INSTRUCTION MANUAL

Vertical Assault

GIANT LEAP ROCKETRY, LLC

2831 SW Cornelius Pass Road

Hillsboro, Oregon 97123

Vertical Assault 54mm

Thank-you and congratulations on purchasing this beautiful high powered rocket from Giant Leap Rocketry.

-The GLR Team-

THE VERTICAL ASSAULT IS THE PERFECT DUEL DEPLOY ROCKET!!!

EASY TO BUILD AND PUNCHES A GIANT HOLE IN THE SKY

PLEASE BE AWARE THAT THE VERTICAL ASSAULT CAN (DEPENDING ON THE MOTER CHOSEN) GO OVER 6000 FEET; THEREFORE A TRACKING SYSTEM IS RECOMMENDED FOR A SUCCESSFUL RECOVERY.

At Giant Leap Rocketry, LLC we hope you enjoy this rocket. The VERTICAL ASSAULT has been carefully engineered to make this rocket high performance on the one hand, yet efficient to build on the other. We recommend that you take your time, learn and enjoy. The VERTICAL ASSAULT series is another in a long line of high quality kits from Giant Leap Rocketry, LLC.

As with most of our kits, the VERTICAL ASSAULT is a COMPLETE KIT, ready to build and contains the finest quality parts in the business! You can't buy a better thought-out kit. The components included in the VERTICAL ASSAULT kit are some of the best components in the industry. The kit features many Giant Leap Rocketry, LLC exclusive parts: pre-molded GLR FinCan, GLR KEVLAR® parachute heat protector pad, GLR aluminum rail guides, GLR SLIMLINE nozzle-shaped motor retainer and a 5-to-l GLR Pinnacle Nosecone.

Vertical Assault

We provide more details to help with your rocketry education

Vertical Assault is a no compromise duel deploy rocket that comes nearly ready to fly. Don't let the ease of construction fool you, this rocket will punch a hole in the sky!

The VERTICAL ASSAULT comes with a 54mm motor mount so that it can be flown on powerful J and K motors. These will propel the VERTICAL ASSAULT to extremely high altitudes. With the optional SLIMLINE 54/38mm adapter, you can fly this rocket to more moderate altitudes on lower impulse H and I motors. Be certain your center of gravity (CG) is at least 3.5" or more forward of the center of pressure (CP), with 4.5" or more being ideal. All measurements need to be done with a "full-up" rocket (with a loaded motor, recovery components and any electronics). Remember, during launch, the recovery hardware may shift aft, thus shifting the CG to an unstable condition. Be sure to check your rocket carefully before flying.

This is critically important or the rocket will not be stable in flight.

For example, if your rocket is 1.5" in diameter, then the CG should be at least 3" forward of the center of pressure. We provide you with the CP distance from the tip of the nosecone. As long the design remains the same as provided by GLR, the CP won't change; but, if you modify the **length** of the rocket you will need to determine the CP again for yourself. The CG depends on the weight distribution, which can change depending on your motor choice or other items that change the **weight** of the rocket. You can find the distance of the CG by balancing the rocket on your finger. If the CG is too far back, add nose weight. All measurements must be done with a "launch ready" rocket. This means your rocket is loaded with a motor, recovery components and any electronics or other accessories you plan to use during flight. Remember, during launch, the recovery hardware may shift aft, thus shifting the CG to an unstable condition. Be sure to allow for this before flying by loading your recovery components aft in order to properly check CG.

Note: Heavier motors shift the CG aft, requiring you to add nose weight. Be sure to check the CG location prior to launch!!

Specifications:

This rocket comes in both Fiberglass and Magnaframe. Fiberglass Specs are listed first and Magaframe listed second

Dry Wt. Mass (no motor load) 6.65 pounds. (Please allow for slight variation in weight due to difference in epoxies and paint thickness).
Length: 89"
Outside Diameter O.D. 2 ¼"
Inside Diameter I.D. 3.00 "
CP= 72" aft from nosecone tip
CG should be less than 66" aft of nosecone tip
Motor Mount: 54mm (29 & 38 mm with optional 54/38 mm and 38/29mm adapters)
Parachute: 36" main and 18" drogue

Dry Wt. Mass (no motor load) 6.65 pounds. (Please allow for slight variation in weight due to difference in epoxies and paint thickness).
Length: 95"
Outside Diameter O.D. 2 ¼"
Inside Diameter I.D. 3.00 "
CP= 72" aft from nosecone tip
CG should be less than 66" aft of nosecone tip
Motor Mount: 54mm (29 & 38 mm with optional 54/38 mm and 38/29mm adapters)
Parachute: 36" main and 18" drogue

Recommended 38mm motors: Requires the optional SLIMLINE 54/38mm adapter
Aerotech: H123, H148, H242, I161, I357, I300, I211, I285, I284, 1366, I435, J420, J350, J570
Pro38: H153 I205, I285, J285, J330

Recommended 54mm motors:

J90, J180, J275, J315, J415, J135, J800, J540, J800, K1100, K695, K550, K695, K700
Pro54: J295, K445, K570, K660

WARNING!!

Flying rockets is potentially dangerous, and you or others can be injured and/or killed by the usage of this product. Property damage can also occur by the usage of this product. In using this product, you agree to comply strictly with all safety codes of the Tripoli Rocketry Association and the National Association of Rocketry, as well as all local, State and Federal laws. By using the product, you agree that Giant Leap Rocketry, LLC, (also in this document noted as GLR) it's owners or employees will not be held legally or financially responsible for the correct or incorrect usage of this product. If you do not agree with these statements, return the kit in resalable condition to Giant Leap Rocketry for a refund. By using this kit, you agree that you have read, understand and accept these conditions.

PLEASE READ THE SAFETY CODE AND LIABILITY STATEMENTS AT THE END OF THESE INSTRUCTIONS.

NOTE: THIS ROCKET IS NOT A TOY

BECAUSE OF THE ROCKETS SIZE AND WEIGHT IT IS A SERIOUS VIOLATION OF FEDERAL LAW TO FLY THIS ROCKET ANYWHERE EXCEPT AT LAUNCHES SANCTIONED BY THE TRIPOLI ROCKETRY ASSOCIATION OR THE NATIONAL ASSOCIATION OF ROCKETRY WHOSE ORGANIZERS HAVE SECURED AN APPROPRIATE WAIVER FROM THE FEDERAL AVIATION ADMINISTRATION. FAILURE TO DO SO CAN RESULT IN SUBSTANTIAL FINES AND/OR IMPRISONMENT. DO NOT EVEN THINK OF FLYING THIS ROCKET ANYWHERE EXCEPT AT CERTIFIED LAUNCHES.

IF YOU HAVE ANY QUESTIONS OR ARE UNCLEAR REGARDING THE ASSEMBLY OR USE OF THIS PRODUCT, PLEASE CALL GIANT LEAP ROCKETRY, LLC. YOU ARE TOTALLY RESPONSIBLE FOR THE SAFE USAGE OF THEIS ROCKET. FOLLOW ALL PERTINENT SAFETY CODES AND DIRECTIONS AT THE LAUNCH SITE. ALWAYS WEAR EYE PROTECTION WHENEVER LOADING EJECTION CHARGES OF ANY TYPE AND KEEP SPECTATORS AWAY. MAKE A CHECK LIST TO HELP YOU PREPARE YOUR ROCKET PROPERLY SO AS NO TO OVERLOOK AN IMPORTANT STEP DURING THE EXCITEMENT AND STRESS OF PRE-FLIGHT PREPARATION. IF YOU DO NOT FEEL READY TO FLY THIS OR ANY OTHER

ROCKET *DON'T*. Take your time and do it safely and correctly. REMEMBER, THE FUTURE OF THIS HOBBY ALONG WITH THE SAFETY OF THOSE AROUND YOU IS IN YOUR HANDS.

PARTS LIST:

1- Airframe 36" long Fiberglass (slotted booster section) or 36" GLR Magnaframe

1- Airframe 36" long Fiberglass (upper section) or 36" GLR Magnaframe

1- GLR Olgive Pinnacle 3" Nosecone

1- GLR Slimline 75-54mm Tailcone Retainer

1- 24" long 54mm Motor Tube

1- GLR 54mm FinCan

1- GLR Aluminum Rail Guides: Pair

3- 3.0" to 54mm Centering Rings

1- Spacer Ring

4- ⅛" Quick Links

2- ¼" KEVLAR® Double Looped Shockcord 15'

2 GLR KEVLAR® Parachute Protectors

18" GLR Drogue Parachute

48" GLR Main Parachute

1- GLR Hard-Point Recovery System Anchor

1 ¼" eyebolt

3- 1000 lb Swivel

Online Assembly Instruction Booklet

3" Complete GLRAvionics Bay

Disposable Supplies Needed by the Builder to Assemble This Kit:

15 or 30 Minute Epoxy or Aeropoxy
(Can Be Ordered Separately From GLR)
Mixing Cups and Mixing Sticks
(Can Be Ordered Separately From GLR)
J.B. Weld
(Can Be Ordered Separately From GLR)
GLR Glass-Miro-Spheres Masking Tape
(Can Be Ordered Separately From GLR)
Tape Measure
Sharp Pencil
#250 Sandpaper
Paper Towels
Gloves
(Can Be Ordered Separately From GLR)
Rubbing Alcohol
Drill with a 1/8" and 1/32" drill bit

NOTE: you **MUST** use high-quality epoxy **and** JB Weld with this kit. Other types of adhesives are not suitable and will make the rocket unsafe for flight. You may prefer a slower setting epoxy (30 min.) if you are a novice builder, as this will allow more time to assemble the rocket.

ASSEMBLY

A. Building the GLR FinCan and Motor tube Assembly

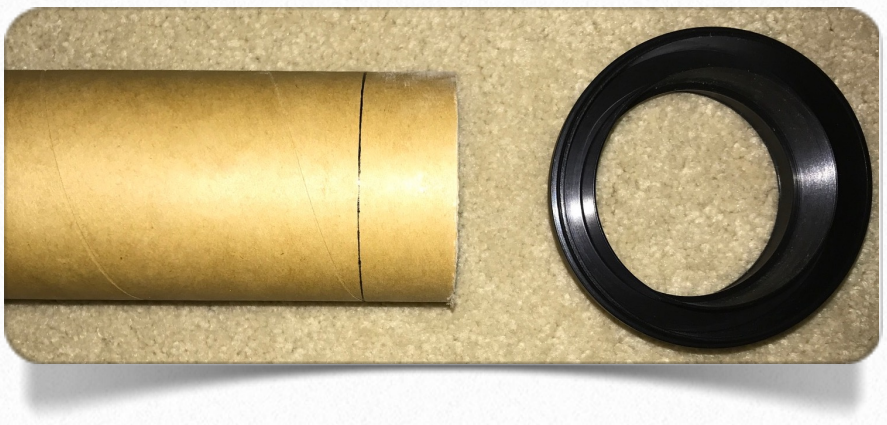
Note: "forward" means the front of the rocket, toward the nosecone, and "aft" is the rear of the rocket.

1. Test fit the GLR Slimline Tailcone Motor Retainer on the Aft end of the 54mm motor tube. Be sure that the GLR Slimline Tailcone Motor Retainer goes onto the motor tube and

seats completely. If the GLR Slimline Tailcone Motor Retainer is seated completely, you will not have any of the epoxy bonding rings of the

GLR Slimline Tailcone Motor Retainer exposed and the motor tube will rest on the the built-in shoulder stop of the GLR Slimline Tailcone Motor Retainer. Sand the motor tube slightly, if necessary, but just enough for a snug-tight fit. If you have a 54mm casing (Aerotech or Pro54), test fit by placing the casing in the motor tube and inserting the retaining ring. Be sure the spacing of all components is correct before proceeding to the next step that involves epoxy.

2 Draw with a pencil, a line at the forward end of the GLR Slimline Tailcone Motor Retainer and remove the retainer from the motor tube.



3. Mix some J.B.Weld (and only J.B Weld - do not use epoxy!) and apply it to the aft end of the motor tube, to the pencil mark of the motor tube. Then, install the GLR Slimline Tailcone Motor Retainer onto the motor tube. Turn the

GLR Slimline Tailcone Motor Retainer while you are installing it in order to spread the J.B. Weld. Be sure that you only apply the J.B. Weld to the motor tube and NOT to the inside of the GLR Slimline Tailcone Motor Retainer. This is important because if you apply J.B. Weld to the GLR Slimline Tailcone Motor Retainer and then try and slip it onto the motor tube, excess J.B. Weld will seep into the snap ring area of the GLR Slimline Tailcone Motor Retainer, making it impossible to insert a motor correctly. MAKE SURE THE GLR SLIM-

LINE TAILCONE MOTOR RETAINER IS SEATED ALL THE WAY ONTO THE MOTOR TUBE!

4. At this point, quickly "dry-fit" the Centering Rings around the Motor Tube to insure a smooth fit - sand the internal area of the Centering Rings as needed. Add some J.B. Weld to the motor tube ¼" forward of the GLR Slimline Tailcone Motor Retainer and slide the rear centering ring down the motor tube until it touches against the GLR Slimline Tailcone Motor Retainer (do not allow any J.B. Weld to be on the forward end of the rear centering ring or the outer circumference of the rear centering ring or the GLR Acme FinCan will not seat level against it. If J.B. Weld does get on the rear centering ring, wipe it away if wet or sand it away if you have allowed it to set.

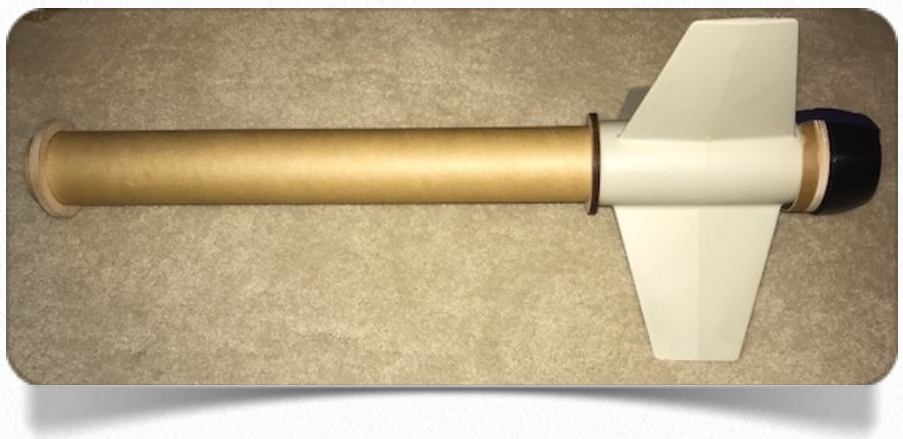
5. Place the phenolic spacer ring over the motor tube and slide it down to the rear centering ring that was previously installed and secured with J.B. Weld. Do not allow the phenolic spacer ring to touch any J.B. Weld. Just tape it

against the rear centering ring and GLR Slimline Tailcone Motor Retainer as shown.

6. From the forward end of the motor tube (the other end), slide on the GLR Acme FinCan and place a pencil mark on the tube at the forward end of the GLR Acme FinCan. Note that

the aft end of the canister is squared off, while the forward end is tapered. Then remove the GLR Acme FinCan and set it aside.

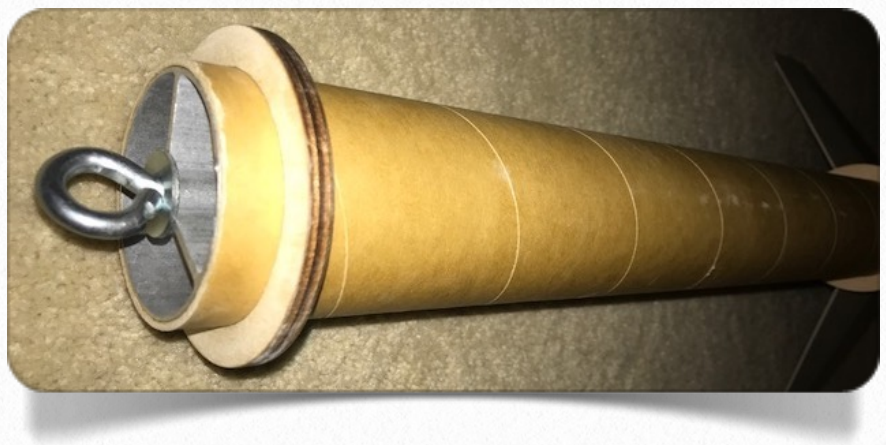
7. Mix some Aeropoxy and apply it to the motor tube, where the GLR Acme FinCan is to go (from the pencil line to the rear centering ring). Then slide on the GLR Acme FinCan (note which end is front and which is back) un-



til it butts up against the rear centering ring. It is advisable to turn the GLR Acme FinCan as you slide it on in order to more evenly spread out the Aeropoxy. **Keep Aeropoxy off of the phenolic spacer ring.** Should adhesive get on the phenolic spacer ring, clean it off. Next, Aeropoxy the middle centering ring in place at the forward position of the GLR Acme FinCan and then Aerepoxy the forward centering ring within 1" of the forward end of the motor tube, as seen the the photo.

8. Next, identify the GLR Hard-Point Recovery System Anchor. Place the eyebolt through the center of the device, and tighten the nut. There should be a washer on both sides of the GLR Hard-Point Recovery System Anchor. Secure one end of the GLR Kevlar® Shock Cord to the eye bolt using the ⅛" quick connect. Because Giant Leap Rocketry provides a high quality, heat-resistant Kevlar® shock cord in this kit, rather than a nylon shock cord, there is no need to wrap the shock cord with masking tape...your welcome!

9. Mix a small amount of J.B. Weld (do not use Aeropoxy) and coat the inside of the forward opening of the motor tube. The ring of epoxy should coat the internal circumference of the motor tube from the outer forward edge to ¾" inside the forward motor tube. It is important to avoid getting the J.B. Weld on other areas inside the motor tube, so do the best you can. Before the JB Weld cures within the motor tube, insert the GLR Hard-Point Recovery Anchor through the FORWARD end of the motor tube. Insert the GLR Hard-Point Recovery Anchor NUT SIDE IN FIRST, until GLR Hard-Point Recovery Anchor is flush with the forward edge of the motor tube. **AVOID MOVING THE JUST PLACED GLR HARD-POINT RECOVERY ANCHOR.**



IMPORTANT: Once the GLR Hard-Point Recovery Anchor is in place, hold the airframe upside down with the FORWARD end (eye of the bolt) pointing to the ground and the GLR Acme FinCan (AFT end) up. This prevents JB Weld from dripping down the motor tube section (which would prevent the insertion of a motor casing). If the GLR

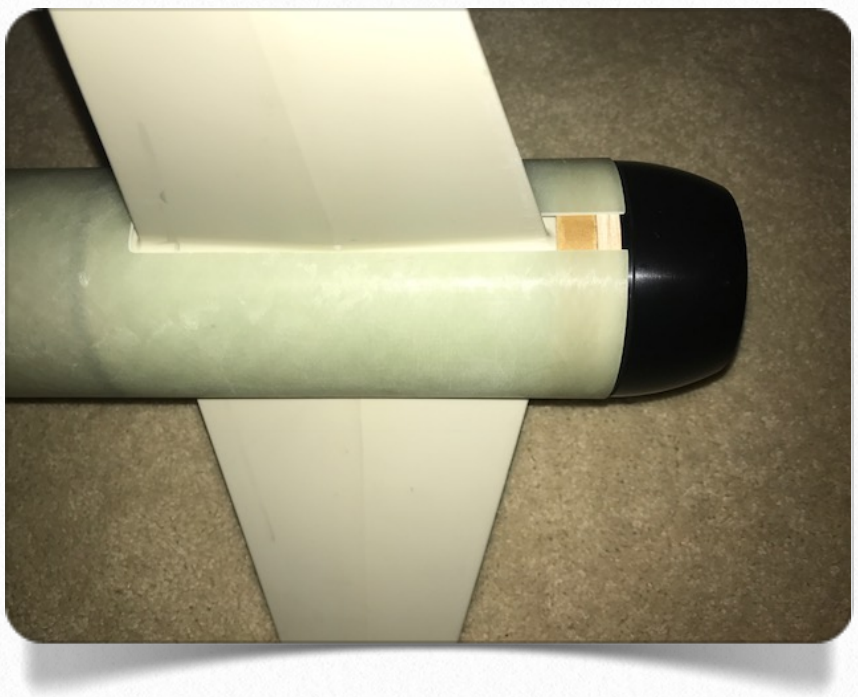
Hard-Point Recovery Anchor slides forward and is not stable in the airframe, place the airframe in a more horizontal position or secure it in place with some masking tape. Allow the J.B. Weld to fully cure, which can take several hours. It is important to look inside the motor tube and insure that the J.B. Weld is not dripping aft in the motor tube. If it is, you can tape some paper towel to the end of a dowel and insert the paper towel into the motor tube and gently remove any excess J.B. Weld.

B. Attaching the Airframe to the GLR Acme FinCan/Motor tube Assembly

1. ****** Before proceeding with this step, make sure that you have your GLR Kevlar® Shock Cord secured to the eye bolt of the GLR Hard-Point Recovery Anchor using the ⅛" quick connect.*****

After the Aeropoxy is completely set, run the GLR Kevlar® Shock Cord through the slotted air frame from slotted end to the solid end (Aft to Forward). Now slide the GLR Acme FinCan/motor tube assembly partway into the slotted airframe. The slotted area of the airframe is vulnerable to breakage before final assembly. If you crack the slotted area of the airframe you can easily repair it with Aeropoxy and it will work fine. Remember, the GLR Acme FinCan and motor tube assembly take the main load. Giant Leap Rocketry, LLC will only replace a broken airframe if you pay for it. Mix some Aeropoxy and apply it around the outer circumference of the forward centering ring. Slide the Airframe over the forward centering ring. Spread some Aeropoxy on the outer circumference of the middle centering ring. Continue to slide the Airframe over the middle centering ring. Spread some Aeropoxy on the outer circumference of phenolic spacer

and the rear centering ring and continue sliding



the airframe over both of these component**s,** until the airframe comes to rest up against the GLR Slimline Tailcone Motor Retainer.

2. You now will need to create a fillet to transition your fin to the airframe. As you can see in the photo, there is a gap around and behind the GLR Acme FinCan. Fillets can be created using a variety of materials, Giant Leap Rocketry,

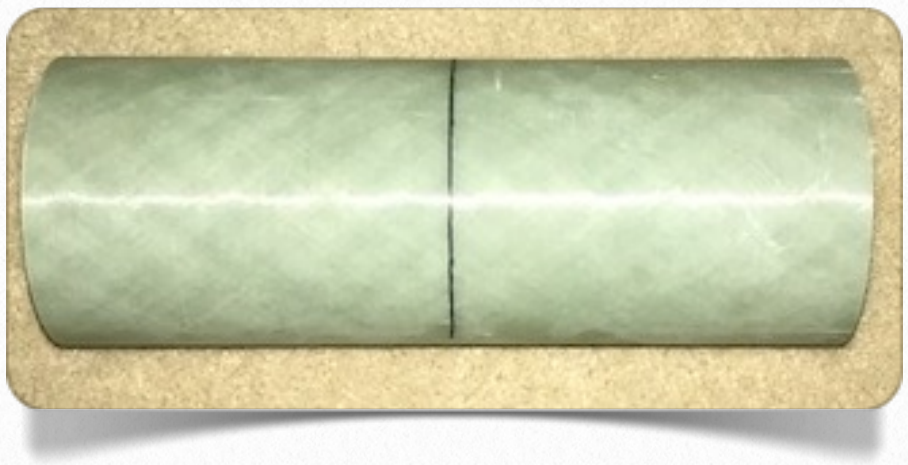
LLC recommends using Aeropoxy and GLR Glass-Miro-Spheres. Mix a generous amount of Aeropoxy. Add to this mixture GLR Glass-Miro-Spheres until you obtain a thick peanut buttery consistency. The ratio is typically 2 parts GLR Glass-Miro-Spheres to 1 part Aeropoxy. More important that the ratio however, is the thick peanut buttery consistency.

Fill the gap between the airframe and the GLR Acme FinCan, completely forward to aft. Using a gloved finger smooth the fillet to a clean transition from airframe to GLR Acme FinCan. Later you can sand any irregularities you may have. The

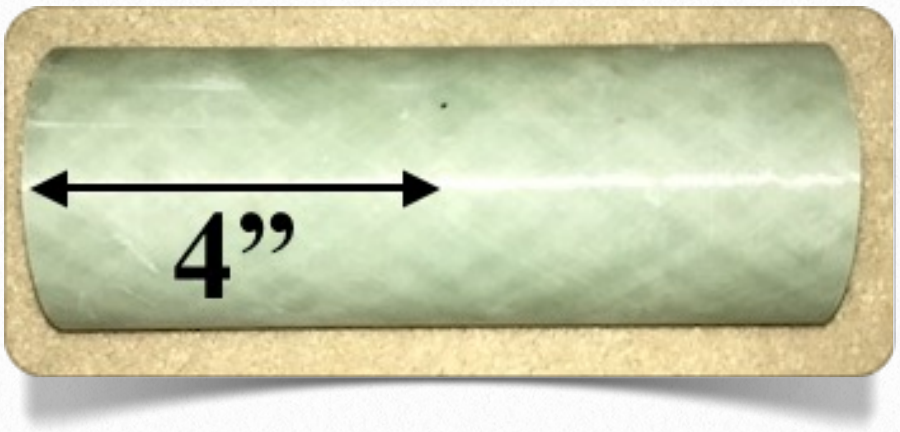
GLR Glass-Miro-Spheres add strength to the epoxy and can be sanded to a smooth surface. It is not uncommon for the fillet to sag or droop over time as it sets up; so you may have to repeat this step. Take great care with your fillets, the better and smoother you place the fillets, the less work is required later when you sand them in preparation for painting.

C. Building the Upper Section and Avionic Bay (GLR E-Bay)

1. Test fit 8” fiberglass coupler (avionics bay body) into the two 33”airframes and sand if necessary for a moderate slip fit.



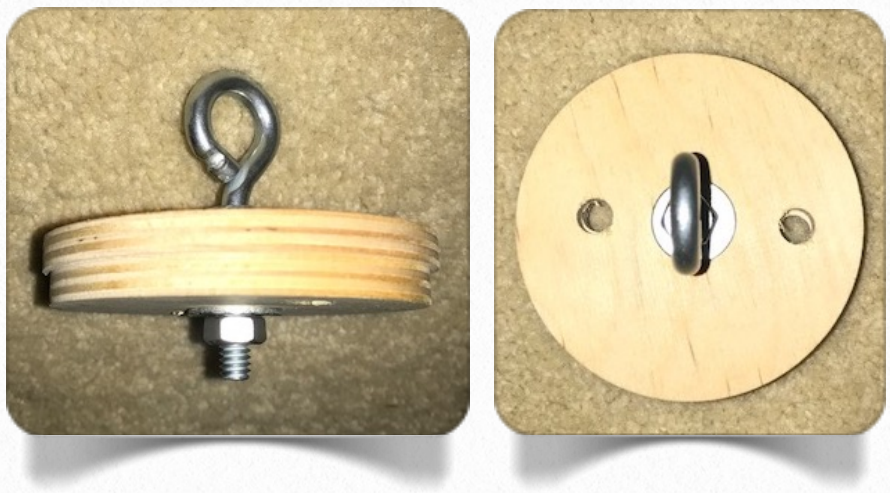
2. Sand the two internal portions of the bulkhead sets so that they go into the airframes eas-



ily, with absolutely no resistance. They should practically fall through the airframe. Make a pencil mark about 4” from one end of the coupler. That should leave about 4” on the other end. Wrap a piece of paper around the coupler with the edges lining up at the mark you just made, this will create a straight edge that you can then draw a line circumferentially around the coupler.

3. Prepare both eye-bolts by screwing one ¼” nut onto the eye-bolt and follow it on with a washer. On one bulkhead, insert an eyebolt through the middle hole, and secure it with a washer and nut on the backside.

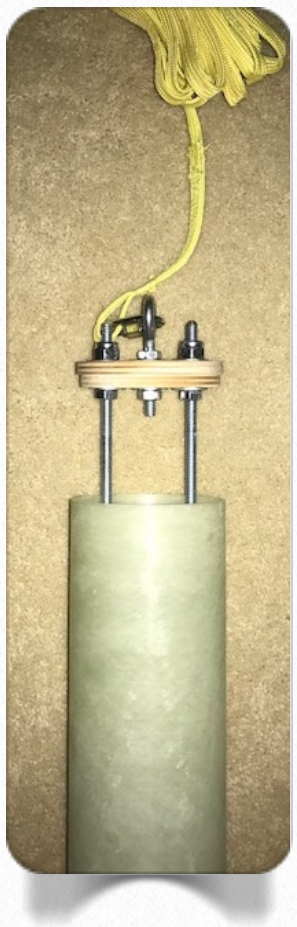
Make sure the ¼” holes line up with each other. Also, make sure the nut is tight on the eye bolt and secure it with a small drop of Aeropoxy. Do the same with the other bulkhead.



4. Secure the two pieces of all-thread in the two ¼” holes using a locknut and washer on the eyebolt side, and a nut and washer on the backside, as is seen in the photo. The all-thread, with the lock nut on it will stick out about ¾” from the bulkhead. Add a ⅛”quick-lock ring to the eye bolt and attach one section of the GLR Kevlar® Shock Cord to the quick lock. Set these pieces aside and we will get back to adhering the GLR E-Bay to the Forward airframe.

5. Apply Aeropoxy to the outer surface of the coupler. Spread the Aeropoxy up to the 4" mark on the coupler. (It is advisable not to spread the Aeropoxy all the way to the edge of the coupler but leave the ½" to ¼" of the coupler free of Aeropoxy. This will be valuable when you attempt to place the forward bulkhead onto the coupler. If you allow some of the Aeropoxy to get on the edge of the coupler the bulkhead will not fit flat on the coupler. Insert the coupler into the Aft end of the forward section of the airframe. **Again, Do NOT apply Aeropoxy to the inside of the airframe and make sure that any Aeropoxy that is on the edge of the GLR E-Bay coupler is cleaned off so that the bulkheads will fit flush against the coupler.** Hold upright or vertical until Aeropoxy sets completely. Do not turn upside down or some Aeropoxy will seep into the upper airframe. Tape the coupler in place if necessary to prevent it from dropping out while the Aeropoxy is setting. Let it set (upright) before handling it further. **Using alcohol and a paper towel, clean up any excess Aeropoxy. Do not leave any extra Aeropoxy on the GLR E-Bay or on the Aft edge of the airframe, or it will not seat properly between the two body tubes.** Let set until completely cured.

6. At this point it is time to build the electronics sled. There are a couple of ways to accomplish this step. I will share my preferred method. Place the tubing on the all-thread and center the sled under the tubing. Mark the sled on either side of the tubings with a Sharpie Marker®. With a power drill, drill four holes (just the size of the zip-ties you will be using) through the fiberglass sled table. Fasten each end of the tube to the sled table with zip-ties. An alternative method is to Aeropoxy the tube to the sled or even combine the two techniques for double redundancy. If you use Aeropoxy, you must sand the tubing slightly to insure an adhesion. At this point the sled is ready to accept



your electronics (sold separately).

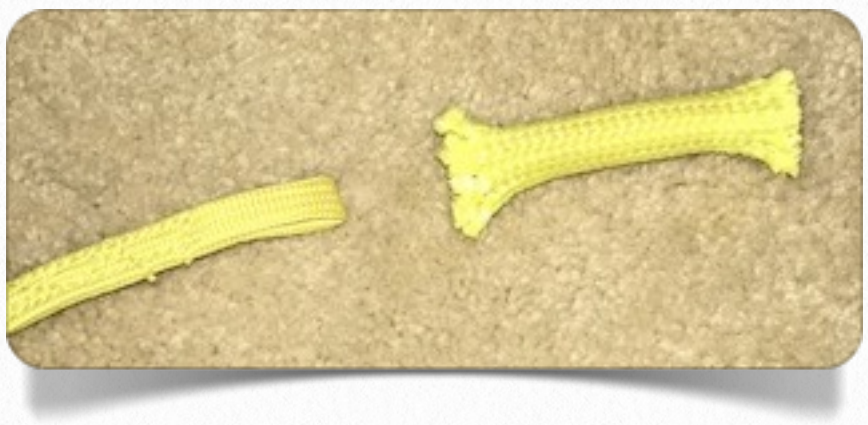
7. Now we will insert the bulkhead attached to the all-thread through the Forward opening in the forward airframe. The bulkhead must slide easily, and without any resistance. Sand the bulkhead as needed to achieve this smooth-sliding fit. Allow it to drop down until it is flush with the top of the GLR E-Bay coupler.

8. We will now pretend that you have attached your electronics to the sled. Take the sled and slide it onto the all-thread that is sticking out of the forward airframe. Line up the unused bulkhead with the all-thread and secure it with the wing nut and washer. Make sure that the bulkhead lines up smoothly with the end of the GLR E-Bay.

9. Attach a ⅛" quick-link to the remaining exposed eye-bolt on the GLR E-Bay.

C. Recovery System

1. We will begin with the Drogue recovery system that will be located in the Aft Airframe. You have been provided two small GLR Kevlar® Socks. Normally these GLR Kevlar® Socks are used to cover and protect nylon shock cords from the burn of the ejection charge; however, we have provided you with GLR Kevlar® Shock Cords in keeping with our commitment to provide the best quality products and to insure the continued and long use of your rocket. The purpose of these small pieces of GLR Kevlar® Sock is to prevent potential damage to the GLR Kevlar® shock cords during deployment of the recovery systems. When the Drogue and Main recovery systems deploy the GLR Kevlar® Shock Cords will rub against the sharp edge of the fiberglass airframe. Though the risk is small, we do not want you to see the GLR Kevlar® Shock Cords separate and fail due to the rubbing of the GLR Kevlar® Shock Cord against the airframe, this GLR Kevlar® Sock will reduce the risk of that happening.



2. To install the GLR Kevlar® Sock first pinch open the GLR Kevlar® Sock and push the forward loop of the GLR Kevlar® Shock Cord through the opening and slide it all the way down to the opening of the Aft section (the one with the GLR Hard-Point Recovery Anchor). When the GLR Kevlar® Sock is at its half way-point lying on the edge of the airframe, secure it with masking tape and/or Aeropoxy.

3. GLR provides a high quality GLR Kevlar® Parachute Heat Shield to protect your parachute from the heat generated that occurs as a result of the ejection charge deploying your recovery system when your rocket reaches apogee. We also provide a second GLR Kevlar® Parachute Heat Shield to protect the Main recovery system during the second deployment. Slide the first GLR Kevlar® Parachute Heat Shield onto the free end of the GLR Kevlar® Shock Cord that is attached to the GLR Hard-Point Recovery Anchor inside the Aft airframe. Let the GLR Kevlar® Parachute Heat Shield slide freely around. The GLR Kevlar® Parachute Heat Shield never gets anchored permanently to the line. **Do not** secure the GLR Kevlar® Parachute Heat Shield to the GLR Kevlar® Shock Cord; just let the GLR Kevlar® Parachute Heat Shield slide freely.

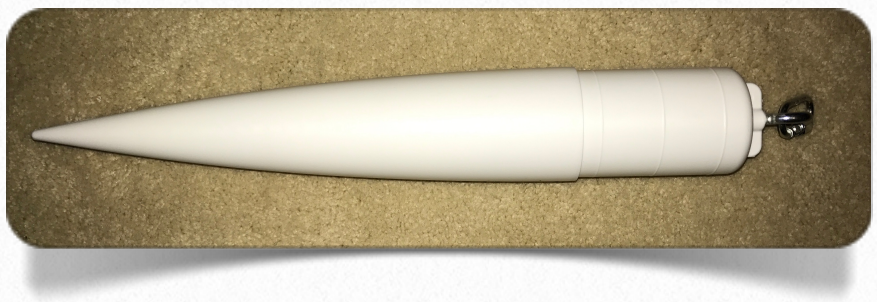
3. Slide the swivel on to the GLR Kevlar® Shock Cord at about 10 feet from the forward end of the Aft body tube. Tie a loop in the GLR Kevlar® Shock Cord where the swivel acts as the apex of the loop. The swivel will be the parachute attachment point.

Be sure that the GLR Kevlar® Parachute Heat Shield is below or is aft of the swivel.

Attach the free end of this GLR Kevlar® Shock Cord to the eye-bolt of the GLR E-Bay. The sequence is a follows: 33” airframe containing the GLR Hard-Point Recovery Anchor, GLR Kevlar® Shock Cord, GLR Kevlar® Parachute

Heat Shield, GLR Kevlar® Shock Cord, swivel, GLR Kevlar® Shock Cord, GLR E-Bay.

4. Attach the eye bolt to the Aft end of the GLR Olgive Nosecone as shown in the photo and attach a quick link bolt to the eye bolt.



5. Now we will connect the the GLR E-Bay / forward body tube and the GLR Olgive Nosecone. You will connect the pieces of the forward section in the same order as you did with the Aft section. Again, begin by sliding the

GLR Kevlar® Sock Cord onto the GLR Kevlar® Shock Cord and secure it at the edge of the forward airframe with masking tape or Aeropoxy. Slide the second GLR Kevlar® Parachute Heat Shield onto the GLR Kevlar® Shock Cord. Again, the GLR Kevlar® Parachute Heat Shield will slide freely on the GLR Kevlar® Shock Cord. Attach the second swivel to the GLR Kevlar® Shock Cord in the same fashion that the first swivel was attached, at the position 10 feet from the forward edge of the forward airframe. Attach the forward loop of the GLR Kevlar® Shock Cord to the quick connect bolt that is attached to the GLR Olgive Nosecone and tighten. Your rocket should now look like the photo.

6. Attach the parachutes to the swivels. Carefully remove the parachutes from their poly bags and hold the first parachute by the shroud lines. Center or "even" the lines at the apex held with your finger. Side the shroud lines to-

gether through the free end of the swivel and open the shroud lines enough to allow the parachute to slide through and knot down onto the swivel. Repeat this process with both para-

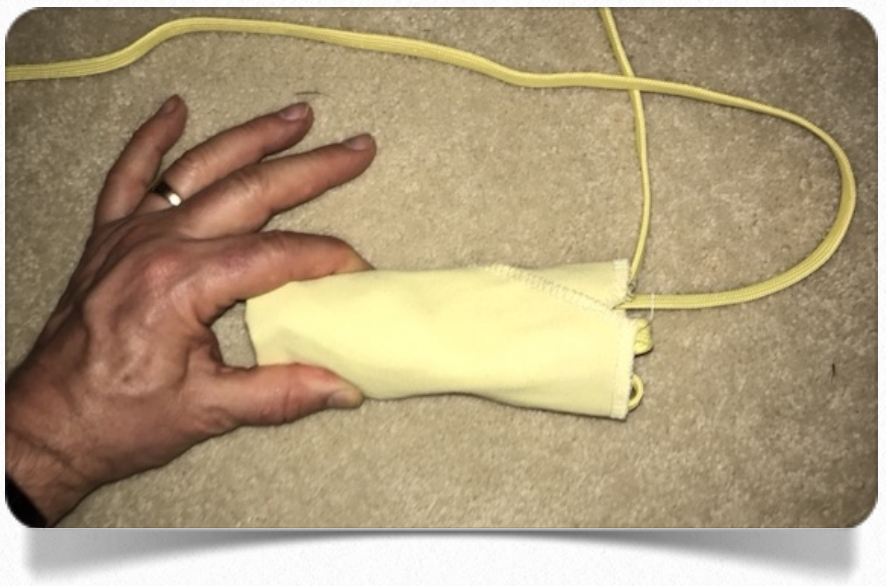
chutes. The Main (48”) parachute will go on the forward swivel - closest to the GLR Olgive Nosecone, the Drogue (18”) parachute will go on the Aft swivel - closest to the GLR FinCan. The attachments points of the swivels are critical. When the rocket descends you don’t want the airframes and GLR Olgive Nosecones banging into each other so there needs to be adequate and appropriate spacing of the parts. The final two photos in this manual will show how the rocket will look during the two deployments so you can see how all of the parts are interacting.

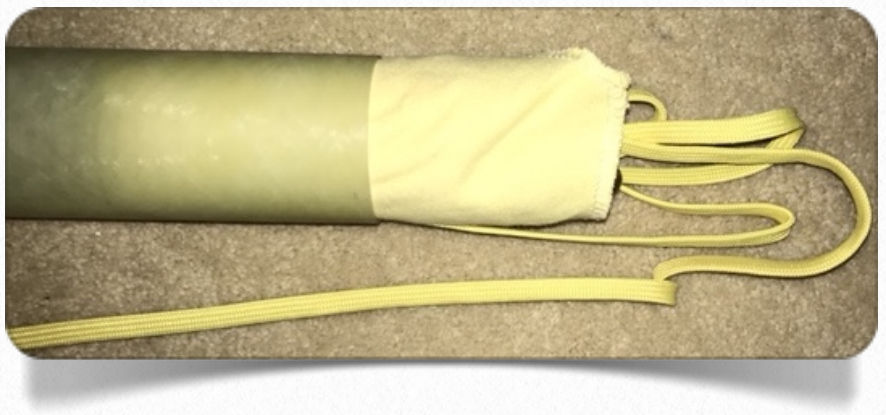
RECOVERY SYSTEM PREPARATION

1. To prepare the rocket for flight you must pack each of the parachutes into their respective airframe. Begin with the Main parachute. Insert most of the shock cord into the airframe first. Do this by creating accordion lengths of cord about 3-4" long, then insert into the tube. Leave about 3-4 feet of cord out.

2. Roll up the parachute and place on the GLR Kevlar® Parachute Heat Shield. Then accordion loop GLR Kevlar® Shock Cord the slide up the protector towards the chute. Do NOT slide the protector all the way to the chute, but instead stop about 1 foot away. Then lay some shock cord into the protector, then lay the chute in the pad too.

3. Fold the protector around the chute like a burrito and insert into airframe. You must position the heat pad so that it protects the chute from scorching. Should you find the “burrito” to tight for the airframe, shake some corn starch on the “burrito” and it should slide much easier.





4. Slide the GLR Olgive Nosecone into the airframe. GLR Olgive Nosecone should be snug but not tight into the airframe. If the GLR Olgive Nosecone is too loose, use a piece of mask-

ing tape on the shoulder of the GLR Olgive Nosecone to snug the fit. If too tight, sand gently with 240 grit sandpaper. Remember, the chute is deployed when HOT gases from ejection charge expand in the airframe, popping the nosecone off, so you want a snug fit - not to tight, not to loose.

5. Now pack the Drogue parachute by following the exact same steps and then connect the forward airframe to the aft airframe.

Attaching the GLR Rail Guides

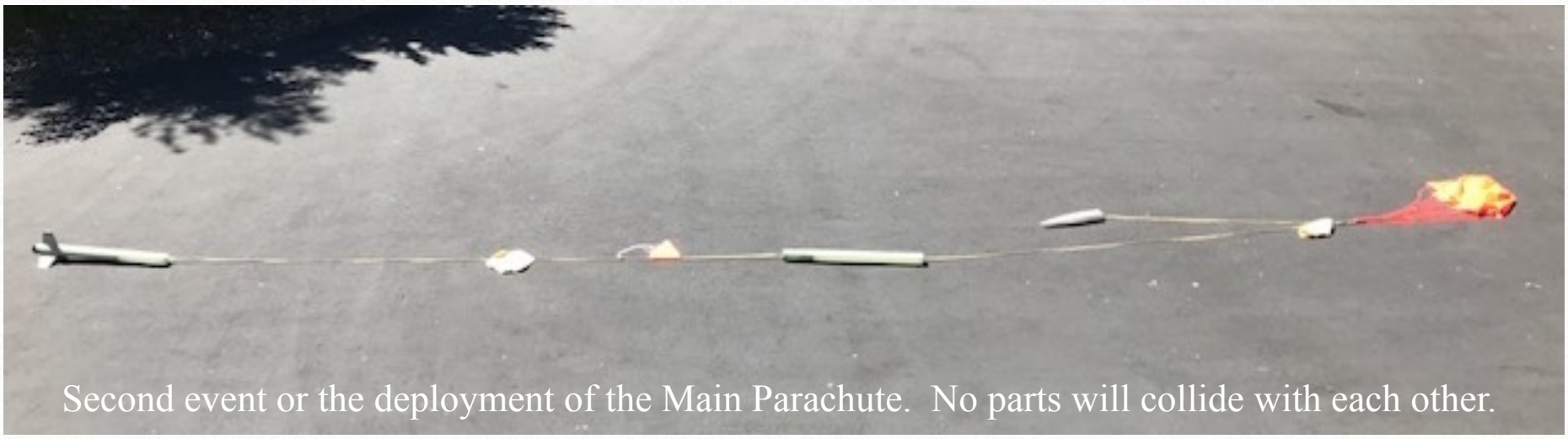
1. The rocket is now nearly ready to fly. We have just a few steps left, but they are critical steps. Begin by marking a line along the length of the airframe section. Angle aluminum (1" by 1”) is particularly helpful because when laid on

a tube, it allows one to mark a straight line on a curved surface. You may want to make it a permanent part of your rocketry toolbox. Make sure that the line is between two of the fins, otherwise the fins will interfere with the rail.

2. Measuring from base of the rocket to base of GLR Rail Guide, place one GLR Rail Guide about 15” forward from the aft end of the rocket and the other about 40" forward from the aft end of the rocket. Then trace each GLR Rail Guide on the airframe.

3. Lightly sand the attachment points on the airframe as well as the GLR Rail Guides for good adhesion. Mix J.B. Weld and attach first the GLR Rail Guide to the points on the airframe (see photo). While curing, sight down the tube to check for good alignment. It is also a good idea to place some tape on the GLR Rail

Initial event or deployment of the drogue parachute.



Second event or the deployment of the Main Parachute. No parts will collide with each other.

Guides lightly securing them to the airframe. The tape will prevent a “drooping” of the GLR Rail Guide system as the J.B. Weld sets.

Vent Holes in Airframe - - IMPORTANT!

REMOVE YOUR RECOVERY SYSTEM BEFORE COMPLETING THIS SECTION!!!

Because the air pressure is reduced at high altitudes, you will need to relieve the internal pressure in the recovery compartment; otherwise the nosecone will pop off the airframe during ascent. To avoid this, drill, **three** holes in your rocket. Using your angled aluminum draw a pencil line the length of the rocket - opposite the GLR Rail Guides. Drill one 3/32” hole just forward of the GLR Slimline retainer, another in the GLR E-Bay on either side of the airframe joint (take care not to damage the internal components of the GLR E-Bay) and another at the joint of the nosecone and airframe. This will place holes in the Aft and Forward airframes and one hole in the GLR E-Bay. These holes are absolutely necessary for a safe flight and deployment of the parachutes. Do not make the holes any larger or you will risk reducing the effectiveness of the ejection charge. The ideal locations for the vent holes would be 26”, 40” and 68” from the most aft position of the rocket or the end GLR Slimline Tailcone Motor Retainer.

Recommendations

1. It is recommended that you use shear pins to attach the nosecone to the airframe. Using tape, as described earlier is often fine; however, depending on the motor chosen, you could send this rocket up with so much power that the nosecone will vibrate loose or deploy when the drogue chute deploys. Using shear pins will reduce the risk of this damage-causing early deployment. Using nylon shear pins, either nylon screws or 0.060" Styrene rods from a hobby store will work. We recommend that you place a piece of paper around the nosecone / airframe interface with marks about 2.45" apart and then mark "witness lines" on both the nosecone and the airframe. When these "witness lines are lined up you can drill the appropriate hole size about 1 ½" from the nosecone / airframe. ALWAYS KEEP THE RELATIONSHIP OF THE WITNESS LINES! It is usually best to do this step AFTER the rocket is painted. Lining up the witness lines allows for a quick delivery of the shear pins. You will deliver and retrieve the shear pins with a needle nose plier and trim them with an end cutting plier.

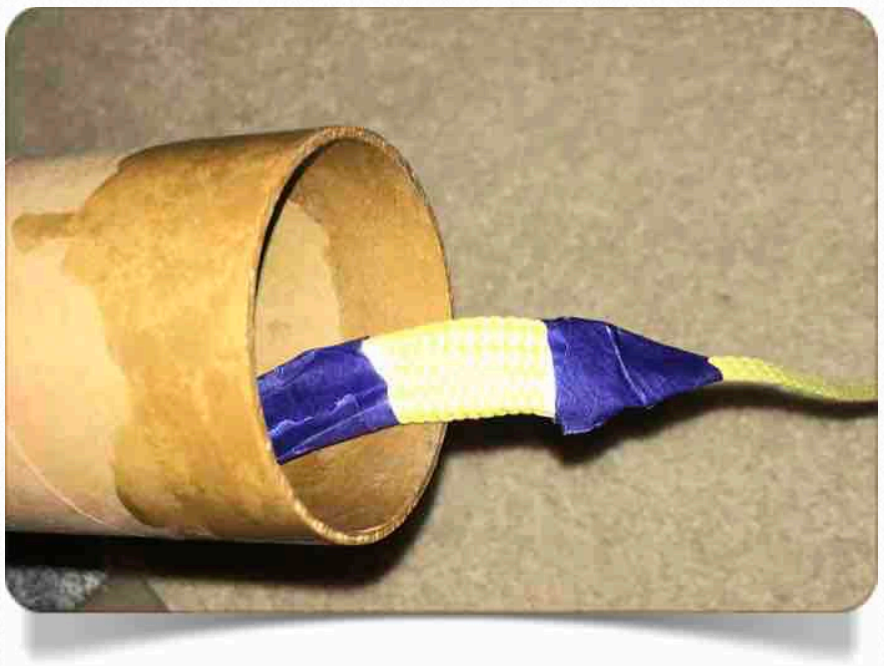
2. You may also want to sheer pin the E-bay to the airframe as well. This will reduce the risks of an early or inappropriate separation of the airframe.

3. With fiberglass, lightly sand the rocket with 240-400 grit paper, prime and sand.

4. Paint with a good quality paint like Krylon or an auto engine paint that will withstand the heat created by the friction during flight.

Finishing with Magnaframe

Protect the Rocket from Zippering.



Zippering is when the ejection charge is too great and the impact of the airframe and the shock cord is so violent that the shock cord literally rips or zips the airframe. To strengthen the Magnaframe airframe and reduce the potential for zippering you can place a small amount of cyanoacrylate (super glue) on the Forward ½" to 1" of the airframe. Spread the glue on the outside, inside and edge of the airframe end and let it set completely. Obtain from your local hardware store some DAP Plastic Wood. It doesn't matter the color. Prime the phenolic airframe with extra thick filler spray primer. With a gloved finger, extrude a small amount of the DAP Plastic Wood and trace the fine grooves of

the Phenolic Airframe and deposit the DAP Plastic Wood into the groves. Be consrervitive because all that is not in the grove must be sanded away. That said, the material does shrink a bit as it drys, so it must be left a little high. When the DAP Plastic Wood is completely set up, sand the airframe to a smooth finish.

Paint with a good quality paint like Krylon or an auto engine paint that will withstand the heat created by the friction during flight.

Safety Code and Waiver

Giant Leap Rocketry, LLC (herein referred to as GLR) has exercised reasonable care in the design and construction of our products and carefully inspects every product prior to shipment. However, since GLR cannot control the use of our products or information provided once sold, we cannot and do not warrant the products or information included herewith or the performance or results obtained by using our products or information. Our products and information are provided "AS IS". GLR. makes no warranties of any kind, either expressed or implied, including but not limited to, non-infringement of third party rights, merchantability, or fitness for a particular purpose with respect to the product and any related published materials. To the extent you use or implement our products or information in your own setting, you do so at your own risk. In no event will GLR be liable to you for any damages arising from your use or, your inability to use our products or information, including any lost or damaged property, or other incidental or consequential damages, even if GLR has been advised of the possibility of such damages, or for any claim by another party. Lack of care can be dangerous. By purchasing our materials you agree to the above conditions and to use our products at your own risk. You must abide by the following safety guidelines: (for more info, see www.tripoli.org The following is a condensed version of the NAR/TRA HIGH POWER SAFETY CODE. The complete code can be found in the handbooks of the organizations. 1. Only a person who is a certified flyer shall operate or fly a high power rocket. 2. Must comply with United States Code 1348,

"Airspace Control and Facilities", Federal Aviation Act of 1958 and other applicable federal, state, and local laws, rules, regulations, statutes, and ordinances. 3. A person shall fly a high power rocket only if it has been inspected and approved for flight by a Safety Monitor for compliance with the applicable provisions of this code. 4. Motors. 4.1 Use only certified commercially made rocket motors. 4.2 Do not dismantle, reload, or alter a disposable or expendable high power rocket motor, not alter the components of a reloadable high power rocket motor or use the contents of a reloadable rocket motor reloading kit for a purpose other than that specified by the manufacture in the rocket motor or reloading kit instructions. 5. A high power rocket shall be constructed to withstand the operating stresses and retain structural integrity under conditions expected or known to be encountered in flight. 6. A high power rocket vehicle intended to be propelled by one or more high power solid propellant rocket motor(s) shall be constructed using lightweight materials such as paper, wood, plastic, fiberglass, or, when necessary, ductile metal so that the rocket conforms to the other requirements of this code. 7. A person intending to operate a high power rocket shall determine its stability before flight, providing documentation of the location of the center of pressure and center of gravity of the high power rocket to the Safety Monitor, if requested. 8. Weight and Power Limits. 8.1 Ensure that the rocket weighs less than the rocket motor manufacturer's recommended maximum liftoff weight for the rocket motor(s) used for the flight. During pre-flight inspection, The Safety Monitor may request documentary proof of compliance. 8.2 Do not install a rocket motor or combination of rocket motors that will produce more than 40,960 newton-seconds of total impulse (4.448 newtons equals 1.0 pound). 9. Recovery. 9.1 Fly a high power rocket only if it contains a recovery system that will return all parts of it safely to the ground so that it may be flown again. 9.2 Install only flame resistant recovery wadding if wadding is required by the design of the rocket. 9.3 Do not attempt to catch a high power rocket as it approaches the ground. 9.4 Do not attempt to retrieve a high power rocket from a place that is hazardous to people. 10. Payloads. 10.1 Do not install or incorporate in a high power rocket a payload that is intended to be flammable, explosive, or cause harm. 10.2 Do not fly a vertebrate animal in a high power rocker. 11. Launching Devices 11.1 Launch from a stable device that provides rigid guidance until the rocket has reached a speed adequate to ensure a safe flight path. 11.2 Incorporate a jet deflector device if necessary to prevent the rocket motor exhaust from impinging directly on flammable materials. 11.3 A launching device shall not be capable of launching a rocket at an angle more than 20 degrees front vertical. 11.4 Place the end of the launch rod or rail above eye level or cap it to prevent accidental eye injury. Store

the launch rod or rail so it is capped, cased, or left in a condition where it cannot cause injury. 12. Ignition Systems. 12.1 Use an ignition system that is remotely controlled, electrically operated, and contains a launching switch that will return to "off when released.

12.2 The ignition system shall contain a removable safety interlock device in series with the launch switch. 12.3 The launch system and igniter combination shall be designed, installed, and operated so the liftoff of the rocket shall occur within three (3) seconds of actuation of the launch system. If the rocket is propelled by a cluster of rocket motors designed to be ignited simultaneously, install an ignition scheme that has either been previously tested or has a demonstrated capability of igniting all rocket motors intended for launch ignition within one second following ignition system activation. 12.4 Install an ignition device in a high power rocket motor only at the launch site and at the last practical moment before the rocket is placed on the launcher. 13. Launch Site. 13.1 Launch a high power rocket only in an outdoor area where tall trees, power lines, and buildings will not present a hazard to the safe flight operation of a high power rocket in the opinion of the Safety Monitor. 13.2 Do not locate a launcher closer to the edge of the flying field (launch site) than one-half the radius of the minimum launch site dimension stated in Table 1. 13.3 The flying field (launch site) shall be at least as large for a given impulse as stated Table 1 of the Tripoli safety code. See www.tripoli.org<http://www.tripoli.org/> . 14. Launcher Location 14.1 Locate the launcher more than 1,500 feet front any occupied building. 14.2 Ensure that the ground for a radius of 10 feet around the launcher is clear of brown grass, dry weeds, or other easy-to-burn materials that could be ignited during launch by the exhaust of the rocket motor. 15. Safe Distances. 15.1 No person shall be closer to the launch of a high power rocket than the person actually launching the rocket and those authorized by the Safety Monitor. 15.2 All spectators shall remain within an area determined by the Safety Monitor and behind the Safety Monitor and the person launching the rocket. 15.3 A person shall not be closer to the launch of a high power rocket than the applicable minimum safe distance set forth in Table 2 of the Tripoli Safety code. See www.tripoli.org <http://www.tripoli.org/> . 16. Launch Operations. 16.1 Do not ignite and launch a high power rocket horizontally, at a target, or so the rocket's flight path goes into clouds or beyond the boundaries of the flying field (launch site). 16.2 Do not launch a high power rocket if the surface wind at the launcher is more than twenty (20) miles per hour. 16.3 Do not operate a high power rocket in a manner that is hazardous to aircraft. 17. Launch Control. 17.1 Launch a high power rocket only with the immediate knowledge, permission, and attention of the Safety Monitor. 17.2 All per-

sons in the launching, spectator, and parking areas during a countdown and launch shall be standing and facing the launcher if requested to do so by the Safety Monitor. 17.3 Precede the launch with a five (5) second countdown audible throughout the launching, spectator, and parking areas. This countdown is given by the person launching the rocket, the Safety Monitor, or other flying site operating personnel. 17.4 Do not approach a high power rocket that has misfired until the safety inter-lock has been removed or the battery has been disconnected front the ignition system, one minute has passed, and the Safety Monitor has given permission for only a single person to approach the misfired rocket to inspect it. I understand and will at all times conduct myself with the understanding that the above stated risks and safety procedures; (a) are not necessarily all of the risks, (b) that even by observing the above procedures there remain RISKS OF INJURY OR DEATH from HIGH POWER ROCKETRY, (c) that the utmost in attention and prudence must be exercised at all times. By purchasing this product(s) from GLR, you agree to: (1) Assume all of the risks, damages, injury, or even death. (2) Assume the obligation to exercise the utmost care in pursuit of my activities at this event. (3) that you must be over 18 years old (for motor purchase and use). GLR cannot be held responsible for the failure of participants to abide by safety codes, rules, regulations, etc. By using the products, you agree to abide by these conditions.