



# ALL FIBERGLASS Tomach

## Specifications

- Length: 60" (shown) or 66"
- Diameter 54mm
- Weight: 3 lbs
- Motor Mount: 54mm
- Fins: 3 - 1/8" G10
- CP: 48" from nose tip (60" version)  
53" from nose tip (66" version)

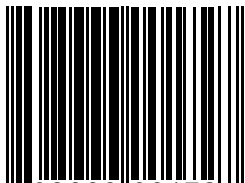
## Parts List

- (1) Filament Wound Nose Cone w/ Metal Tip
- (1) Nose Cone Coupler
- (1) Main body tube (30" or 36")
- (1) Payload section body tube (18")
- (1) Coupler
- (4) Bulkheads
- (3) 1/8" G10 fins
- (3) 1/4-20 Eyebolts w/nuts and washers
- (6) 10-24 Nuts
- (6) #10 Washers
- (2) 10-24 Threaded Rods
- (2) Nylon Shock Cord
- (2) Rail Buttons with screws
- (2) Cardboard fin guides

## You'll need these items to complete this kit

- Epoxy
- Filler and Paint
- Zap or CA Super Glue
- Motor Retainer
- 60/80 Sandpaper
- Pencil

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Please make sure you read all directions and understand how to assemble your model before you start construction. It is also a good idea to test fit each part before assembly.

Fiberglass parts still contain small amounts of mold release and other materials on the surface that will inhibit adhesives and/or paint. It is important to clean each part prior to assembly with a solution of 1 part rubbing alcohol, 3 parts water and a drop of dish washing soap. **IMPORTANT:** do not sand any parts until after you have cleaned them - you will embed the materials you are trying to clean making it difficult to clean.

Some G10 parts may have holding tabs left over from the CNC machine. These small tabs will need to be sanded off before assembly.

Use only a high quality epoxy like Aeropoxy or West System to bond parts together. You can use a colloidal silica filler like West System 404 or 406 to thicken epoxy when making fillets. When using a filler for fillets a consistency like peanut butter or syrup is best. For extra strength you can add 1/16" or 1/32" milled glass fiber.

For Mach+ flights, it is important to use a strong heat resistant epoxy on surface mount fins like the Cotronics EE 4525.

**IMPORTANT:** Before assembling any part with epoxy, rough up the surface to be epoxied using 60-80 sandpaper. The scratches in the fiberglass surface will give the epoxy something to grab onto. Epoxy will not soak into the fiberglass like wood or cardboard - epoxy will not grip very well to fiberglass without this rough surface. You can use Zap or CA glue to tack parts into place before you apply epoxy.



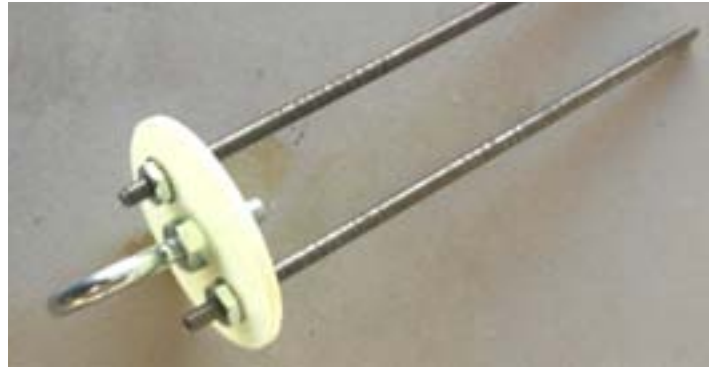
□ Step 1 - Mark one of the bulkplates as shown.



□ Step 2 - Stack 2 large bulkplates and 1 smaller bulkplate and temporarily secure the plates with a single eyebolt to hold them together. Drill through all 3 bulkplates at the points you just marked with a 3/16" drill bit. You can also drill a single 1/8" hole for the ematch wires.



□ Step 3 - Separate the bulkplates and then glue one of the large bulkplates to the smaller bulkplate while aligning the holes. Make sure the bulkplates are centered so that they will go into the end of the coupler and not interfere with the body tube. You can secure with an eyebolt, nut and washer while these dry. While the epoxy is setting, take the single large bulkplate (the other smaller bulkplate is for the nose cone to be used later on) and trap the two 10-24 threaded rods using 2 nuts and two washers each as shown. Use thread lock to make sure these don't come undone later. Also mount an eyebolt using thread lock as shown.



□ Step 4 - DO NOT EPOXY OR USE THREAD LOCK FOR THIS STEP. Place the bulkplate with the threaded rods on one end of the long coupler. Place the other two bulkplate set on the other end of the longer coupler and secure using a nut and washer on each threaded rods. The larger bulkplate should seat against the coupler edge with the smaller bulkplate going inside the coupler. Check to make sure the single bulkplate is centered on the other end of the coupler.



□ Step 5 - Mark the longer coupler 3.5" from the end with the double bulkplate that didn't have thread lock on the nuts. This will be the exposed part of the coupler. The single bulkplate with thread lock will be the covered part of the coupler that will go inside the payload section. Test fit the coupler inside the shorter payload tube and sand the single bulkplate if necessary.



- Step 6 - Attach the forward shock cord (12' long) to the eyebolt that will be going inside the forward body tube (the single bulkplate).



- Step 7 - Spread some epoxy on the inside of the end of the payload tube (the shorter body tube) and slide the coupler into the payload tube up to the mark made in the previous step. Keep the double bulkplate attached to the coupler in order to hold the single bulkplate on the inside end of the coupler in place until the epoxy sets. Keep the payload tube with the open end facing up so the epoxy doesn't run down the tube and interfere with the nose cone shoulder later.



- Step 8 - Using one of the fin guides, mark where the 3 fins will go around the fin can (the longer body tube). Use a door jamb or angle iron to mark along the body tube where the fins will go. Make a line half way between two of the fin lines for the rail button alignment along the length of the tube. Also, mark the fin lines 2.5" from the aft end of the fin can. This is where the trailing edge of the fin will go. You can also wrap the body tube with masking tape aft of this line to make it easier to see.

- Step 9 - rough up at least 1/4" on each side of the fin lines where the fins will go. Redraw the lines if necessary. Also rough up at least 1/4" on each side of the fin roots.

- Step 10 - IMPORTANT: if you plan to exceed Mach on this rocket, it is very important to use a high quality heat resistant epoxy like Cotronics EE 4525. You can also choose to fiberglass tip to tip or use another common method to ensure your surface mount fins do not come loose during flight.

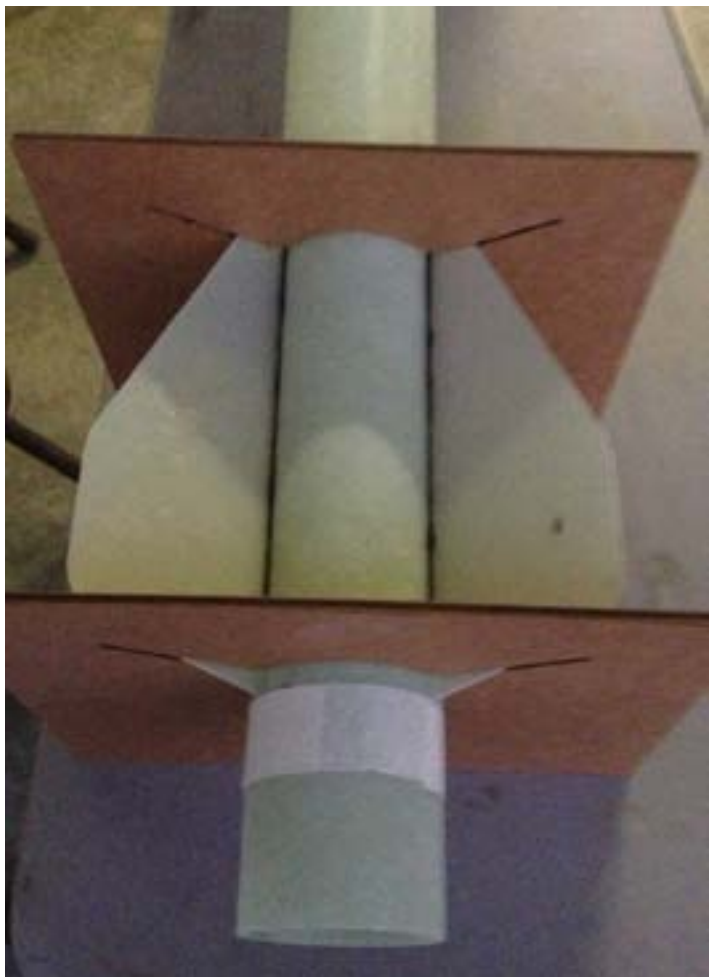
- Step 11 - Mount the fin can as shown in the cardboard guides and carefully epoxy each of the fins by placing epoxy on the root of each of the fins and lining them up along the fin lines you drew earlier. You can use CA glue on the tips of the root edge to hold them in place while the epoxy dries. Keep the alignment guides in place until the epoxy sets.

- Step 12 - Mix some additional epoxy of the same type you used on the fin root and thicken with milled glass or other appropriate filler until you have a peanut butter consistency. Apply fillets on each side of the fins for additional strength.

- Step 13 - Sand the outside end of the shorter coupler and the inside of the nose cone where the coupler and nose cone parts will bond together. Also sand the inside of the opposite side of the coupler where the bulkplate will be bonded.



- Step 14 - Use lock-tite on the nose cone tip to make sure it does not come loose during transportation.



- Step 15 - Mount the eyebolt with a nut and washer to the remaining small bulkplate and secure with epoxy so it will not come apart later.



- Step 16 - Epoxy the bulkplate into the end of the nose cone coupler where you sanded the inside. Leave about 3/8" for a fillet. After the epoxy sets, apply a fillet around the inside edge.
- Step 17 - Drill a 9/64" hole on the rail button line for the forward and aft rail buttons. The aft hole should be 2 1/2" from the aft end of the longer body tube and the forward hole should be just behind the CG. **IMPORTANT:** if you decide to use an external retainer that is wider than the body tube, you will need to use longer screws and spacers between the rail button and body tube to allow the rail room to go past the retainer.
- Step 18 - Apply a small amount of epoxy or CA in the holes and attach the rail buttons using the supplied screws. Make sure the screw is loose enough for the rail button to spin freely - this ensures the button is not compressed to the point it will hang on the rail guide. **IMPORTANT:** make sure the screws do not protrude inside the body tube where they will interfere with the chute or motor. Grind the screw to a shorter length if needed.
- Step 19 - Tie the remaining shock cord (15' long) to the aft end of the altimeter bay and also to the motor anchor bolt. This design relies on the motor's forward closure retention eyebolt for the recovery attachment point.
- Step 20 - Pack the chutes and assemble the rocket. Insert the largest motor that you intend to fly (or simulate the weight with an appropriate substitute) and ensure that the CG is at least 1 body diameter in front of the estimated CP point specified on the first page. The estimated CP should be measured from the tip of the nose cone. If the CG is too far back, add weight inside the nose cone by pouring lead shot into the nose cone and adding some epoxy. Please note, it is unlikely you will need nose weight because of the long nose design.
- Step 21 - Drill a 1/8" vent hole in the bulkplate to let the air out while you epoxy the coupler into the nose cone base. Epoxy the coupler into the base of the nose cone and make sure you leave at least 2.5" of the coupler exposed. Also ensure you get epoxy on the whole area where the coupler and nose cone will contact to ensure a good bond. It is best to put epoxy inside the nose cone and not the outside of the coupler. Make sure you have a clean coupler so as to not interfere with the payload body tube later.
- Step 22 - Your model is now ready to paint and fly.

Now go have some fun!

## Flying Your Model

**IMPORTANT:** always use positive motor retention to secure the motor. Failure to use motor retention will cause the motor to be ejected instead of the parachute making for a dangerous ballistic reentry.

**IMPORTANT:** Proper CG is critical to the stability of this model. This model may require some ballast in the nose - the amount will depend on how you build and the size motor you use to fly. Do not fly without balancing this model properly as a dangerous unstable flight will result.

**IMPORTANT:** Always follow the NAR safety code and remember that rockets are not toys and can be dangerous if not prepared and used properly. If you are a beginner, it is a good idea to fly with a club or other group of experienced rocketeers until you have gained some experience.

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**IMPORTANT:** Please contact us via phone or email if you have any questions about constructing or flying your model.



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