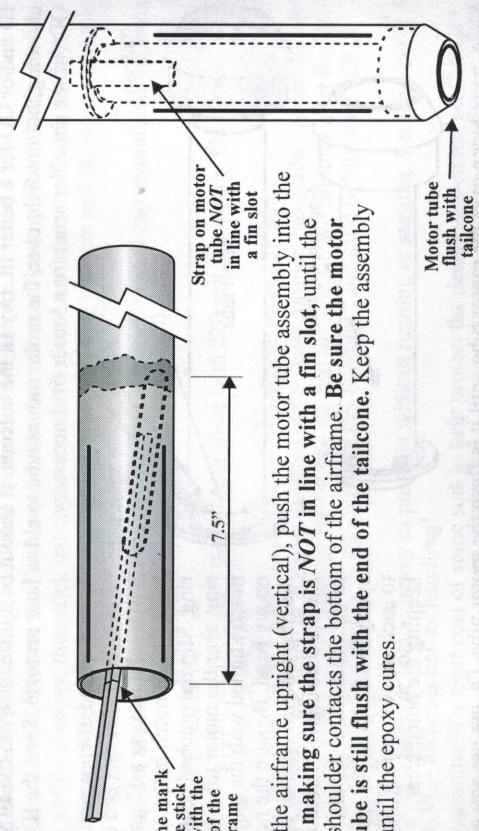
The PML Web Store and Knowledge Base

Step 3

You will need a long stick or dowel for applying epoxy in this step. Just below is a drawing of one good method for creating an extended epoxy applicator. Simply epoxy a dowel or stick to a tongue depressor or popsicle stick.



Make a mark on the stick at 7.5" so you can tell how deep the stick is in the airframe when spreading the epoxy. Using your extended epoxy applicator, spread a bead of epoxy around the inside circumference of the airframe 7.5" from the bottom of the airframe.



Holding the airframe upright (vertical), push the motor tube assembly into the airframe, **making sure the strap is NOT in line with a fin slot**, until the tailcone shoulder contacts the bottom of the airframe. Be sure the motor mount tube is still **flush with the end of the tailcone**. Keep the assembly vertical until the epoxy cures.

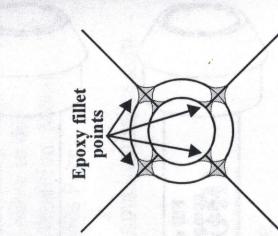
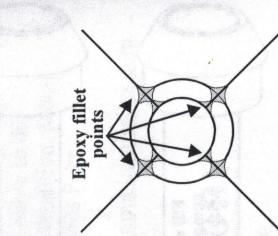
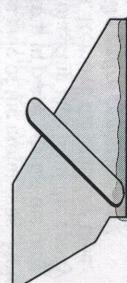
Step 4

A) Apply a bead of epoxy to the root edge of one of the lower fins. Push the fin through the slot in the airframe and against the motor mount tube. Make sure that the fin is perpendicular to the airframe. Use tape to hold the fin in position while the epoxy cures. Repeat this process for all three lower fins.

B) Apply an epoxy fillet to both sides of each fin. Carefully smooth the epoxy with your finger before it begins to gel. Allow the epoxy to set up before rotating the rocket to do the next set of fins. Once the epoxy has fully cured, you should sand the fillet smooth with fine sandpaper. Sanding will help the primer hold better to the epoxy.

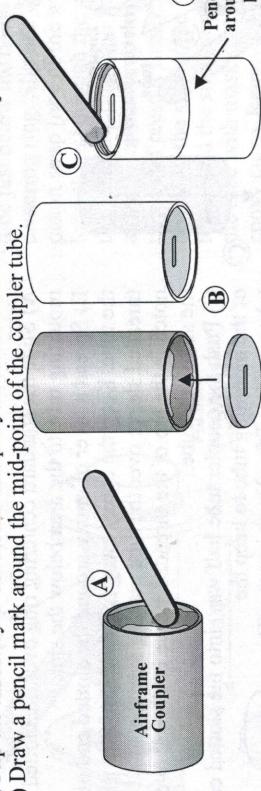
C) Gently pull the tailcone off of the end of the rocket. Using a stick, apply an epoxy fillet to the fins at the motor mount tube and the inner airframe wall.

D) Permanently epoxy the tailcone in the base of the rocket.



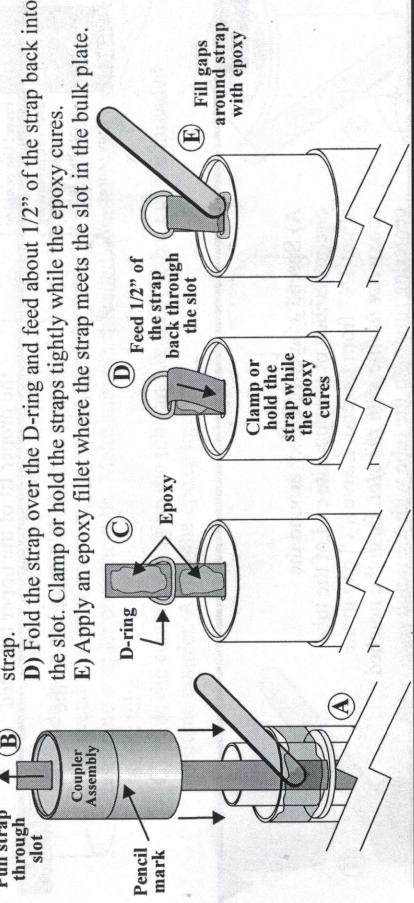
Step 5

- Spread a bead of epoxy around the inside circumference of one end of the coupler tube.
- Press the slotted bulk plate into the coupler about 1/4" past the end. Allow the epoxy to cure.
- Flip the assembly over and add an epoxy fillet to the other side of the bulk plate.
- Draw a pencil mark around the mid-point of the coupler tube.



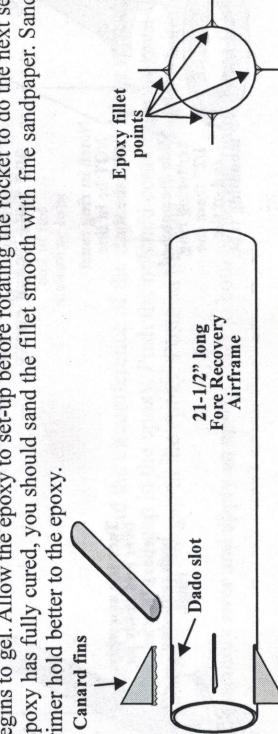
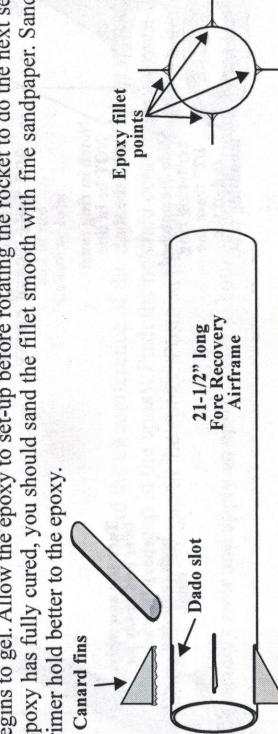
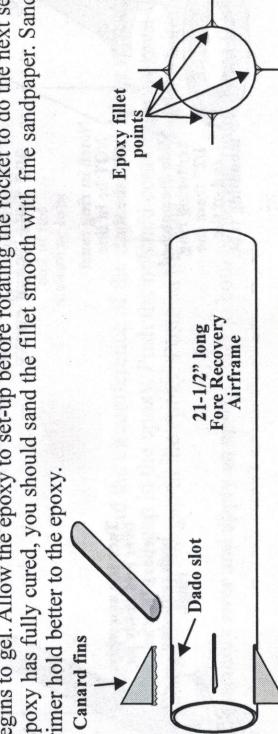
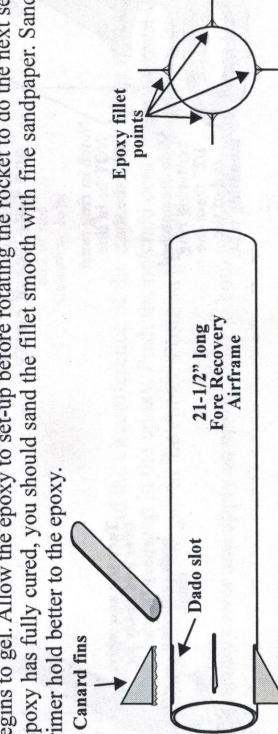
Step 6

- Spread a layer of epoxy around the inside circumference of the airframe above the uppermost centering ring.
- Slip the end of the strap in the bulk plate of the coupler assembly. Slowly and with a twisting motion, push the coupler into the airframe up to the pencil mark. Pull up on the strap to make sure it is not bunched up inside the coupler.
- Cut the strap 4-1/2" above the bulk plate and seal the end by heating it with a lighter or match. Spread a layer of epoxy onto the strap as shown. Place the D-ring over the strap.



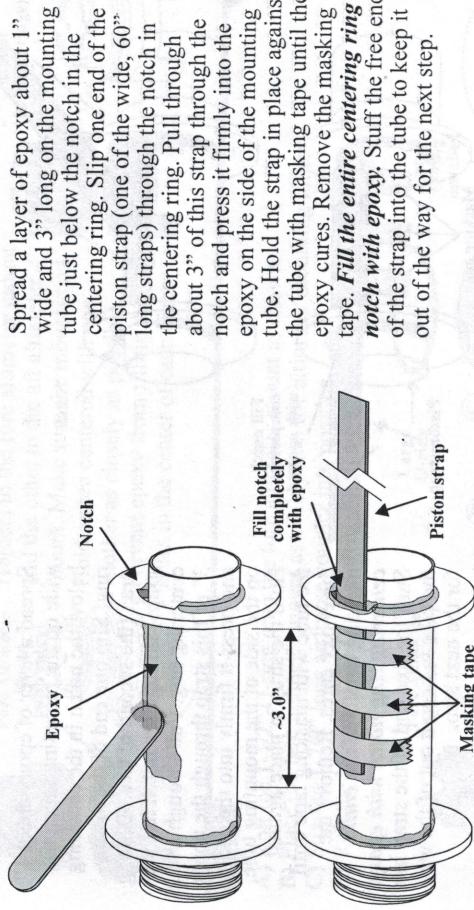
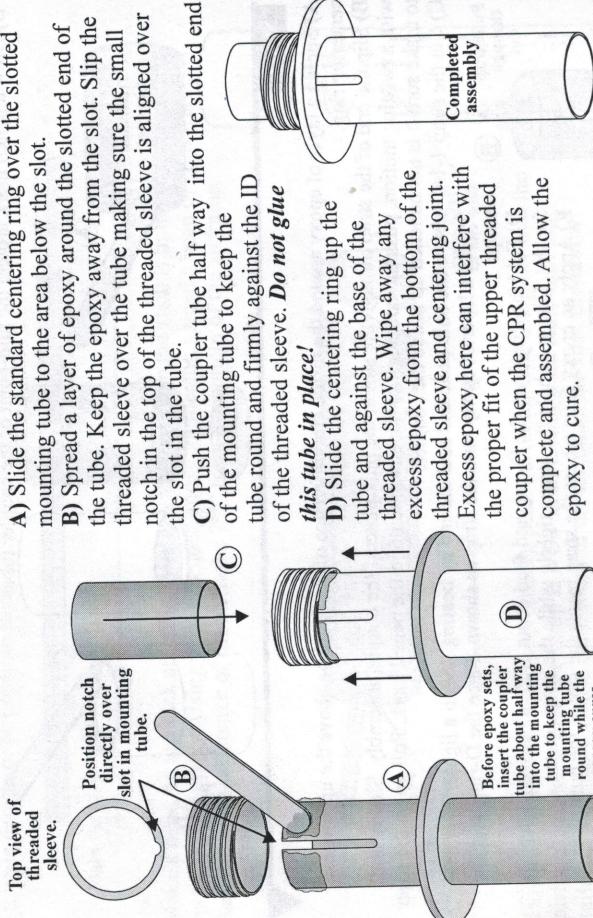
Step 7

- Feed 1/2" of the strap back through the slot.
 - Fold the strap over the D-ring and feed about 1/2" of the strap back into the slot. Clamp or hold the straps tightly while the epoxy cures.
 - Apply an epoxy fillet where the strap meets the slot in the bulk plate.
- A) Apply a small bead of epoxy to the root edge of one of the canard fins. Set the fin into the dado slots on the Fore Recovery Airframe. Make sure that the fin is perpendicular to the airframe. Use tape to hold the fin in position while the epoxy cures. Repeat this process for all four canard fins.
- B) Apply an epoxy fillet to both sides of each fin. Carefully smooth the epoxy with your finger before it begins to gel. Allow the epoxy to set up before rotating the rocket to do the next set of fins. Once the epoxy has fully cured, you should sand the fillet smooth with fine sandpaper. Sanding will help the primer hold better to the epoxy.
- C) Gently pull the tailcone off of the end of the rocket. Using a stick, apply an epoxy fillet to the fins at the motor mount tube and the inner airframe wall.
- D) Permanently epoxy the tailcone in the base of the rocket.



Step 10

Important note: This step must be completed without interruption before the epoxy sets.



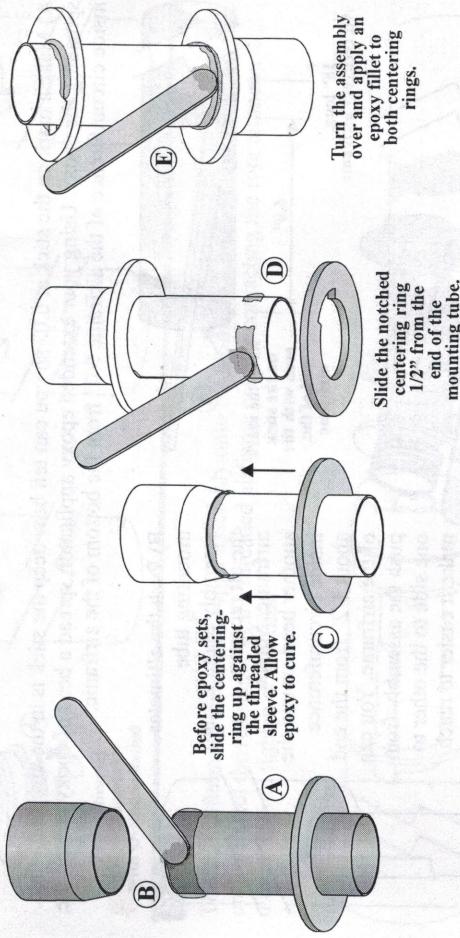
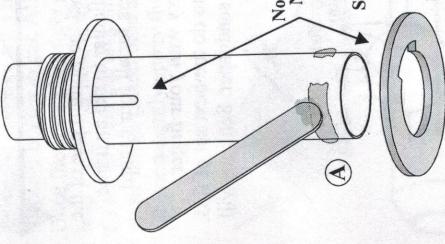
Spread a layer of epoxy about 1" wide and 3" long on the mounting tube just below the notch in the centering ring. Slip one end of the piston strap (one of the wide, 60"-long straps) through the notch in the centering ring. Pull through about 3" of this strap through the notch and press it firmly into the epoxy on the side of the mounting tube. Hold the strap in place against the tube with masking tape until the epoxy cures. Remove the masking tape. **Fill the entire centering ring notch with epoxy.** Stuff the free end of the strap into the tube to keep it out of the way for the next step.

Step 11

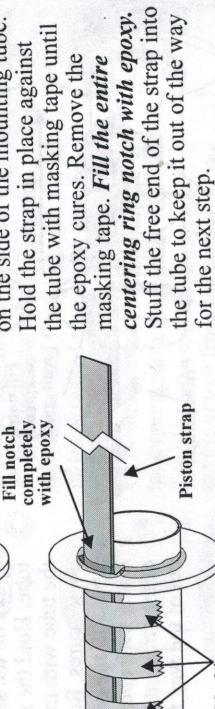
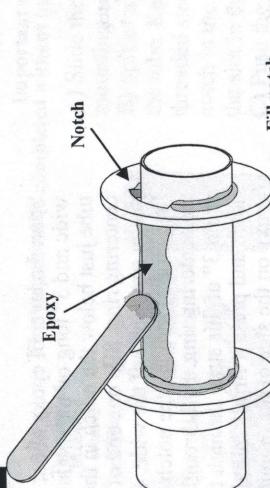
- Slide the standard centering ring over the 4" long mounting tube.
- Spread a layer of epoxy around one end of the tube. Slip the threaded airframe coupler over the tube. Make sure the threaded coupler is fully seated on the tube.
- Slide the centering ring up the tube and against the base of the threaded airframe coupler. Allow the epoxy to cure.

Step 9

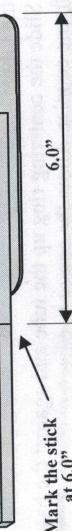
- Spread a layer of epoxy around the circumference of the opposite end of the tube about 1/4" from the end. Leave a 1" gap in the epoxy **not in line with the slot**. Push the notched centering ring onto the tube with the notch aligned with the gap in the epoxy. Position the ring 1/2" from the bottom. Allow the epoxy to cure.
- Remove the coupler tube from the mounting tube and discard it.
- Turn the assembly over and apply an epoxy fillet to both centering rings. Keep the notches and slots free of epoxy.



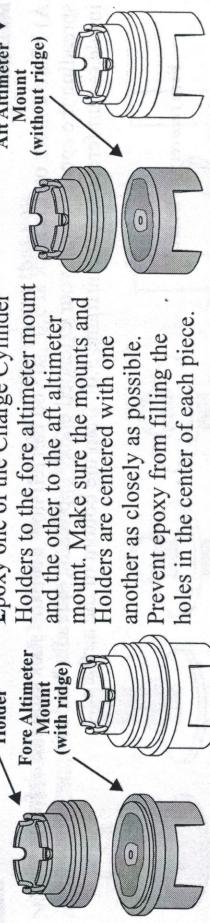
- Turn the assembly over and apply an epoxy fillet to both centering rings.
- Slide the notched centering ring 1/2" from the end of the mounting tube.
- Turn the assembly over and apply an epoxy fillet to both centering rings.
- Spread a layer of epoxy around the circumference of the opposite end of the tube about 1/4" from the end. Leave a 1" gap in the epoxy with the notch aligned with the gap in the epoxy. Position the ring 1/2" from the bottom. Allow the epoxy to cure.
- Turn the assembly over and apply an epoxy free of epoxy.

Step 12

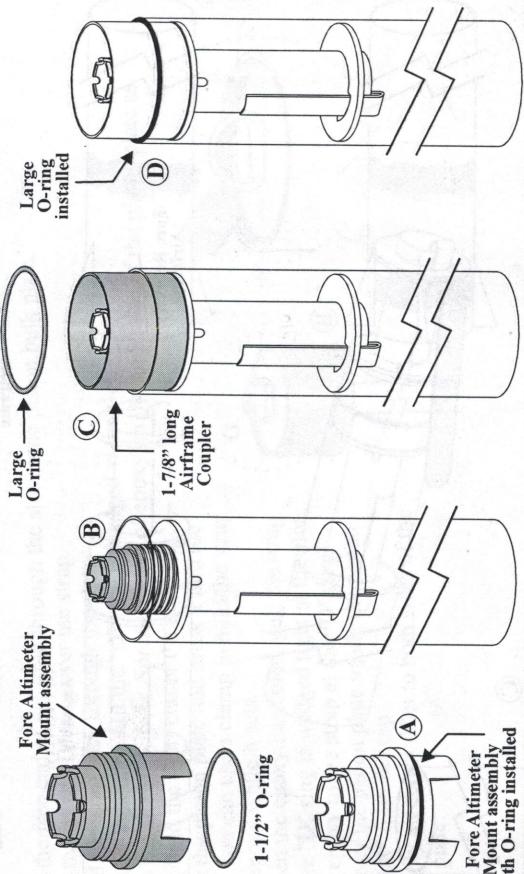
- Step 13**
- A) Make a mark on the stick at 6.0" so you can tell how deep the stick is in the airframe when spreading the epoxy. Using your extended epoxy applicator, spread a bead of epoxy around the one good method for creating an extended epoxy applicator. Simply epoxy a dowel or stick to a tongue depressor or popsicle stick.



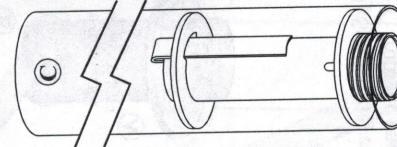
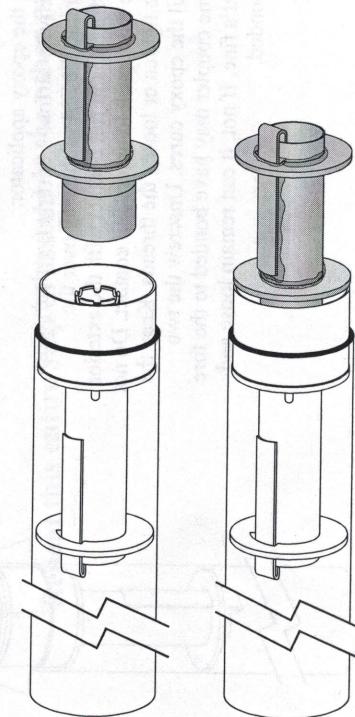
- Step 14**
- Epoxy one of the Charge Cylinder Holders to the fore altimeter mount (without ridge) and the other to the aft altimeter mount. Make sure the mounts and Holders are centered with one another as closely as possible. Prevent epoxy from filling the holes in the center of each piece.

Step 15

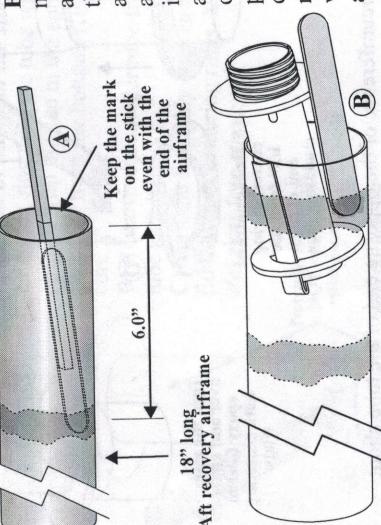
- A) Roll the 1-1/2" O-ring onto the fore altimeter mount as shown.
B) Place the fore altimeter mount assembly into the altimeter mounting tube.
C) Slip the 1-7/8" long airframe coupler into position.
D) Roll the largest of the O-rings over the coupler down to the airframe.

**Step 16**

- Thread the threaded airframe coupler assembly onto the altimeter mounting tube assembly just until you feel the resistance of the threaded airframe coupler contacting the fore altimeter mount. Do not tighten at this time.



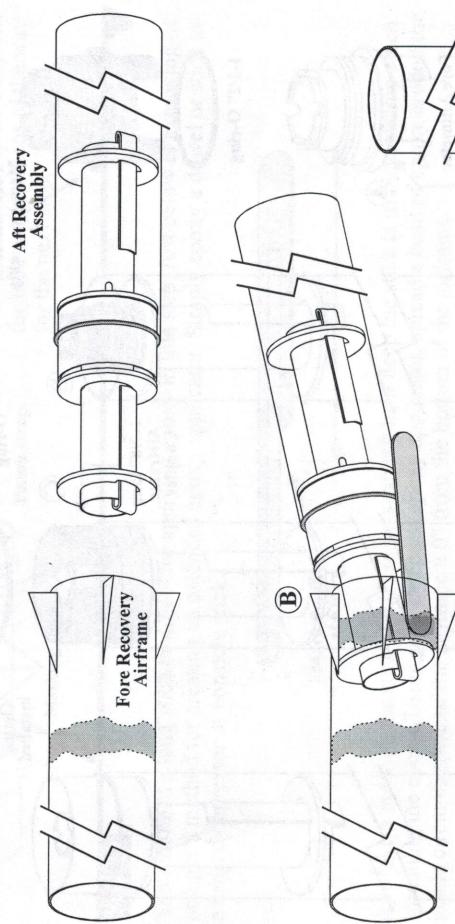
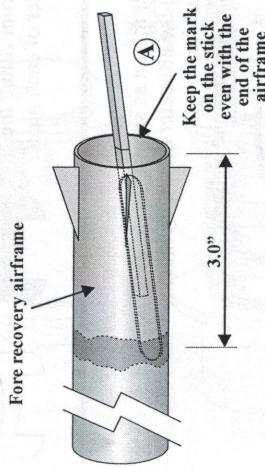
- B)** Push the altimeter mounting tube assembly about 2" into the aft recovery airframe. Spread another bead around the inside circumference about 1/2" from the end of the airframe. You can push the assembly from one side to the other to make it easier to reach with the epoxy applicator.



- C)** Holding the aft recovery airframe upright (vertical), push the altimeter tube assembly the rest of the way into the airframe until the bottom of the threaded sleeve is flush with the bottom of the airframe. Keep the assembly vertical until the epoxy cures.

Step 17

A) Make a mark on the stick at 3.0" so you can tell how deep the stick is in the airframe when spreading the epoxy. Using your extended epoxy applicator, spread a bead of epoxy around the inside circumference of the airframe 3.0" from the bottom of the airframe.

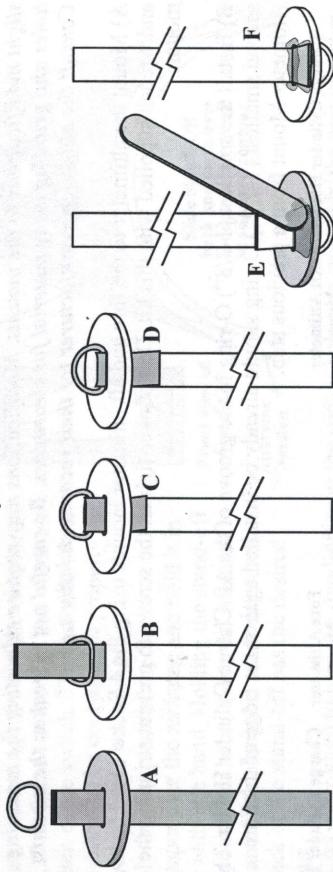


B) Push the altimeter mounting tube assembly about 2" into the aft recovery airframe. Spread another bead around the inside circumference about 1" from the end of the airframe. You can push the assembly from one side to the other to make it easier to reach with the epoxy applicator.

C) Holding the aft recovery airframe upright (vertical), push the fore recovery airframe the rest of the way over the assembly until the airframe is in full contact with the exterior O-ring. Give it a little extra push to assure full contact. Do not turn either airframe to tighten or loosen the threads. Keep the assembly vertical until the epoxy cures. Unscrew the two airframes. The airframe coupler may have bonded to the fore airframe. If it has, that's fine. If not, it can remain loose and does not need to be bonded.

Step 18

NOTE: In this step you will be using the free end of the straps that you mounted to the fore and aft recovery assemblies.



A) Pull the free end of the strap through the slot in the piston bulk plate.

B) Slip the metal "D" ring over the strap.

C) Feed the strap back through the slot.

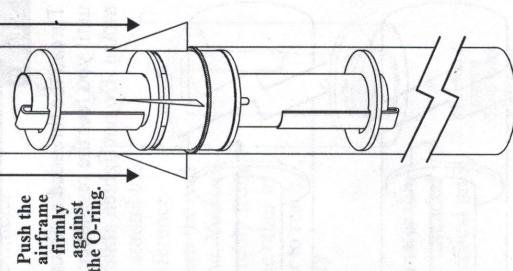
D) Pull on the strap until the "D" ring is wedged at the slot.

E) Flip the assembly over. Spread a layer of epoxy on the underside of the piston plate as shown. Fold the short end of the strap flat against the piston plate and press it into the epoxy. You can use a clamp to hold the strap in the epoxy while it sets.

F) When the epoxy has cured, pull the strap until the "D" ring is wedged tight at the slot. Apply epoxy to the strap at the "D" ring.

G) Epoxy the piston plate inside the piston body 1/8" from the top.

H) Apply an epoxy fillet to both sides of the piston plate.



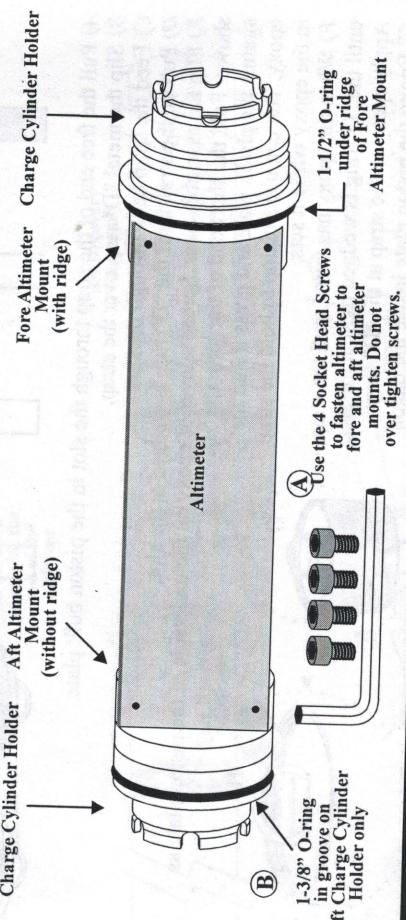
Repeat this entire step to assemble the other piston

Step 19

The Fore and Aft Altimeter Mounts used in the CPR-3000 system are designed around the PML Co-Pilot Altimeter and the Transolve P6 Altimeter. Mounts for the Transolve P5 and ALTS-25 are available as optional items through PML. Other units may work as well with slight modifications to the mounts. Modifications may require relocating the mounting holes and grinding away material for clearances. Be careful not to weaken the mounts. Consult the altimeter manufacturer for their recommendations.

A) Mount the altimeter to the fore and aft altimeter mounts using the 4 Socket Head Screws and wrench supplied with this kit. Do not over-tighten the screws to prevent stripping the mounts.

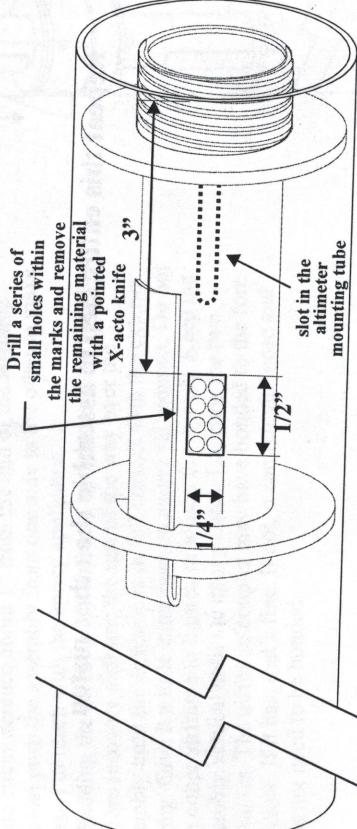
B) Install the smallest (1-3/8") O-ring in the groove of the Aft Charge Cylinder Holder. The second smallest (1-1/2") O-ring should already be installed against the ridge of the Fore Altimeter Mount from a previous step.



Step 20

In order to properly install the safety switch, you will need to cut a 1/2" x 1/4" opening into the airframe as indicated in the drawing below. This switch opening must be aligned with the slot in the internal Altimeter mounting tube. First mark out the perimeter of the opening on the airframe, then drill a series of small holes within the marks, starting near the corners, and removing the remaining material with a pointed X-Acto knife. Test fit the switch into the hole to assure a good fit.

Drill a 1/8" hole in the airframe opposite of the safety switch and 5" from the top of the airframe. This hole is for venting the altimeter to the atmosphere.



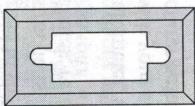
Step 21

The switch Stand-Off is necessary to create the clearance needed between the altimeter mounting tube and the exterior of the 2.1" airframe for the lugs and wires on the back of the switch. The backside of the stand-off must be contoured to properly fit the 2.1" airframe you are using. Simply drape a piece of medium sandpaper over the airframe and hold it in place with one hand. Holding the stand-off with your other hand, move the stand-off back and forth along the sandpaper until the back of the stand-off has the desired contour.

Slide Stand-Off back and forth over sandpaper to create the desired contour.

Front view of Stand-Off Airframe section

Medium sandpaper

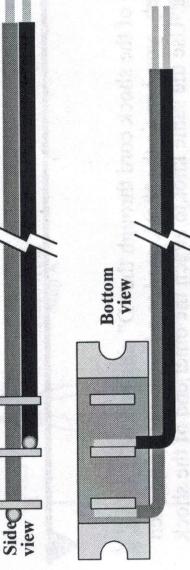


Step 22

Solder one safety switch wire to the center terminal of the switch and the other wire to one of the outside terminals of the switch. Since space between the altimeter tube and the airframe is limited, solder the wires to the terminals from the side as shown in the bottom view below. Polarity does not matter in this application. This switch has two positions; ON-ON, meaning the switch is able to make connections in both positions. Since you are using only two wires (center terminal and one end terminal), the switch position toward the unwired terminal is "off". Moving the switch toward the wired terminal is "on". Be sure to mount the switch into the rocket with the two wired terminals furthest away from the threaded sleeve end of the airframe. In this configuration, "down" will be "on" and "up" will be "off". Mark the airframe for the on-off positions.

Side view

Bottom view

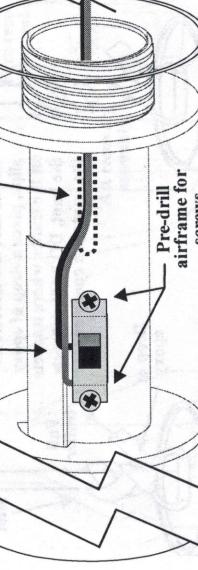


Strip about 1/4" of the insulation from the two wires and "tin" the exposed wires with a bit of solder to stiffen them. These wires will be attached to the power terminals of the altimeter.

Step 23

Feed wires through airframe opening

Then feed wires through slot in altimeter tube.



Drill a series of small holes within the marks and remove the remaining material with a pointed X-acto knife.

3"

1/4"

1/2"

slot in the altimeter mounting tube

Feed the wire ends into the airframe opening, then through the slot in the altimeter tube and finally out through the end of the altimeter tube. Set the switch into the airframe hole (or stand-off), pre-drill the airframe for the mounting screws, and install the screws. Mark the airframe near the switch for the on-off positions.

Flight Prep

Congratulations! You have completed the assembly process of the CPR-3000 based Mini-BBX rocket kit.

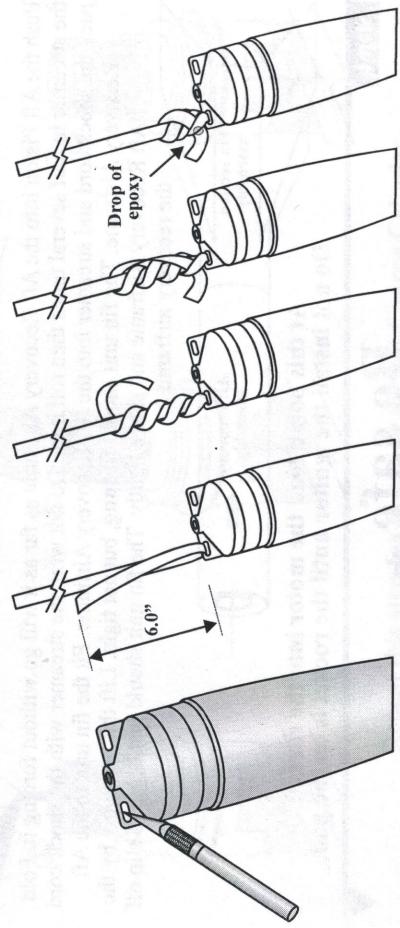
The remainder of this booklet is designed to show you how to prep your CPR-3000 based rocket for flight. Please follow the instructions in the order they are written.

When prepping and packing the parachutes, refer to the chute instructions that are packed with each chute.

Instructions for using your particular altimeter, as well as connecting charges and safety switches should have been included with your altimeter. If these instructions are missing or vague, consult your altimeter manufacturer before proceeding.

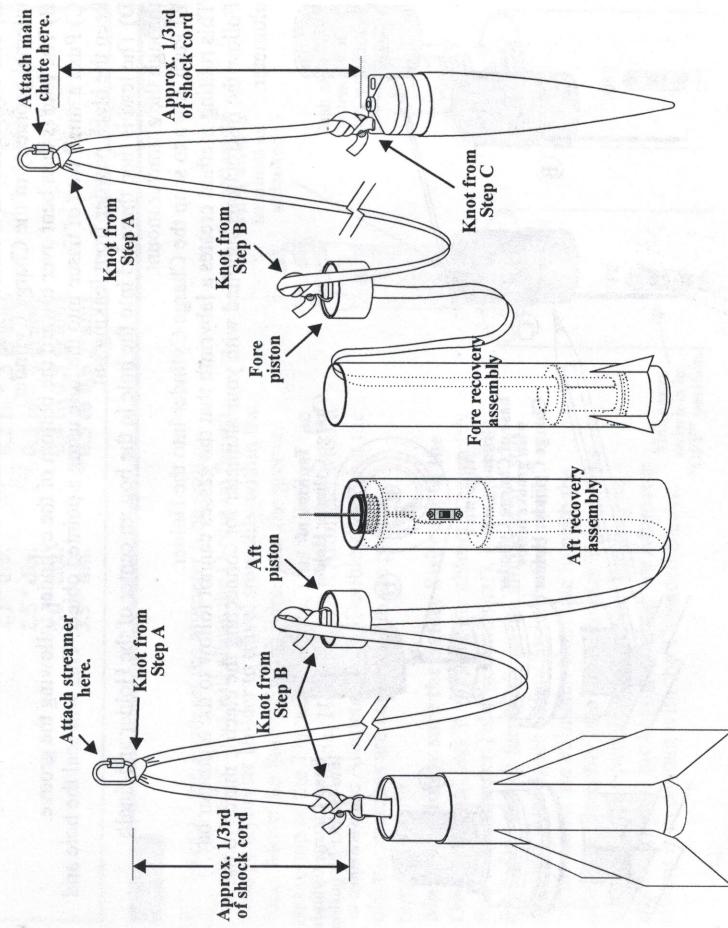
Step C

Using a sharp pointed knife, remove the flash from the eyelet at the base of the nosecone. If necessary, you can enlarge the eyelet by using the knife to extend the opening toward the nosecone body (not toward the edges as this will weaken the edges). Thread the shock cord through the eyelet and tie it to the nosecone using the knot illustrated below. Add a drop of epoxy to the trailer at the knot to make sure the knot never slips. DO NOT saturate the knot with epoxy or CA. Alternatively, you can tie the shock cord to a "kwik-link" and then attach the "kwik-link" to the nosecone eyelet.



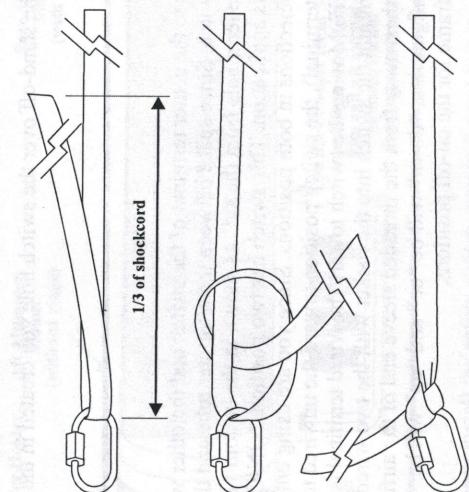
Step D

Below is a diagram illustrating the various shock cord and parachute attachment points.



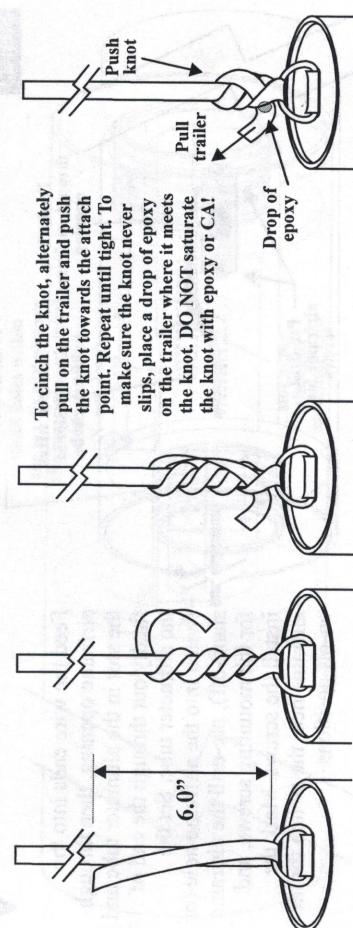
Step A

Thread the shock cord through the Kwik-Link and tie it using the knot illustrated on the left. Note that the Kwik-Link should be attached to the shock cord at about the 1/3 point of the shock cord.



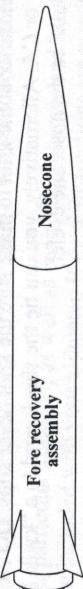
Step B

Thread the long end (the 2/3 section) of the shock cord through the "D" ring and tie it using the knot illustrated below. Alternatively, you can tie the shock cord to a "kwik-link" and then attach the "kwik-link" to the "D" ring. Use the same knot to attach the other end of the shock cord to the eye bolt on the payload section.

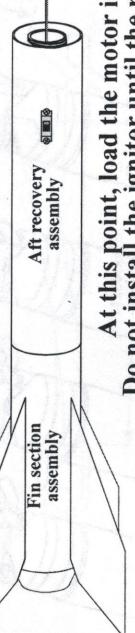


Step E

Push the Fore Piston into the Fore Recovery Airframe as far as it will go without forcing it. Pack the main chute as directed in the parachute packing instructions. Fit the nosecone to the Fore Recovery airframe. The nosecone should fit **tight** (you should be able to lift the entire assembled rocket by the nosecone without it slipping off). Apply masking tape to the nosecone shoulder to make the fit tighter if necessary. Double-check this fit once the rocket is fully assembled.



Push the Aft Piston into the Aft Recovery Airframe as far as it will go without forcing it. Fold the streamer in half several times then roll it up. Do not wrap the streamer with the shock cord. Pack the shock cord and streamer into the Aft Recovery Airframe. Fit the fin unit to the Aft Recovery Airframe. The fin unit should fit **snug**, but not tight. Lift this assembly by the Aft Recovery Airframe and shake lightly. The fin unit should just begin to slip off the recovery airframe.



**At this point, load the motor into the rocket.
Do not install the ignitor until the rocket is on the pad.**

Step F

Be Safe...

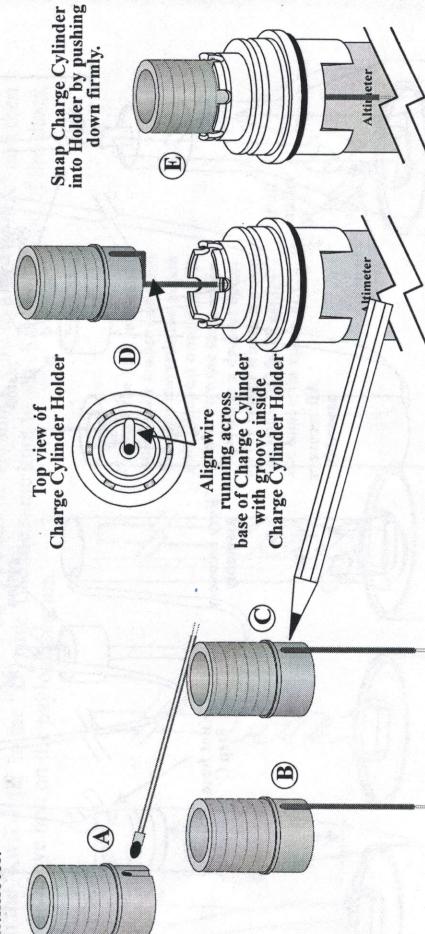
From this point on, wear safety glasses while prepping your altimeter for flight!

NOTE: Charge Cylinders for use with flash bulbs are available as an option through PML.

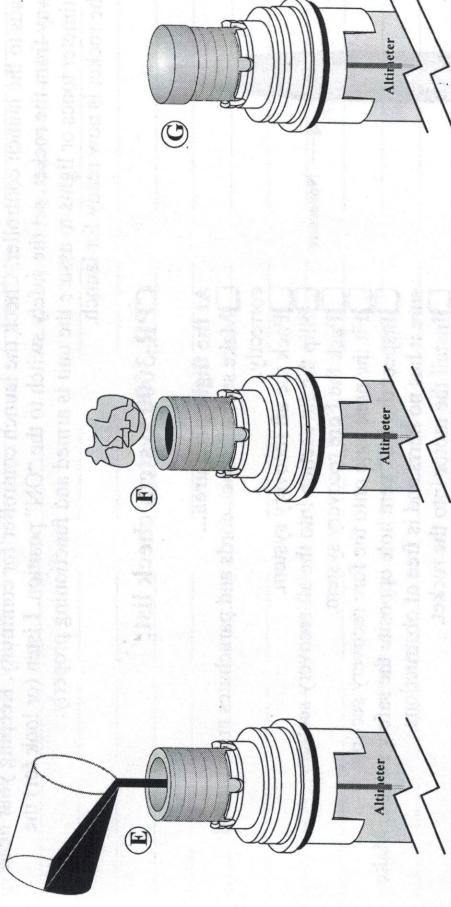
- A) The electric match is inserted into this hole and is held horizontal and centered by the internal geometry of the Charge Cylinder.
- B) The lead is then bent over toward the bottom of the cylinder following the groove.
- C) Push a small wad of tissue into the hole using a pointed object. This will seal the hole and keep the black powder from leaking out.
- D) The lead is then threaded into the hole in the bottom center of the Holder and finally through the altimeter mount.

- E) Push down to snap the Charge Cylinder into the Holder.

This routing method creates a labyrinth that the gasses cannot follow to the altimeter bay. Follow the instructions supplied with your altimeter for connecting the electric match to the altimeter.



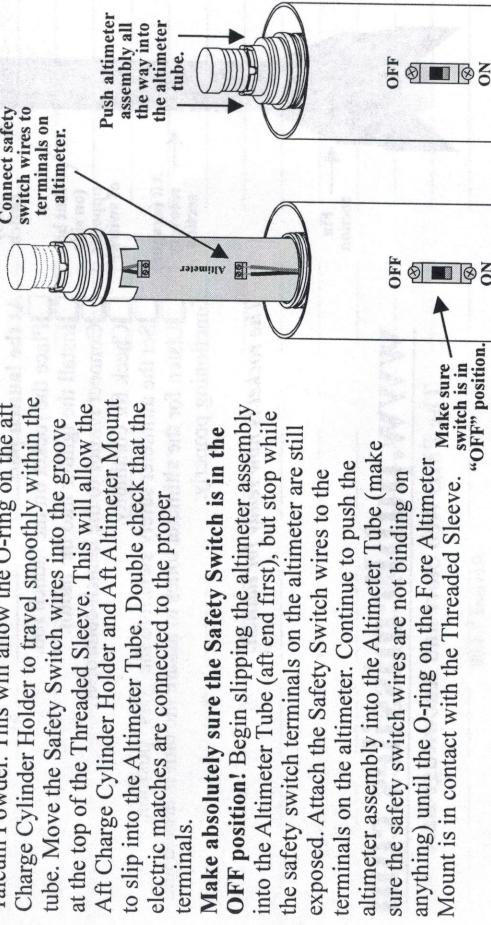
- E) Determine the correct amount of FFFFg Black Powder to use for proper ejection using the chart below. Measure-out the Black Powder and pour it into the Charge Cylinder.
- F) Fill the remainder of the Charge Cylinder with a crumpled piece of flame-proof wadding to keep the Black Powder from moving about.
- G) Place the orange vinyl cap over the Charge Cylinder.



Repeat this step for prepping the Aft Charge Cylinder.

The chart below is intended as a guide for determining the proper amount of ejection powder used with various diameter CPR-3000 rockets using a piston ejection system and an 18" fore or aft recovery airframe.

2.1" dia.	0.2 to 0.3 grams
2.5" dia.	0.3 to 0.4 grams
3.0" dia.	0.4 to 0.5 grams
3.9" dia.	0.5 to 0.6 grams



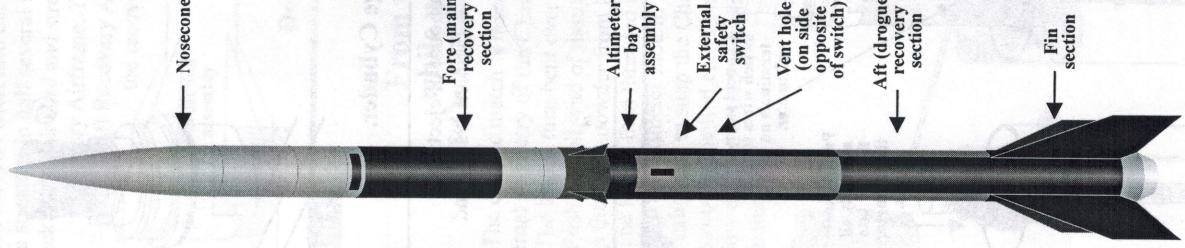
Step II

Step 11
Screw the Fore section of the rocket to the Aft section. Once contact is made between the Fore and Aft sections, give the airframes a little extra turn to snug everything up.

Performance track record

Place the rocket on the launch pad. Install the ignitor into the motor and attach the ignitor leads to the launch controller. Check the launch controller for continuity. Keeping your head away from the rocket, set the safety switch to the "ON" position. Listen (or look for) the altimeter tones or lights to assure the unit is armed and functioning properly.

CPR-3000 system check list:



- At the flight prep area...**

 - Make sure all shock cords and parachutes are attached correctly.
 - Pack the aft recovery system.
 - Slip the fin section into the aft recovery section.
 - Pack the Fore recovery system.
 - Fit the nosecone onto the fore recovery section.
 - Inspect the 1/8" vent hole opposite the safety switch. Make sure it has no burrs and is free of obstructions.
 - Install the motor into the rocket.

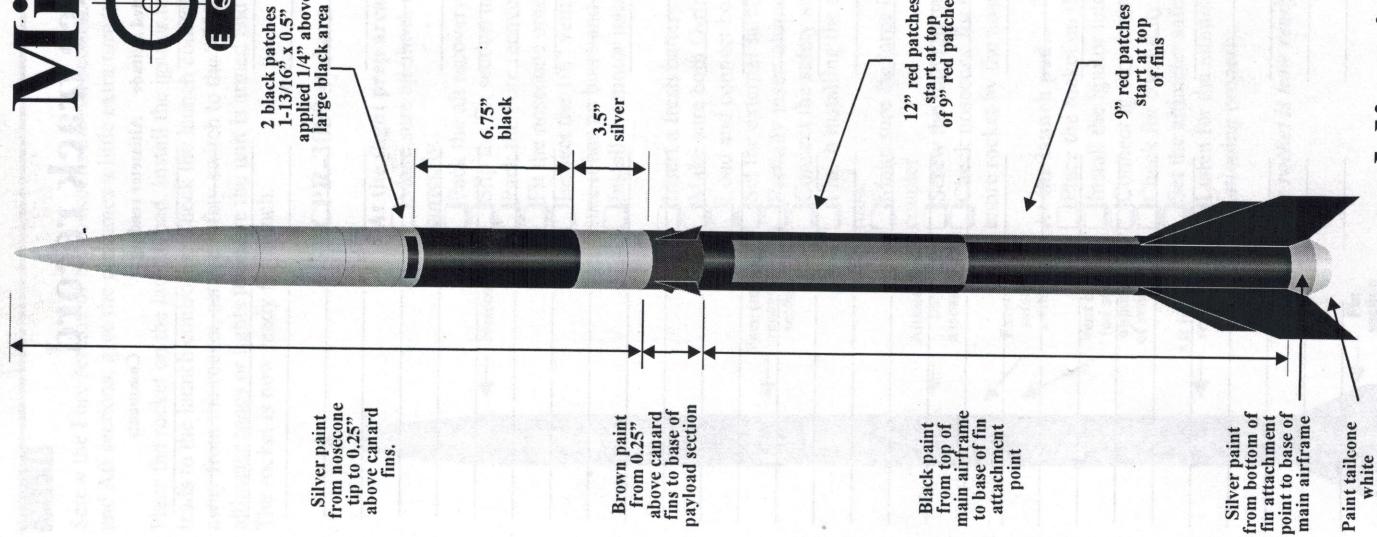
 - Insert a fresh battery into the altimeter.
 - Make sure both O-rings are in place.
 - Load and connect both ejection charges.
 - Set the external safety switch to the "OFF" position.
 - Partially insert altimeter assembly into the altimeter tube.
 - Connect the safety switch wires to the altimeter.
 - Finish installing the altimeter assembly into the altimeter tube.
 - Make sure the large O-ring is in place around the airframe coupler.
 - Screw the fore recovery section to the aft recovery section.
 - Check nosecone for tight fit (you should be able to lift the entire rocket by the nosecone without it slipping off).

At the launch pad... - Place the rocket on the launch rod.
 - Install the ignitor into the motor.
 - Connect ignitor to the launch controller.
 - Check for continuity.
 - Set the altimeter safety switch to the "ON" position.
 - Listen for the altimeter tones to assure the unit is armed and functioning properly.

The rocket is now ready for launch.

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Mini BBX



Paint the rocket in the following order for best results:

Paint the entire payload section including the nose cone silver.
Paint the base of the lower airframe (the area between the tail cone and the fin root) silver also.
Mask off the payload section 1/4" above the canard fins and paint the canard area brown. Mask off the middle of the payload section to create the black patches. Mask off the silver section on the lower airframe and paint the entire lower airframe and fins black. Now paint the tail cone white.

Once the paint has dried, cut the

supplied red vinyl into four rectangles. Two rectangles should measure 12" x 1-13/16" and the other two should measure 9" x 1-13/16". Apply the red patches to the lower airframe as shown.



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Revised 3.27.00

Terrier Booster

HIGH POWER ROCKET KIT

The Terrier Booster kit contains all the parts necessary* to build the booster section of the Mini Black Brant X rocket:

Pre-slotted main airframe

- (1) Fins

Piston ejection kit:

- (1) Piston tube

Slotted bulkplate

- (1) Piston strap

D-ring

Parachute

Motor mount tube

Airframe to MMT centering ring

Noched airframe to MMT cent. ring

Shock cord

Launch lugs

Interstage Coupler kit:

Finner Tube 8" long, drilled

Airframe section 1.25" long

Coupler 1.5" x 3" long

Coupler 2.5" x 4.25" long

Bulkplate 1.5" dia.

Coupler Centering Ring

Notched Coupler Centering Ring

Strap 12" long

D-Ring

Transition

Fore Timer Mount

Aft Timer Mount

Safety Switch

Wire 10" long

Set Screws

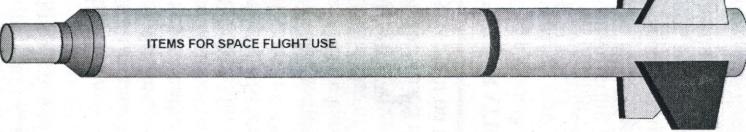
Socket Head Screws

Allen Wrench

Kwik-Link

Safety Switch Screws

Rubber Disk 1.5" dia.



*Epoxy, paint, and motor not included.

Please read and understand all instructions before building!

The center of pressure (CP) of this booster combined with the Mini-BBX upper stage is 64 inches from nose tip. After finishing your rocket, permanently mark the center of pressure on the airframe. After loading the rocket with the motors, make sure that the center of gravity (balancing point) is at least one body diameter forward of the center of pressure mark. The center of gravity can be moved forward by adding weight to the nose cone.



Basic Construction FAQ

The major parts involved in each step are shown shaded at the beginning of that step. Areas where epoxy should be applied are shown as well.

PREP & ASSEMBLY

- ⊗ Read and understand the instruction steps fully before you begin the step.
- ⊗ ALWAYS sand the parts to be bonded with 100-120 grit sandpaper.
- ⊗ We strongly recommend you dry-fit (assemble without gluing) all parts in each step BEFORE epoxying them together. Sand or adjust fit as needed before gluing.
- ⊗ Most epoxies work fine. Use 5 or 15 minute depending on how quickly you feel you can complete the step. Use longer set-time epoxy if you're unsure.
- ⊗ To make internal fillets to the fins deep up into the airframe, "load up" the end of a dowel with a blob of epoxy, then stick the dowel into the airframe and onto the fin joint you're working on. After depositing enough epoxy in this fashion, you can pull the dowel toward you, making a fillet with the rounded edge of the dowel.
- ⊗ Be sure to follow the "Do's & Don'ts" sheet provided with QT tubing.
- ⊗ Fins do not need to be "shaped". Lightly sand the edges to remove any manufacturing burrs.

PAINTING/FINISHING

- ⊗ Before you paint the fins, scuff the entire surface with 220 grit sandpaper. This is easiest to do before mounting the fins.
- ⊗ Plastic nosecone imperfections can be filled with plastic model kit putty.
- ⊗ Stay with the same brand of paint throughout the process; primer, base color, accent colors, and clear coat. DO NOT skip on the "shake the can for at least two minutes after the ball rattles" step! For the best finish, let each coat dry overnight and sand lightly with 320 or 400 grit sandpaper.
- ⊗ Apply the last color or coat as heavy as possible without running or sagging. Let the paint cure for at least 48 hours before handling!
- ⊗ We recommend a clear coat of some sort to help protect the decals as well as "seal" their edges to help prevent them peeling off. When using any clear coat, put on only VERY thin, light coats, and wait at least 5 minutes between coats. The clear coat can damage your decals or paint if you put it on too heavily or don't wait long enough between coats!

FINAL FITTING/PREPAREATIONS FOR FLIGHT

- ⊗ The piston should be a smooth slip-fit in the airframe; this is critical. Sand the piston as needed so it can be easily inserted, and pulled out with just a gentle tug on the shock cord. Keep sandpaper in your range box in case you need to adjust the fit the first few times at the field to deal with differing temperature and humidity.
- ⊗ Couplers should also be sanded to allow easy separation of the rocket.
- ⊗ If the coupler or nosecone is too loose, use masking tape to build it up to a good fit. If the nosecone is too tight, sand the ribs on the shoulder until it fits well. The parts fit properly if the rocket can be held upside down and gently shaken with nothing moving or coming apart.
- ⊗ Ejections will leave a black, gritty residue inside the airframe. Occasionally wipe the tube interior with a damp cloth wrapped around a dowel or broomstick; allow to dry.
- ⊗ See our website FAQ for information about thrust rings and motor retention. Motor recommendation information is available on our website on the Specs Page.

For our complete FAQ, see the FAQ Page on our website at www.publicmissiles.com.

www.publicmissiles.com

The PML Web Store and Knowledge Base

Other items you will need:

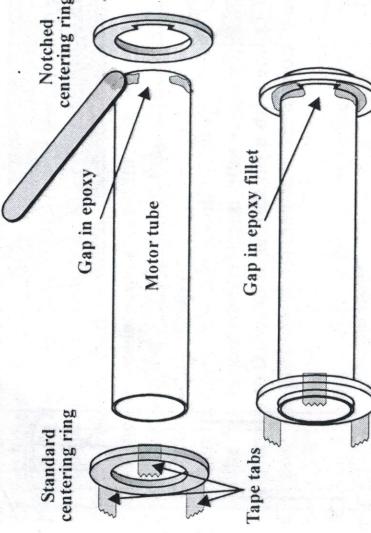
- Masking tape
- One set of epoxy
- One sheet each 120 and 220 sandpaper
- Ruler and pencil

- Masking tape
- Cellophane tape

**Please read and understand all instructions before continuing!
All surfaces to be bonded must be scuffed with 120 grit sandpaper.**

Step 1

Dry fit both centering rings into the airframe and over the motor mount tube. The notched ring can be a little snug in the airframe and on the motor tube. If it is tight, sand the ID and/or OD for a better fit. The standard centering ring should be a little looser in the airframe and over the motor mount tube to aid in later removal. Sand the ID and/or OD for a looser fit if necessary.

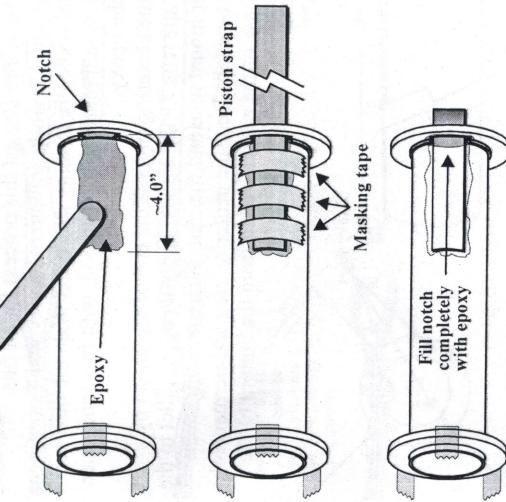


Spread a bead of epoxy around the circumference of one end of the motor tube leaving a 1" gap in the bead for the notch in the centering ring. Slip the notched centering ring over the motor tube with the notch aligned with the gap in the epoxy bead. Be sure the notch in the ring remains clear of epoxy. Locate the ring 1/2" from the end of the motor tube and allow the epoxy to set. Apply an epoxy fillet to each side of the ring still keeping the notch clear.

Slide the standard centering ring over the motor tube until 1/8" of the motor tube is protruding beyond the ring. Make 3 or 4 tabs using cellophane tape as shown above to aid in removing this ring later. Do not use any glue at this time, this centering ring will be removed in a subsequent step.

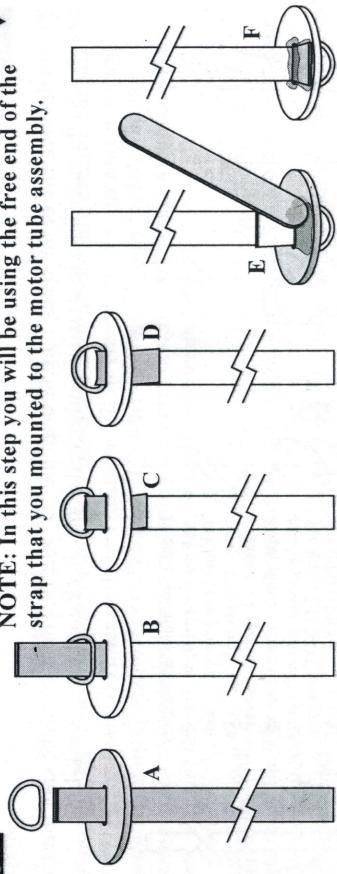
Step 2

Spread a layer of epoxy about 1" wide and 4" long on the motor tube just below the notch in the upper centering ring. Slip one end of the piston strap (the widest strap in the kit) through the notch in the centering ring. Pull through about 4" of this strap through the notch and press it firmly into the epoxy on the side of the motor tube. Hold the strap in place against the tube with masking tape until the epoxy cures. Remove the masking tape. **Fill the entire centering ring notch with epoxy.** Stuff the free end of the strap into the motor tube to keep it out of the way for the next step.



Step 5

NOTE: In this step you will be using the free end of the strap that you mounted to the motor tube assembly.



A) Pull the free end of the strap through the slot in the piston bulk plate.

B) Slip the metal "D" ring over the strap.

C) Feed the strap back through the slot.

D) Pull on the strap until the "D" ring is wedged at the slot.

E) Flip the assembly over. Spread a layer of epoxy on the underside of the piston plate as shown.

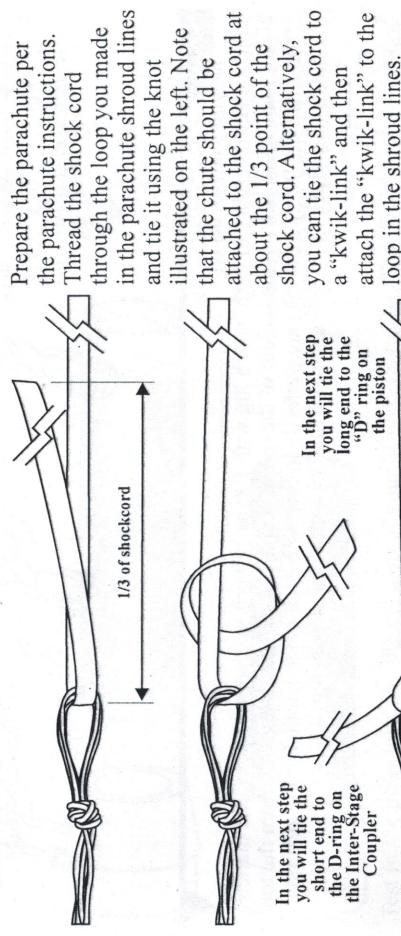
F) Fold the short end of the strap flat against the piston plate and press it into the epoxy. You can use a clamp to hold the strap in the epoxy while it sets.

G) When the epoxy has cured, pull the strap until the "D" ring is wedged tight at the slot. Apply epoxy to the strap at the "D" ring.

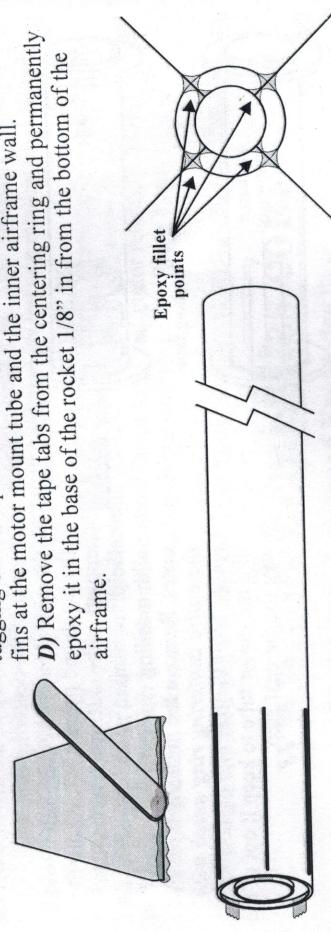
H) Epoxy the piston plate inside the piston body $1/8"$ from the top.

I) Apply an epoxy fillet to both sides of the piston plate.

Step 6

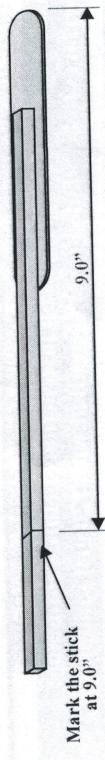


A) Prepare the parachute per the parachute instructions. Thread the shock cord through the loop you made in the parachute shroud lines and tie it using the knot illustrated on the left. Note that the chute should be attached to the shock cord at about the $1/3$ point of the shock cord. Alternatively, you can tie the shock cord to a "kwik-link" and then attach the "kwik-link" to the loop in the shroud lines.

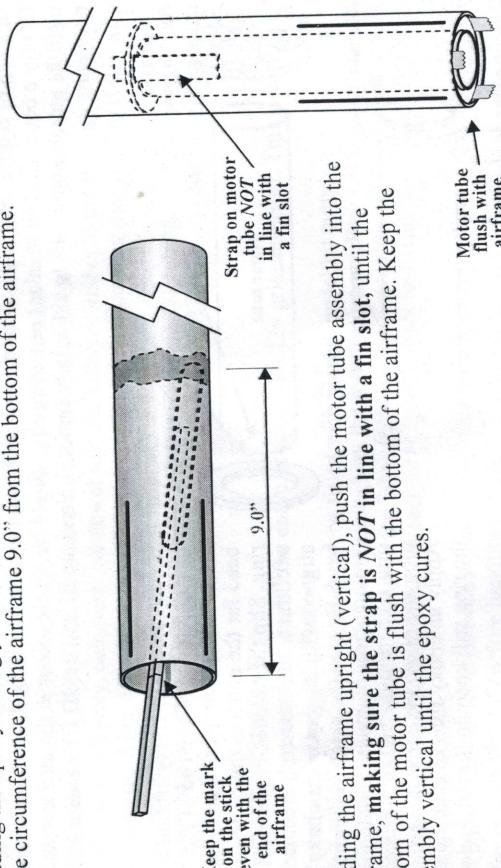


Step 3

You will need a long stick or dowel for applying epoxy in this step. Just below is a drawing of one good method for creating an extended epoxy applicator. Simply epoxy a dowel or stick to a tongue depressor or popsicle stick.



Make a mark on the stick at $9.0"$ so you can tell how deep the stick is in the airframe when spreading the epoxy. Using your extended epoxy applicator, spread a bead of epoxy around the inside circumference of the airframe $9.0"$ from the bottom of the airframe.



Holding the airframe upright (vertical), push the motor tube assembly into the airframe, **making sure the strap is NOT in line with a fin slot**, until the bottom of the motor tube is flush with the bottom of the airframe. Keep the assembly vertical until the epoxy cures.

Step 4

A) Apply a bead of epoxy to the root edge of a fin. Push the fin through the slot in the airframe. Use tape to hold the fin in position while the epoxy cures. Repeat this process for all fins.

B) Apply an epoxy fillet to both sides of each fin. Carefully smooth the epoxy with your finger before it begins to gel. Allow the epoxy to set up before rotating the rocket to do the next set of fins. Once the epoxy has fully cured, you should sand the fillet smooth with fine sandpaper. Sanding will help the primer hold better to the epoxy.

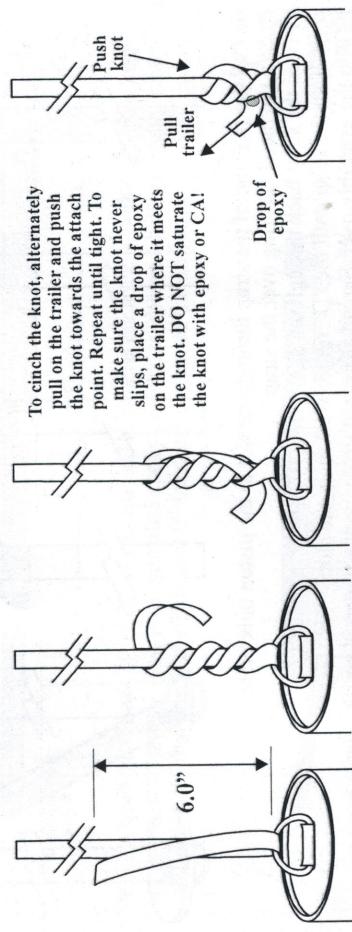
C) Gently pull the centering ring off the end of the rocket by tugging on the tape tabs. Using a stick, apply an epoxy fillet to the fins at the motor mount tube and the inner airframe wall.

D) Remove the tape tabs from the centering ring and permanently epoxy it in the base of the rocket $1/8"$ from the bottom of the airframe.

Step 10

Assembling the Inter-Stage Coupler

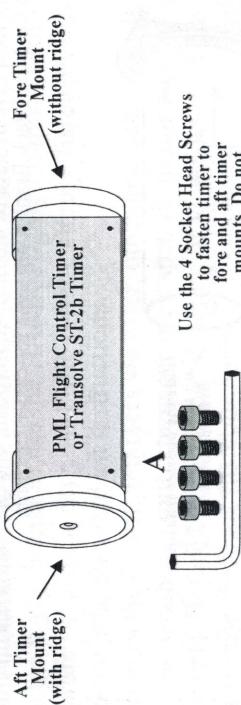
Thread the long end of the shock cord through the "D" ring and tie it using the knot illustrated below. Use the same knot to attach the other end of the shock cord to the Kwik-Link.



Step 7

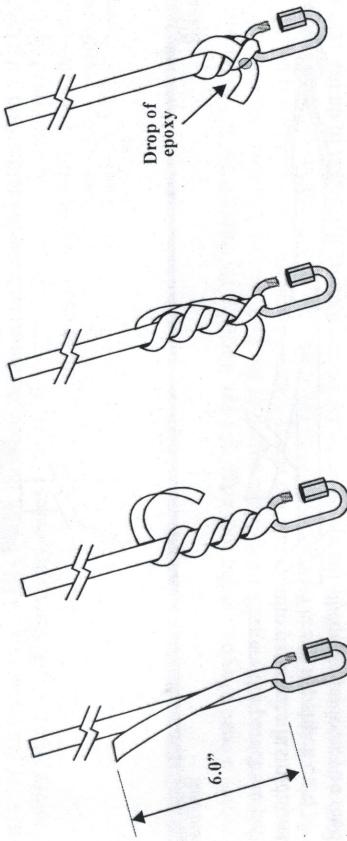
The Fore and Aft Timer Mounts used in the Inter-Stage-3000 system are designed around the PML Flight Control Timer and the Transolve ST-2b Timer. Other units may work as well with slight modifications to the mounts. Modifications may require relocating the mounting holes and grinding away material for clearances. Be careful not to weaken the mounts. Consult the timer manufacturer for their recommendations.

- A) Mount the PML Flight Control Timer or Transolve ST-2b Timer to the fore and aft timer mounts using the 4 Socket Head Screws and wrench supplied with this kit. Do not over-tighten the screws to prevent stripping the mounts.
 B) Thread one set screw into each threaded hole in the Aft Timer Mount until it is just below the outside surface of the mount.



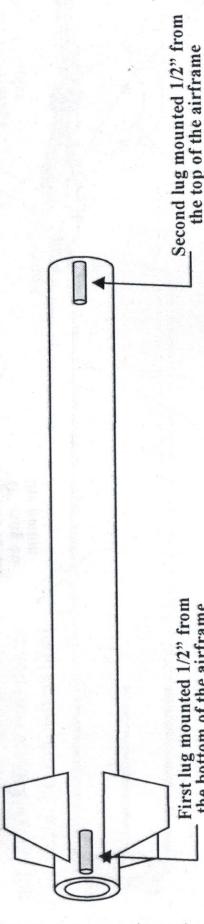
Step 8

Thread the shock cord through the Kwik-Link and tie it using the knot illustrated below. Add a drop of epoxy to the trailer at the knot to make sure the knot never slips. DO NOT saturate the knot with epoxy or CA.



Step 9

Sand the entire surface of each launch lug with 100 or 120 grit sandpaper. Epoxy one launch lug in place 1/2 inch from the bottom of the rocket and the other launch lug 1/2" from the top of the airframe. Be sure the lugs are perfectly in line with each other, parallel to the airframe and not in line with a fin. Apply an epoxy fillet to both sides of each lug.



Now sand the inside 1/4" of the tube until the tube slides into the tail cone of your Mini-BBX rocket. The fit will be very tight or against the bulkhead inside the tail cone. A snug fit is good for now as long as the tube totally bottoms out in the tail cone. You will fine tune this fit later. DO NOT EPOXY THIS TUBE INTO THE TAIL CONE!

Test fit the timer tube into the tail cone of your Mini-BBX rocket. The fit will be very tight or not fit at all. This is intentional. Sand the outside 2" of the tube (opposite end from the 2 small holes) until you have a snug fit into the tail cone. Now sand the inside 1/4" of the tube until the tube slides into the tail cone bottoming out against the bulkhead inside the tail cone. A snug fit is good for now as long as the tube totally bottoms out in the tail cone. You will fine tune this fit later. DO NOT EPOXY THIS TUBE INTO THE TAIL CONE!

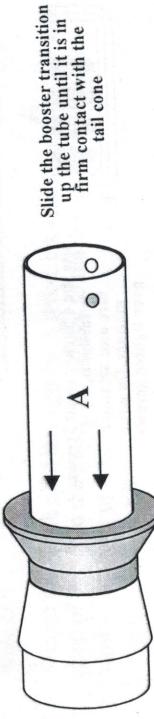
Choose a motor retainer before you begin building this rocket!

Step 12

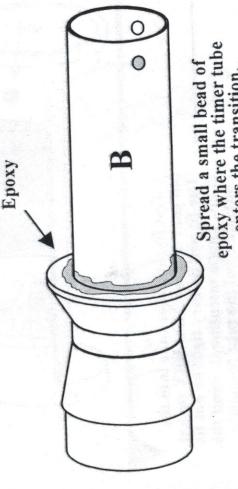
- A) Slide the booster transition up the tube until it is in firm contact with the tail cone.
 B) Spread a small bead of epoxy where the timer tube enters the transition. Continue to next step quickly, before epoxy begins to set.

C) Slide the **un-notched** centering ring down the timer tube and firmly against the transition. Wipe any epoxy that may ooze out. Be sure that the timer tube is firmly against the bulkhead inside the tail cone, the transition is in contact with the tail cone, and the centering ring is firmly against the base of the transition.
 Allow the epoxy to cure.

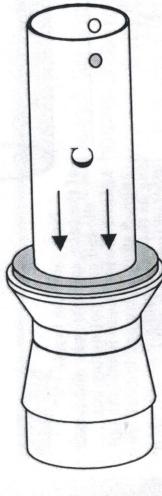
D) Epoxy the notched centering ring to the timer tube $7/8"$ from the end. Make sure the notch in the ring is NOT in line with either of the two holes of the ring. At this point, you can remove the timer tube assembly from the Mini Black Brant X tail cone for easier handling.



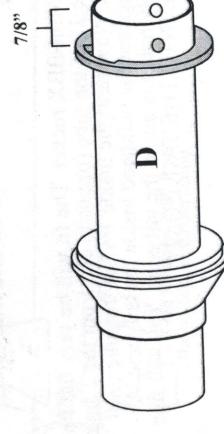
Slide the booster transition
up the tube until it is in
firm contact with the
tail cone



Epoxy
Spread a small bead of
epoxy where the timer tube
enters the transition.



Slide the un-notched centering
ring down the timer tube and
firmly against the transition.
Wipe any epoxy that may ooze
out. Be sure that the timer tube
is firmly against the bulkhead
inside the tail cone, the transition
is in contact with the tail cone,
and the centering ring is firmly
against the base of the transition.
Allow the epoxy to cure.



Epoxy the notched centering
ring to the timer tube $7/8"$
from the end. Make sure the
notch in the ring is NOT
in line with either of the two
holes near the end of the timer tube.
Apply an epoxy fillet to both
sides of the ring.

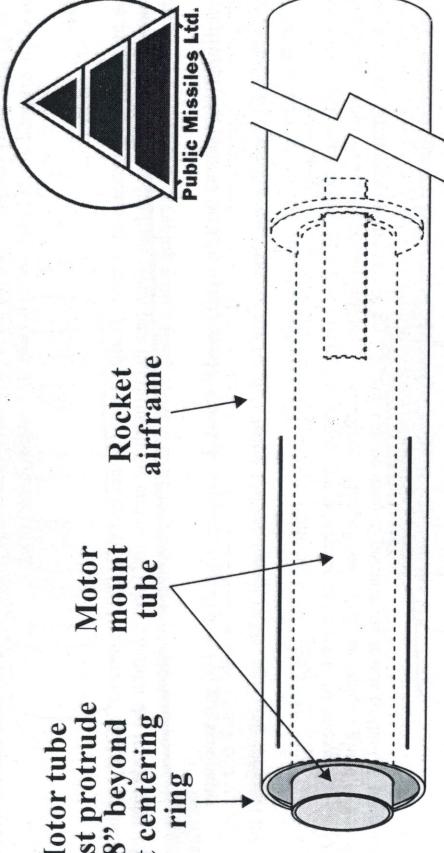
Public Missiles Ltd now offers 2 distinctly different motor retention systems.

The original PMR is the most economical solution while the new HAMR system is the easiest to use. Both systems are a safe and reliable means of keeping the motor where it belongs; in the rocket!

Because these retainer systems are so different, the motor mount must be installed differently for each retainer type. Below is a minor but very important modification to the standard PML kit instructions. You must make this change if you intend to use the HAMR Highly Adaptive Motor Retainer. If you prefer to use the original PMR system, simply disregard this notice and proceed with the standard kit instructions.

In addition to the 2 PML retainers we offer, other brands are available as well. Consult the retainer manufacturer for their specific motor mount requirements. Before beginning construction of your rocket, choose the retainer system that best fits your needs.

Modification to the motor mount assembly required for using the HAMR Highly Adaptive Motor Retainer:



For years we have only sold the PMR for motor retention. Hence most of our kit instructions state that the motor tube should be flush with the aft centering ring. But as illustrated above, the motor tube MUST protrude beyond the aft centering ring by $3/8"$. You can confidently ignore the kit instructions and make the required adjustment to facilitate the HAMR system. There will be no adverse effects to the rocket, it's assembly, or it's flight characteristics. However, it is always prudent to check the CP/CG relationship on any rocket before flight.



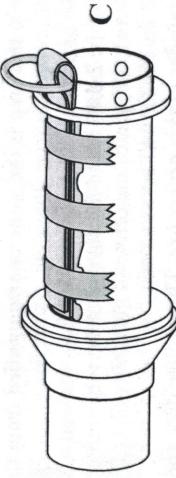
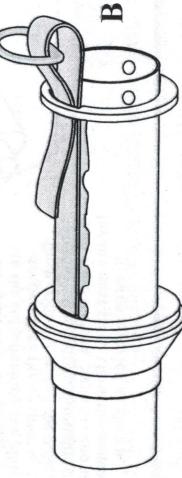
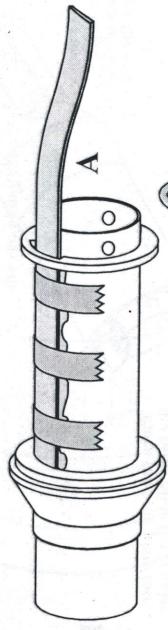
QUANTUM TUBE

polymer airframe

Step 13

- A) Slip one end of the 12" long strap through the notch in the centering ring. Pull the strap through until it just touches the upper centering ring. Epoxy the strap to the timer tube between the two centering rings. Hold the strap to the tube using masking tape while the epoxy cures.
- B) Place the D-Ring over the strap. Push the free end of the strap through the same notch in the centering ring and pull until the strap just touches the upper centering ring.

C) Epoxy this section of strap over the strap already bonded to the timer tube. Again, use masking tape to hold the strap in place while the epoxy cures. Once epoxy has cured, remove the masking tape.



The **Quantum Tube** (QT) airframe included in this kit is made from a special blended polymer that is extremely durable and easy to use. You will find this new material easy to work with and very forgiving, even during those "less than perfect" flights. Most epoxies and paints will readily adhere to this material. The *Quantum Tube* can be squeezed, dropped, or even thrown and will not suffer any damage as can sometimes occur with cardboard or phenolic tube. The *Quantum Tubes* are molded in medium gray and have a glass smooth finish. The *Quantum Tube* does have one thing missing, the spiral groove!!! You will appreciate the fact that you no longer have to fill and sand the airframes to achieve the perfect finish.

IMPORTANT NOTICE: PLEASE READ BEFORE USING THE QUANTUM TUBE (QT)

The Quantum Tubes have been tested and found to be compatible with most paints and epoxies and CA adhesives. Paints tested were lacquer, enamel, epoxy, and urethane including various primers. As with any paint, apply several light coats allowing each to flash before re-coating.

Most brands of epoxy adhesive bond well with no adverse affect to the tubing. The bonding area must be sanded prior to applying epoxy. Follow the suggestions below.

The Quantum Tubes are resistant to the heat of ejection charges. As with any tube, repeated ejections will leave a black, gritty residue inside the tube. To remove the residue simply wipe the tube interior with a wet cloth wrapped around a dowel or broom stick and allow to dry.

DOs:

The manufacturing process of cutting QT may leave the cut end of a tube "squeezed" slightly so that nosecones or pistons seem tight when passing through the end of the tube. Chamfer the inside edge of the tube end via sanding or scraping with a sharp X-Acto knife to prevent this problem.

Before applying paint to the QT, lightly sand the outside surface using 320 or 400 grit sandpaper.

Sand the fin fillet area on each side of the fin slots using 150 sandpaper before applying epoxy to the fin and tube.

Sand the inside area of the QT using 120 or 150 sandpaper wherever parts are to be epoxied to the QT. Most hobby epoxies can be used with the QT. Sandpaper flappers on a drill, sandpaper glued to a large wood dowel, sandpaper on the end of a stick, etc. can be used to prepare the inside of the QT for epoxy.

Using alcohol or mineral spirits will not damage the gloss finish on the QT.

DON'Ts:

Do not wipe or spill lacquer thinner or acetone on the Quantum Tube, either will melt and distort the tube.

QUANTUM TUBE
Another PML exclusive!

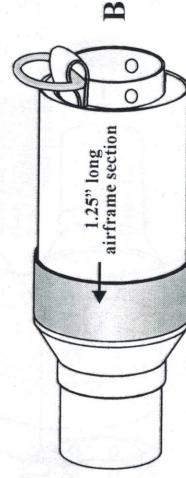


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Step 14

- A) Epoxy the 4.25" long coupler tube over the two centering rings and firmly against the base of the transition.

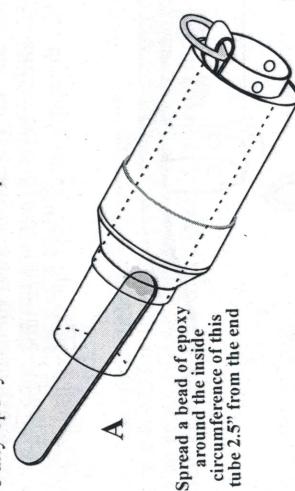
- B) Epoxy the 1.25" long airframe section over the coupler tube and firmly against the base of the transition.



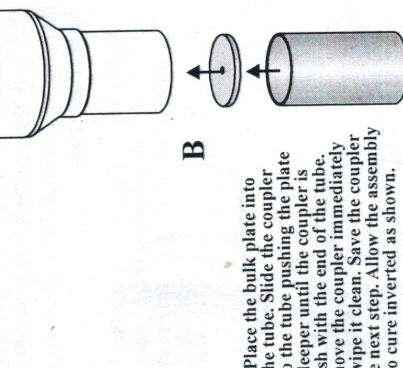
Step 15

A) Spread a bead of epoxy around the inside circumference of the timer tube 2.5" from the end.

B) Place the 1.5" dia. bulk plate into the tube. Slide the 1.5" x 3" long coupler into the tube, pushing the plate deeper until the coupler is flush with the end of the tube. Remove the coupler immediately and wipe it clean. Save the coupler for the next step. Allow the assembly to cure inverted as shown. Wipe any epoxy residue off the coupler tube.



Spread a bead of epoxy around the inside circumference of this tube 2.5" from the end



Place the bulk plate into the tube. Slide the coupler into the tube pushing the plate deeper until the coupler is flush with the end of the tube. Remove the coupler immediately and wipe it clean. Save the coupler for the next step. Allow the assembly to cure inverted as shown.

Step 16

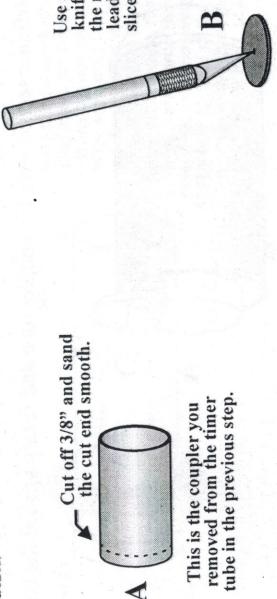
The coupler tube referred to in this step is the same one you pulled from the timer tube in the previous step.

A) Using and X-Acto razor saw or hacksaw blade, cut off 3/8" from one end of the coupler tube. Coupler length should now be 2-5/8". Sand the cut end of the tube smooth.

B) Using a sharp, pointed X-Acto knife, pierce the center of the rubber disk. The igniter leads will pass through this slice and the rubber will act as a seal.

Do not use epoxy for the remainder of this procedure. The rubber disk and shortened coupler should remain removable and replaceable if damaged by Sustainer motor ignition.

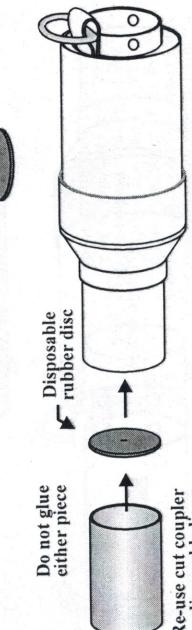
C) Push the rubber disk into the timer tube as shown followed by the shortened coupler tube. Be sure the rubber disk lays flat against the bulkplate and the coupler tube is firmly against the rubber disk.



Cut off 3/8" and sand the cut end smooth.



This is the coupler you removed from the timer tube in the previous step.



Do not glue either piece

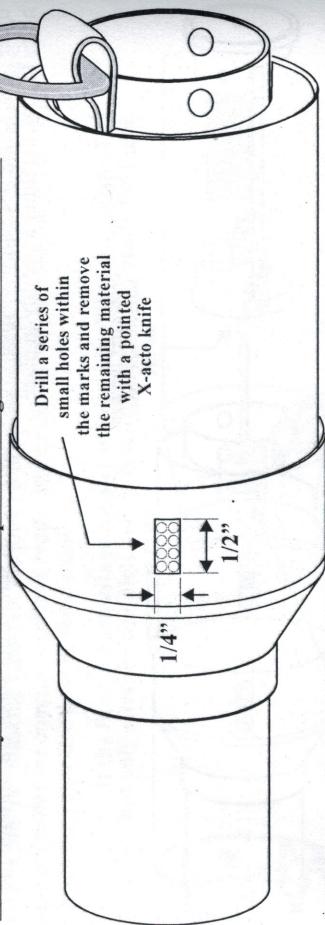


Re-use cut coupler Re-disposable liner

Step 17

In order to properly install the safety switch, you will need to cut a 1/2" x 1/4" opening into the airframe as indicated in the drawing below. First mark out the perimeter of the opening on the airframe, then drill a series of small holes within the marks, starting near the corners, and removing the remaining material with a pointed X-Acto knife. Test fit the switch into the hole to assure a good fit.

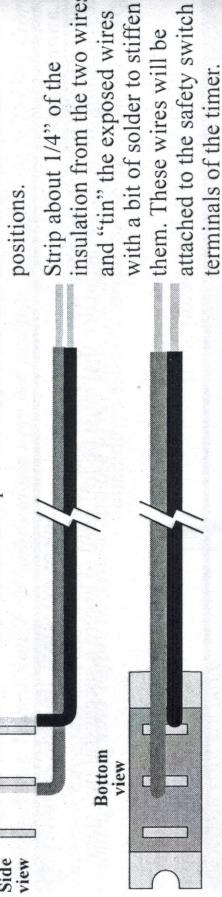
Drill a 1/8" hole in the timer tube through the rectangular switch opening so that the safety switch leads can pass through into the timer tube.



Step 18

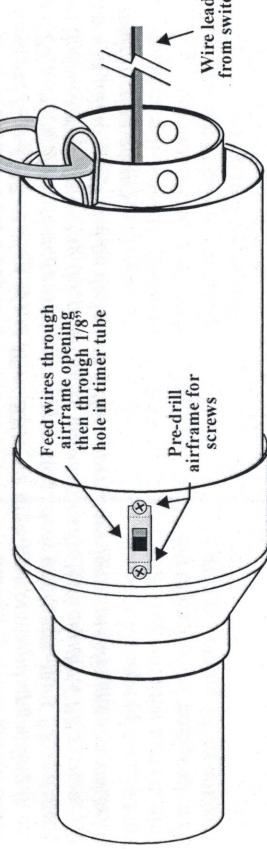
Solder one safety switch wire to the center terminal of the switch and the other wire to one of the outside terminals of the switch. Polarity does not matter in this application. This switch has two positions; ON-ON, meaning the switch is able to make connections in both positions. Since you are using only two wires (center terminal and one end terminal), the switch position toward the unwired terminal is "off".

Moving the switch toward the wired terminal is "on". Be sure to mount the switch into the rocket with the two wired terminals towards the bottom of the rocket. In this configuration, "down" will be "on" and "up" will be "off". Mark the airframe for the on-off positions.



Step 19

Feed the wire ends into the airframe opening, then through the 1/8" hole in the timer tube and finally out through the end of the timer tube. Set the switch into the rectangular airframe opening, pre-drill the airframe for the mounting screws, and install the screws. Mark the airframe near the switch for the on-off positions.

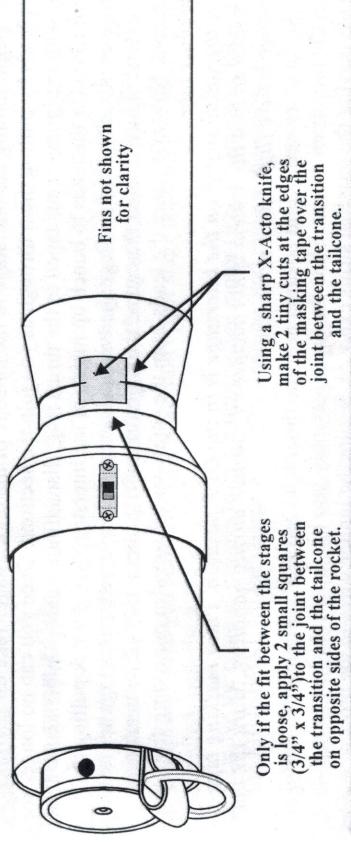
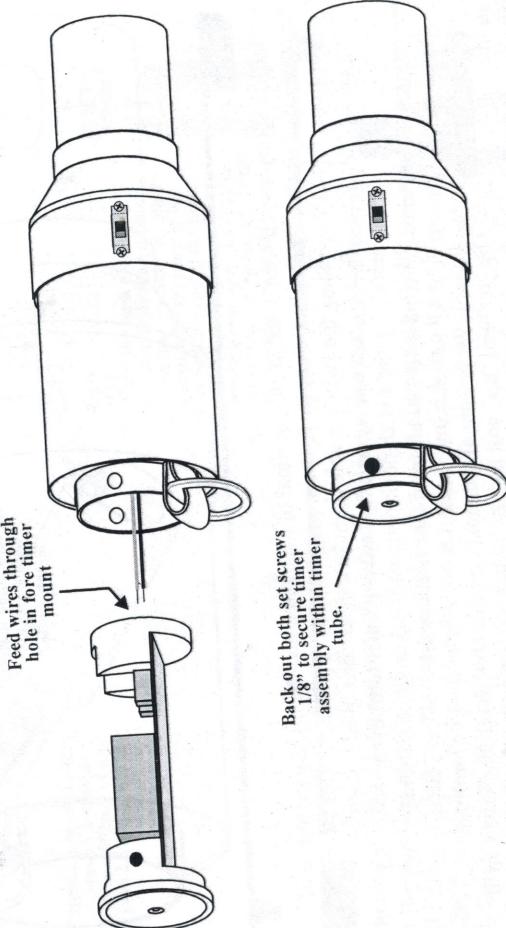


Step B

Step 20
Align the timer assembly with the timer tube. Pass the safety switch wires through the hole in the fore timer mount (in flight prep, you will also pass the igniter leads through this hole). Begin sliding the timer assembly into the timer tube while gently pulling the wires through the hole. As soon as the fore timer mount is in the tube, attach the safety switch wires to the appropriate terminals on the timer. Once the wires are attached, continue to push the timer assembly into the timer tube until the ridge on the aft timer mount contacts the timer tube. Turn the timer assembly until the set screws in the aft timer mount align with the holes in the timer tube. Using the supplied Allen wrench, back the set screws out about 1/8" through the holes to lock the timer assembly in place.

Once again, check the fit of the interstage coupler into the tailcone of the Mini-BBX. The coupler at the top of the interstage should have a slight friction fit into the tailcone yet bottom out firmly (transition on the interstage must contact the tailcone). This fit should be such that the two assemblies do not separate from a little vertical shaking. If the fit is too tight throughout the entire travel distance when pushing them together, sand the outside of the coupler section of the interstage. If the fit is too tight in just the last 1/4" of the travel, sand the inside of the coupler section of the interstage. If the fit is too loose, apply two small pieces (3/4" x 3/4") of masking tape over the joint on opposite sides as illustrated. *Apply the masking tape only after the complete rocket is ready for launch. We will remind you of this in the launch prep checklist later in this booklet.*

If the fit of the interstage coupler is loose, use this taping method but only after the complete rocket is fully prepped and ready for flight.



Step C

WARNING: Not all igniter types will fire using the timer you have selected. In most cases you will need a low current igniter. Be sure to test fire an igniter with the timer of the exact type you will be using in the rocket. Refer to the instructions provided by the timer manufacturer. In addition, E-Matches alone may not produce enough heat or for too short a duration to properly ignite the motor. Once you have selected the proper igniter, use one of the two methods described below for preparing the igniter before insertion into the upper stage motor.

Method A:

If the nozzle throat and propellant core are too small for Method A, then this is the preferred method of igniter preparation. Very carefully bend the lead wires just below the pyrogen as shown. If the pyrogen cracks or flakes during bending, discard the igniter and try again with a different one. If done properly, the igniter should have a slight friction fit within the propellant core and the pyrogen will be in firm contact with the core. Be sure the igniter is inserted to the very top of the propellant core.

Method B:

If the nozzle throat and propellant core are too small for Method A, then this is the preferred method of igniter preparation. Very carefully bend the lead wires just below the pyrogen as shown. If the pyrogen cracks or flakes during bending, discard the igniter and try again with a different one. If done properly, the igniter should have a slight friction fit within the propellant core and the pyrogen will be in firm contact with the core. Be sure the igniter is inserted to the very top of the propellant core.

Launch Prep

The remaining steps are the sequence that must be followed to assure a successful two stage flight of the Mini-BBX and Terrier Booster combination.

Step A

Refer to the instruction booklet that was supplied with your Mini-BBX CPR Version*. Follow all the flight prep steps to the letter including both the CPR prep and motor installation. Place a piece of masking tape over the CPR arming switch while it is in the off position to avoid accidental arming while handling the rocket. Print "Remove before flight" on the tape as a reminder.

*If you have the Non-CPR version of the Mini-BBX, we highly recommend upgrading it with the CPR system. If for some reason your upper stage does not ignite, the CPR system, with save the rocket by deploying the parachutes automatically. Without the CPR system, the rocket will fall to earth and be destroyed if the upper stage ignition fails or some other staging malfunction occurs.

Step D

WARNING: WHEN USING THE CPR VERSION OF THE MINI-BBX AS THE UPPER STAGE, REMOVE ALL OF THE EJECTION POWDER FROM THE UPPER STAGE MOTOR, FILL THE WELL WITH WADDING AND REPLACE THE CAP BEFORE INSTALLING THE MOTOR.

Friction fit the motor into the upper stage. Install the igniter as described in the previous step.

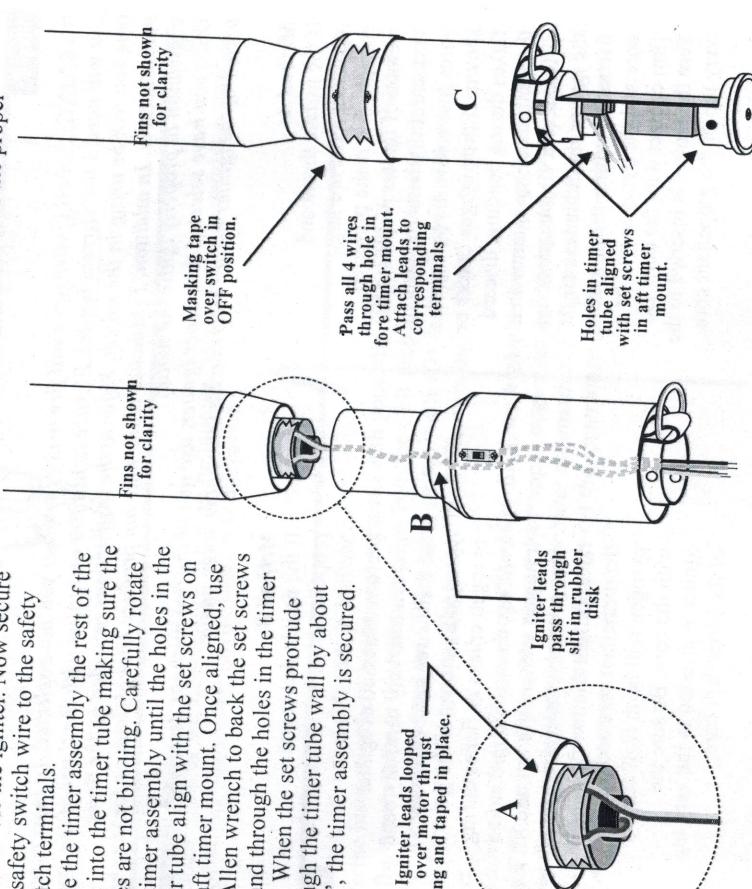
A) Once you are sure the pyrogen end of the igniter is at the top of the propellant core, carefully bend the leads up and into a loop against the thrust ring of the motor. Use masking tape to secure the leads to the thrust ring.

B) Feed the igniter leads through the small slit in the rubber disk within the interstage coupler. Continue pushing the leads through until they exit the timer tube at the bottom of the interstage. Begin joining the interstage to the tailcone of the upper stage. Take up any slack in the motor with the igniter leads taped to the thrust ring, discontinuing pulling on the leads. There is plenty of room for the leads to bunch up inside of the interstage. Do not risk pulling the igniter loose or out of the motor. Once the two sections are fully joined, cut the igniter leads so they only extend about 3" from the end of the timer tube. Strip about 1/4" of the insulation from each lead. Now make sure the leads from the safety switch are also protruding from the end of the timer tube.

Make sure the safety switch on the interstage is in the OFF position. Place masking tape over the switch so that the system is not accidentally armed during handling. Mark the tape with "Remove before flight" as a reminder.

C) Bring the timer assembly into position near the timer tube and feed all four wires through a hole in the fore timer mount. Slide the timer assembly into the timer tube just enough to start it in yet leaving the terminal strips exposed. Secure the igniter wires to the proper terminals for the igniter. Now secure the safety switch wire to the safety switch terminals.

Slide the timer assembly the rest of the way into the timer tube making sure the wires are not binding. Carefully rotate the timer assembly until the holes in the timer tube align with the set screws on the aft timer mount. Once aligned, use an Allen wrench to back the set screws tight and through the holes in the timer tube. When the set screws protrude through the timer tube wall by about 2", the timer assembly is secured.



Step E

Secure the motor into the Terrier Booster,

Slide the piston down into the airframe. Pack the parachute as described in the Parachute packing instructions supplied with the chute. Attach the Kwik-Link from the booster shock cord to the D-Ring on the interstage coupler. Make sure the interstage fits snugly into the booster. Use strips of masking tape placed on the shoulder of the interstage to tighten the fit if necessary. Sand the shoulder if the fit is too tight. The fit is proper if you can lift the rocket by the interstage and shaking it vertically, the interstage does not begin to slip out. Rotate the booster so that the fins on the upper and lower stage are aligned. Fin alignment between the upper and lower stages is mainly for aesthetic purposes. Misalignment should not affect stability.

Check list

At the prep table...

- Test the timer and adjust the time so that upper stage ignition takes place 0.5 to 2.0 seconds after booster burnout. (Depending on velocity at booster burnout.)
- Completely prep your Mini-BBX CPR Version upper stage according to the instruction supplied with the kit.
- Remove the ejection powder from the upper stage motor (when using the CPR Version of the MINI-BBX), fill the charge well with wadding, and replace the charge cap.
- Install the motor in the upper stage.
- Install and secure the igniter into the upper stage.
- Set timer safety switch to OFF position and place masking tape over switch.
- Join interstage to upper stage.
- Secure all leads from timer and safety switch to proper terminals on timer.
- Secure timer assembly within timer tube using the set screws.
- Make sure to pack the booster chute properly and that all shock cords are attached.
- Install and secure motor in booster.
- Fit the interstage to booster.

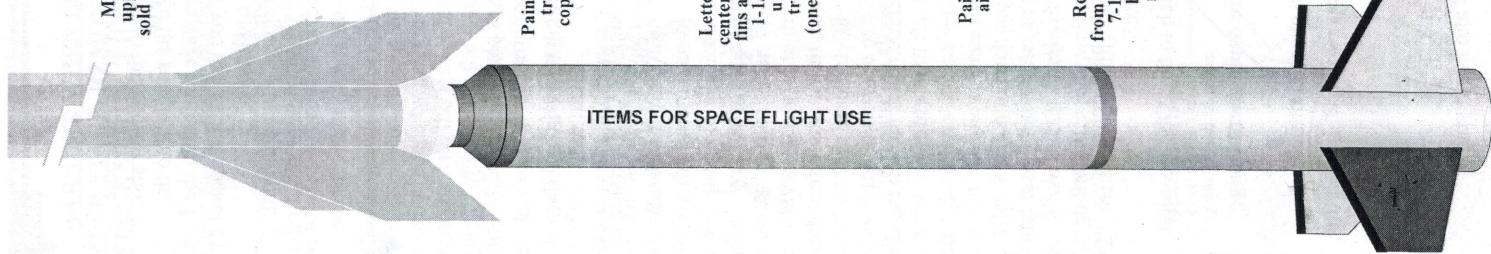
At the launch pad...

- Slide the complete rocket onto the launch rod.
- Use a stand-off to keep the base of the rocket a few inches from the blast deflector.
- Install the igniter into the booster motor and make sure it is secure.
- Remove the tape from the CPR safety switch and move the switch to the "ON" position.
- Allow the altimeter time to arm and calibrate itself.
- Listen for the proper tones emanating from the altimeter to assure deployment charge continuity and flight readiness.
- Attach launch control wire leads to the igniter of the booster and check continuity.
- When continuity is verified, remove the tape from the timer safety switch and move the switch to the "ON" position.
- The rocket is now fully armed and ready for flight.
- Get your camera and/or binoculars ready!
- As with any complex flight profile, call for a "heads-up launch" and begin your countdown.

Terrier Booster

Mini-BBX
upper stage
sold separately

To be used only
with the PML
Mini-BBX kit.
(CPR Version highly recommended)



Paint urethane
transition
copper color

Lettering decal
centered between
fins and starting
1-1/2" below
urethane
transition
(one side only)

Paint entire
airframe
white

Red stripe
from decal sheet
7-1/2" from
base of
rocket

All fins have
a black leading
edge about
3/16" wide

Three white
fins and one
red fin



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Revised 12.7.00

