

INSTRUCTION MANUAL

# Talon 4



GIANT LEAP ROCKETRY, LLC

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2831 SW Cornelius Pass Road

Hillsboro, Oregon 97123



# TALON 4

We provide more details to help with your rocketry education



## THE TALON 4 IS A FANTASTIC - LARGE ROCKET BUILD!!!

**PLEASE BE AWARE THAT THE FIRESTORM CAN (DEPENDING ON THE MOTER CHOSEN) GO OVER 8,000 FEET; THEREFORE A TRACKING SYSTEM IS RECOMMENDED FOR A SUCCESSFUL RECOVERY.**

At Giant Leap Rocketry, LLC hope you enjoy this rocket. The TALON 4 is 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 TALON 4 series is another in a long line of high quality kits from Giant Leap Rocketry, LLC.

The TALON 4 is the first of our nearly complete kits. At this level of rocket building and design most rocketeers like some choice in the recovery components of the rocket. The TALON 4 comes with everything you need to build the rocket. All you need to provide is the parachute. In the parts list you will find recommended parachutes. Should you need assistance do not hesitate to reach out to our fantastic GLR team.

# TALON 4 is a no compromise duel deploy rocket. This rocket is for the more experienced flyer. You have chosen the best and most beautiful 98mm rocket on the flight line!!!

The TALON 4 comes with a 54mm motor mount so that it can be flown on powerful J and K motors. These will propel the TALON 4 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 8" or more forward of the center of pressure (CP), with 9" 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:*

Dry Wt. Mass (no motor load) 198 oz. (Please allow for slight variation in weight due to difference in epoxies and paint thickness).

Length: 92"

Outside Diameter O.D. 4.02"

Inside Diameter I.D. 3.9"

CP= 65" aft from nosecone tip

CG should be less than 57" aft of nosecone tip

Motor Mount: 54mm (29&38 mm with optional 54/38 mm adapter)

**Recommended 38mm motors: Requires the optional SLIMLINE 54/38mm adapter**

**Aerotech:** H123, H148, H242, I161, I357, I300, I211, I285, I284, I366, 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 ROCK-ETRY, LLC. YOU ARE TOTALLY RE-SPONSIBLE FOR THE SAFE USAGE OF THIS ROCKET. FOLLOW ALL PERTI-NENT SAFETY CODES AND DIREC-TIONS 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 PROP-ERLY SO AS NOT TO OVERLOOK AN IM-PORTANT STEP DURING THE EXCITE-MENT 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:**

### **TALON 4 BODY PARTS**

1- 98mm Nose Cone

1- 98mm Tailcone -Slotted

1- 98mm 36" Fiberglass Airframe Slotted  
-Tagged to Match the Talecone

1- 98mm 24" Fiberglass Airframe

1- 54mm 36" Phenolic Motor Mount Tube

1- 98mm/54mm Centering Rings

3- Small 0.093" Fiberglass Pre-cut Fins

3- Large 0.093" Fiberglass Pre-cut Fins

1- 54mm GLR Slimline Retainer Set

1- 98mm R Rail Guide Pair

6 - 4" Frackets

6 - 8" Frackets

### **AV-Bay Parts:**

1- 98mm 8" Fiberglass Coupler

2- 98mm Bulkhead (Pre-Drilled)

2-98mm Coupler Bulkhead (Pre-Drilled)

1- 6.75" X 3.25" Fiberglass Sled

2- 4" X 1/4" Plastic Tubes

2- 1 X 1/4" Eye Bolt

2- 10" All-Thread

2- 1/4" Lock Nut

6- 1/4" Nut

2- 1/4" Wing Nut

10- Washers

**Recovery Mount:**

2- 98mm/54mm Centering Ring  
(Pre-Drilled)

1- 1/4" Eye Bolt

2- Washers

1- Lock Nut

**Recover Components:**

4- 1/8" Quick Link

2- 1,000 lb Swivels

2- 15' 1/4" GLR Kevlar Double Loop Shockcord

2- 2" x 1/2" GLR Kevlar Tube Cord

2- Medium Sized GLR Kevlar Parachute Protec-  
tor

1- 24" Wooden Dowel

Online Assembly Instruction Booklet



**Optional Parts to Consider:**

72" GLR TAC1 Parachute

24" GLR TAC1 Parachute

4-way Reduced Momentum Parachute Slider as  
seen in photograph. Free with the Purchase of a  
72" GLR TAC1 Parachute

98mm GLR Slimline Threaded Retainer

Retainer Adapter 54mm/38mm

1- 12" Motor Mount Tube

1- 1" Spacer

Retainer Adapter 38mm/29mm

1- 12" Motor Mount Tube



1- 1" Spacer

## Disposable Supplies Needed by the Builder to Assemble This Kit:

*30 Minute Epoxy or GLR 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)*

*Glass-Mirco-Spheres*

*Masking Tape*

*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.

## ASSEMBLY

### A. Building the Motor tube Assembly

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



1. Test fit the GLR Slimline Motor Retainer on the Aft end of the 54mm motor tube. Be sure that the GLR Slimline Motor Retainer goes onto the motor tube and seats completely. If the GLR Slimline Motor Retainer is seated completely, you will not have any of the epoxy bonding rings of the GLR Slimline Motor Retainer exposed and the motor tube will rest on the the built-in shoulder stop of the GLR Slimline 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 it 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 Place the GLR Slimline Motor Retainer on the motor tube and draw with a pencil, a line



at the forward end of the GLR Slimline Motor Retainer and then remove the retainer from the motor tube.

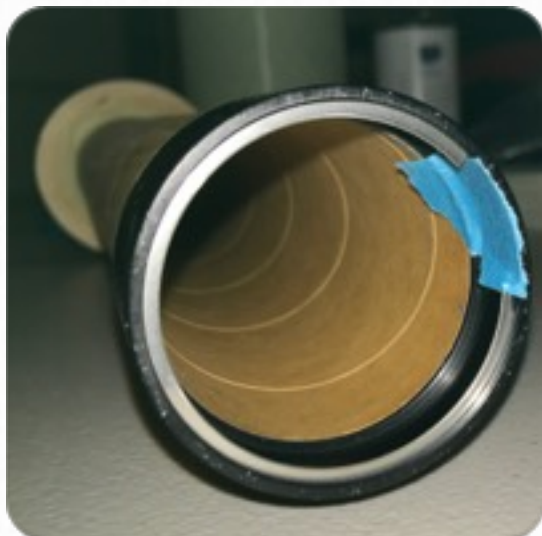
3. Mix some J.B.Weld (and only J.B Weld - do not use epoxy!) and apply it to the aft end of the motor tube, to the pencil mark of the motor tube.



Then, install the

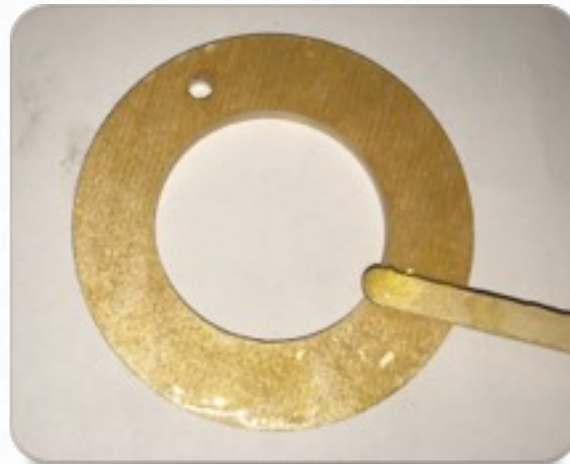
GLR Slimline Motor Retainer onto the motor tube. Turn the GLR Slimline Motor Retainer while you are installing it in order to spread the J.B. Weld. **Be sure that you only apply the J.B. Weld to the motor tube and NOT to the inside of the GLR Slimline Motor Retainer.** This is important because if you apply J.B. Weld to the GLR Slimline 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 Motor Retainer, making it impossible to insert a motor correctly. It is also

a good idea to place the snap ring into the slot and tape off the exposed slot of the GLR Slimline Motor Retainer while seat-



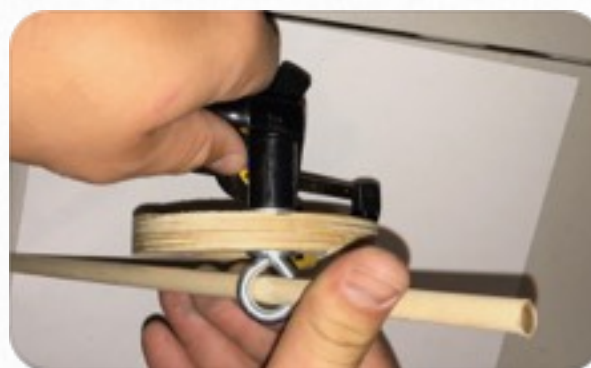
ing the GLR Slimline Motor Retainer onto the motor tube as this will prevent excess J.B. Weld from seeping into the snap ring area. **MAKE SURE THE GLR SLIMLINE MOTOR RETAINER IS SEATED ALL THE WAY ONTO THE MOTOR TUBE.** Remove the snap ring, clean up any excess epoxy and let it set up completely.

4. There are two centering rings that make up the Forward Centering Ring assembly. Both



will have a hole drilled in them for the eye-bolt assembly, which will secure part of your recovery system. Mix a portion of

GLR Aeropoxy and place on the the surface of



both of the Forward Centering rings. Place the eye-bolt assembly and tighten the nut completely. There

is a washer on both sides of the centering ring. (It is advisable to use gloves when using epoxies). Place a clamp opposite of the ring to insure that the rings are perfectly together and





symmetrical. This is critical or the rings will not enter the airframe correctly, nor will they go onto the motor tube correctly. Let the GLR Aeropoxy set up completely.

Now you will place the Forward Centering



Ring onto the motor tube. Measure from the forward end of the motor tube 2" and place a



mark. Using a piece of paper wrapped around the motor tube, centered on the mark that you made at 2", draw a line around the motor tube. Place multiple layers of masking tape on the line that was drawn. This will act as a stop when you seat your Forward Centering Ring. Place a generous amount of JB Weld around the motor tube the thickness of the Forward Centering Ring. Do not use epoxy for this union.

This centering ring will take a tremendous amount of force when the recovery system deploys and JB Weld is significantly stronger. Slide the Forward Centering Ring onto the motor tube, twisting as you seat it. You will notice that the eye-bolt is close to the forward end of

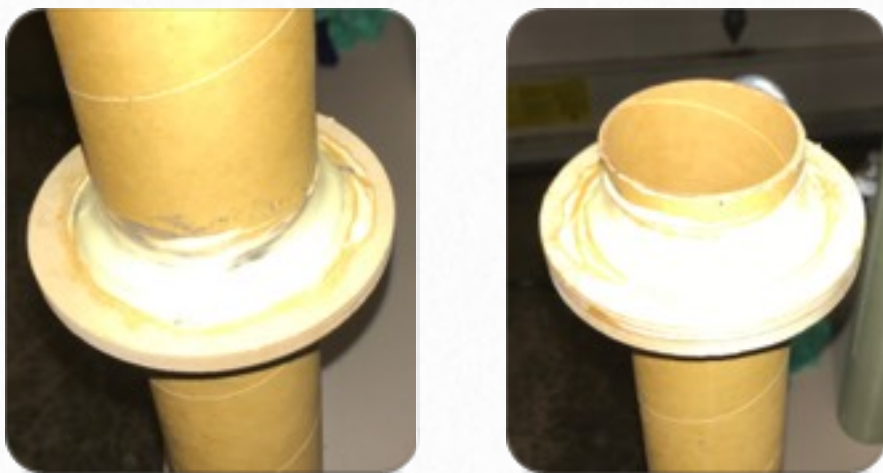


the tube and that is correct. Make sure that the Forward Centering Ring is level and parallel to the forward opening of the motor tube. Allow the JB weld to cure completely.

5. Now that the Forward Centering Ring is fully cured it is time to place the Middle Centering Ring. This Centering Ring is placed exactly like the Forward Centering Ring except you will place the Middle Centering Ring 15"

from the Aft opening of the Airframe or the GLR Slimline Retainer previously welded to the motor tube. Make sure that the Middle Centering Ring is level and parallel to the opening of the motor tube. Allow the JB weld to cure completely.

6. It is now very important to place a thick fillet on the Forward and Aft ends of both of the



Centering Rings to secure the Centering Rings to the Airframe. Fillets can be created using a variety of materials, Giant Leap Rocketry, LLC recommends using GLR Aeropoxy and GLR Glass-Micro-Spheres. Mix a generous amount of Aeropoxy. Add to this mixture GLR Glass-Micro-Spheres until you obtain a thick peanut buttery consistency. The ratio is typically 2

parts GLR Glass-Micro-Spheres to 1 part GLR Aeropoxy. More important that the ratio however, is the thick peanut buttery consistency. Create a large fillet between the motor tube and the Centering Rings by placing a liberal amount of material on both the Forward and Aft surfaces of the Centering Rings and allow them to completely set up.

### B. Securing the Motor Tube to the Airframe and Talecone

**Warning:** Once everything is set up and cured your motor tube is ready to be inserted and glued to the airframe and tailcone. This is the most difficult step in the entire build and it is important that you take great care in following the directions exactly.

1. Line up the airframe and the tailcone. Each airframe and tailcone are paired and cut together. You will notice as you put the tailcone and airframe together there is a number or letter





on each piece. The number or letter should be the same. You will also see a large X at the interface of the two pieces. This is the position in which each set of fin slots were prepared and you must maintain this position if your fins are to line up true to one another.

You will first place the motor tube into the fiberglass airframe. Dry fit the motor tube several times into the airframe. It should slide smoothly but snugly in and out and line up with the end of the tailcone. You may need to carefully remove a small amount of the internal diameter of the end of the tailcone if need. Please be careful, the motor tube is meant to be snug-fit. Once you feel that it is correct, place the tailcone onto the motor tube and connect the tailcone to the airframe with the motor tube in place. Once you can line the X up on the airframe and tailcone you are ready to insert the motor tube for real.



Since the airframe is a high quality fiberglass you will be able to see through the fiberglass and see the Centering Rings. On the outside

of the airframe make a mark with a pencil where the Centering Rings are. Disassemble the motor tube from the tailcone and airframe.

**Warning:** If you have large hands and you cannot comfortably fit your hand into the 4" airframe you will want to attach your quick link and GLR Kevlar Shock Cord to the eye-bolt at this point. This is not however recommended because it is very difficult to keep the GLR Aeropoxy from contaminating your GLR Kevlar Shock Cord. So if you can wait until later to attach the quick link, that is best.

Using the included wooden dowel, you will now fabricate a custom glue stick. You can use just the dowel if you would like; however you



may find it easier to keep your dowel clean if you take this additional step. Tape a wooden frozen treat stick to your wooden dowel. This gives a nice edge to smear the GLR Aeropoxy and keeps your dowel clean. Place a piece of tape on the dowel so that the tip of your stick corresponds to the line drawn on the airframe indicating where the centering rings are located. You will have two measurements on this one dowel because you will be placing GLR



Aeropoxy inside the airframe in two locations: the luting position of the Forward and Middle Centering Rings. Mix a very generous portion of GLR Aeropoxy. Place the GLR Aeropoxy on the inside of the airframe at the level that you marked for the Forward Centering

Ring. Once you have a good thick coating of GLR Aeropoxy circumferentially at this location, insert the motor tube about half way into the airframe. When it is inserted thus, place GLR Aeropoxy on the inside of the airframe at the level where you marked the Middle Centering Ring. Once you have a good thick coating of GLR Aeropoxy circumferentially at this location insert the motor tube the rest of the way until the motor tube is inserted completely and the Centering Rings line up with the lines that you drew on the outside of the airframe. Place the tailcone onto the motor tube to make sure that the GLR Slimline Motor Retainer lines up perfectly with the Aft opening of the tailcone. Adjust the motor tube in or out as needed to insure that the GLR Slimline Motor Retainer lines up perfectly with the Aft opening of the tailcone. **DO NOT EPOXY THE TAILCONE TO THE AIRFRAME AT THIS TIME.** Let the GLR Aeropoxy cure completely.

2. Sand the inside of the slotted airframe and the corresponding area of the tailcone. Place some masking tape on the inside of the GLR Slimline Motor Retainer or stuff it with paper towel - this will prevent epoxy from entering this critical area. Apply a generous amount of GLR Aeropoxy to the tailcone. **DO NOT INSERT THE TAILCONE INTO THE AIRFRAME JUST YET.** Also mix a generous portion of JB Weld and place it on the outside of the GLR Slimline Motor Retainer. Carefully guide the tailcone over the motor tube and into the airframe. **MAKE SURE THAT THE X LINES UP ON THE TAILCONE AND THE AIRFRAME.** Take care to remove the paper towel or masking tape from the GLR Slimline Motor Retainer and clean the GLR Slimline Motor Retainer with a solvent to insure that no JB Weld has contaminated the internal surface of the GLR Slimline Motor Retainer.

3. Set the rocket upright resting on the tailcone. Mix some GLR Aeropoxy and add some GLR Glass Micro-spheres. In this mix we are not going for the typical peanut butter consistency, but rather we want a thick but flowable mixture. When you are happy with the consistency, you will pour the GLR Aeropoxy / GLR Glass Micro-spheres mixture into the forward opening of the slotted airframe. The idea is to pour in enough epoxy to cover the entire Forward Centering Ring. Be careful not to put in



so much that you can not connect the D-ring to the eye-bolt later on.

### C. Attaching the Fins

We at Giant Leap Rocketry believe you are going to love this next step. We have innovated a device that adds strength to the fin / airframe connection and incredible ease to the fin mounting process. No longer will you need to use “fin mounting templates” to place your fins. GLR has provide in this kit our exclusive 4” GLR Frackets.

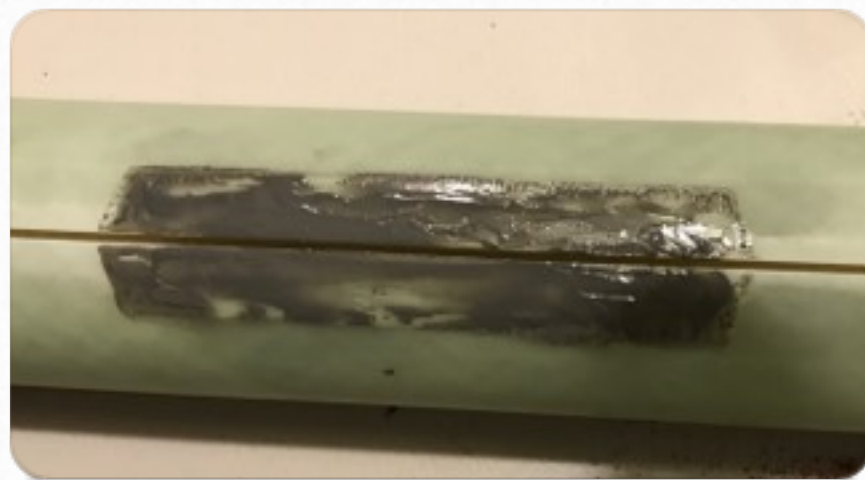
1. Place the forward (large) fin into the forward slot in the airframe. All fins are inserted with the rounded or curved portion of the fin forward. Insure that the fin is all the way forward in the slot. Once you have successfully preformed your dry fit, remove the fin. Mix some GLR Aeropoxy and place it on the edge of the fin. Insert the fin into the slot until the fin makes contact with the motor tube and trans-

fers the GLR Aeropoxy to the motor tube. You will want to repeat the process 3-5 times to insure that you have good amount of GLR Aeropoxy contacting the fin / motor tube interface. In addition you can drip some GLR Aeropoxy through the slot.

2. Now you are ready to attach the GLR Frackets to the airframe and fin. The Frackets are optional but allow increased rigidity and strength to the large fins. Take two 8” GLR Fracket and place on the airframe “sandwiching” the fin. On the forward fins, the GLR Fracket should be placed between 2” and 3” from the forward edge of the fin; on the aft fins the forward portion of both GLR Frackets should line up



evenly with the forward tip of the fin. In both cases insure that the curved portion of the GLR



Fracket is on the airframe and the flat portion is against the fin. As you press the GLR Fracket firmly against the airframe and fin, you will notice the fin will straighten up and true itself to its 90 degree, correct position. With a pencil, outline the GLR Fracket on both the airframe and fin. Sand these areas to insure a strong bond of the JB Weld. You should also sand the bonding surface of each of the GLR Frackets. Mix some JB Weld and place on both planes of the bonding surface of the GLR Frackets and in the area of the airframe that you marked for the GLR Fracket. Once satisfied, place the fin in the slot and place both GLR Frackets in place



on either side of the fin. Remove any excess JB Weld with a solvent and a paper towel and secure the GLR Fracket in place with clamps until fully cured.

3. On the aft fins you will repeat the above steps with this one modification: the forward portion of both GLR Frackets should line up

evenly with the forward tip of the fin. The bond to the fiberglass is much greater than the bond to the plastic tailcone, so take advantage of all of the airframe that you have.

4. Repeat this step with all remaining fins. For added strength and security, once the JB Weld is set you can drill two holes in each GLR Fracket about  $\frac{3}{4}$ " from the end and drive a bolt through and secure the bolt, using a lock washer and nut. Should you choose to drill through the GLR Fracket on the wing that is attached to the airframe or tailcone you will have to use a small wood screw to attach it. Make sure the hole is small enough so that the wood screw is slightly difficult to insert and make sure the wood screw is not so long as to enter and damage the motor tube.

5. You now will need to create a fillet to transition your fin to the airframe. As you can see there is a gap around and behind the fin. As described earlier, fillets can be created using a variety of materials, Giant Leap Rocketry, LLC



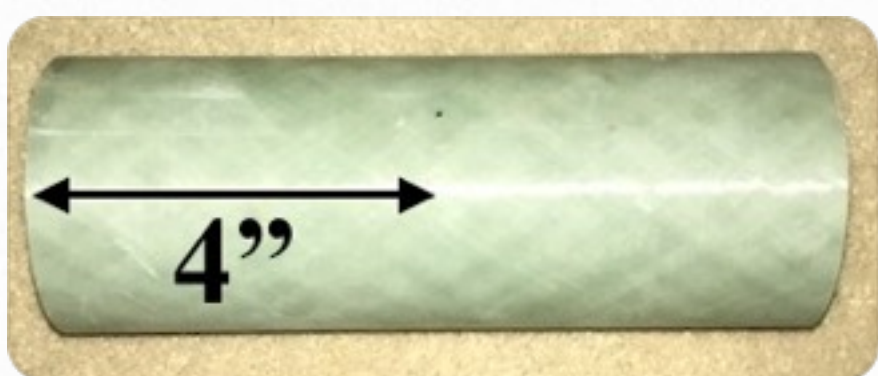
recommends using Aeropoxy and GLR Glass-Micro-Spheres. Mix a generous amount of



Aeropoxy. Add to this mixture GLR Glass-MicroMicro-Spheres until you obtain a thick peanut buttery consistency. The ratio is typically 2 parts GLR Glass-Micro-Spheres to 1 part Aeropoxy. More important than the ratio however, is the thick peanut buttery consistency. Create a fillet between the airframe and the fin, completely, forward to aft. Using a gloved finger smooth the fillet to a clean transition from airframe to the fin. We also advise you to create a fillet circumferentially around the GLR Frackets. This will streamline area and create less drag. Later you can sand any irregularities you may have. The GLR Glass-Micro-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.

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

1. Test fit 8" fiberglass coupler (avionics bay body) into the two 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 easily, with absolutely no resistance. They should practically fall through the airframe. Make a pencil mark about 4" from one end of the cou-

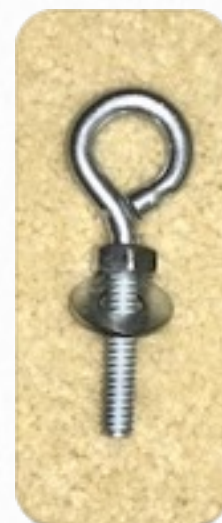


pler. That should leave about 4" on the other end. Wrap a piece of paper around the coupler



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 1/4" 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 1/4" 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 1/4" holes using a locknut and washer on the eye-bolt 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 3/4" from the bulkhead. Add a 1/8" 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 1/2" to 1/4" of the coupler free of Aeropoxy. This will be valuable

when you attempt to place the forward bulkhead onto the coupler. If you allow the GLR Aeropoxy to get on the edge of the coupler when you attempt to place the bulkhead 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 GLR 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



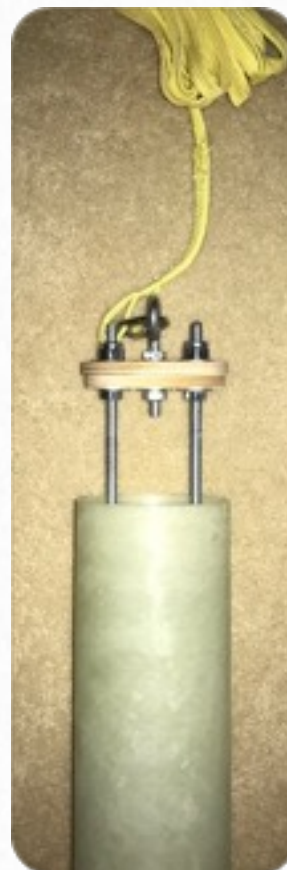
GLR Aeropoxy is setting. Let it set (upright) before handling it further. **Using alcohol and a paper towel, clean up any excess GLR Aeropoxy. Do not leave any extra GLR Aeropoxy on the GLR E-Bay or on the Aft edge of the airframe, or it will not seat properly between the two body tubes.** Let set until 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



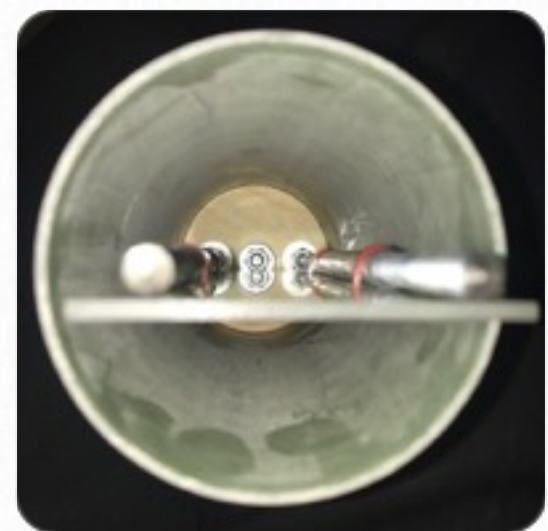
on either side of the tubings with a Sharpie Marker®. With a power drill, drill four holes through the fiberglass sled table. Make sure that the holes are just the size of the zip-ties you will be using. Fasten each end of the tube to the sled table with zip-ties. An alternative method is to GLR Aeropoxy the tube to the sled or even combine the two techniques for dou-

ble redundancy. If you use GLR Aeropoxy, you must sand the tubing slightly to insure a proper adhesion. 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 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



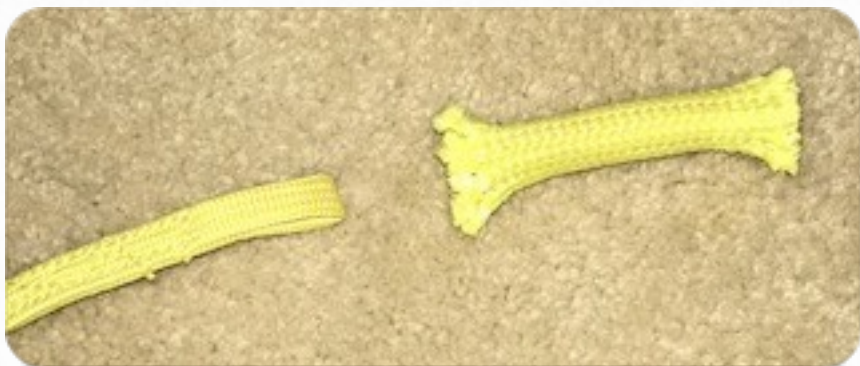
sticking out of the forward airframe. Line up the unused bulkhead with the all-thread and secure it with the wing nut and washer. Make sure that the bulkhead lines up smoothly with the end of the GLR E-Bay.



9. Attach a 1/8" quick-link to the remaining exposed eyebolt 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 instead of masking tape 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 the GLR Kevlar® Shock Cords to 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 Forward opening of the Aft section. Attach the GLR Shock Cord to the d-ring that you placed on the eyebolt that is attached to the Forward Centering Ring of the motor tube. With one hand pull tight on the GLR Kevlar® Shock Cord and with the other hand slid the GLR Kevlar® Sock until is at its half way-point lying on the edge of the airframe, secure it with making 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 eye-bolt that is attached to the Forward Centering Ring 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. Attach the free end of the GLR Kevlar® Shock Cord to the exposed eyebolt that is attached to the GLR E-Bay

3. 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.



4. Now we will connect the eyebolt of the forward end of 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 GLR 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 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 minus the parachutes. We will address the parachutes now.

5. The parachutes recommended by GLR, come pre-sewn to the swivels. Giant Leap Rocketry, LLC Recommends a high quality, large and strong parachute like the 72" GLR TAC1 Parachute for your main deployment and



the 24" GLR TAC 1 Parachute for your drogue deployment. These parachutes are made to the most stringent standards. They are a high quality parachute for high-end applications. We think it's the strongest and most stable chute in the industry.

The TAC 1 is Tear-resistant - All seams are reinforced with nylon webbing.

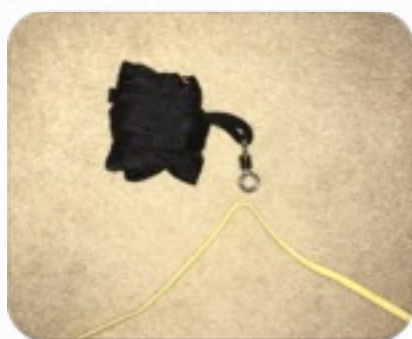
The TAC 1 is Strong - 1/2" mil spec nylon (1400 lbs test) all around the canopy.

The TAC 1 is Lightweight - 1.1 oz silicone-coated low-porosity ripstop nylon.

The TAC 1 has a No Tangle Design - only four suspension lines! The TAC1 comes with 1500# test swivel for tangle-free descents.

It doesn't get any stronger.

3. At this point we will assume that you have acquired your parachutes and we will now describe how to install them.



At about 10 feet from the forward end of the Aft body tube, pinch the GLR Kevlar® Shock Cord and slide the GLR Kevlar®

Shock Cord through the open end of the swivel that is attached to the



GLR TAC 1 parachute, form a loop and wrap that loop around the GLR TAC 1 parachute and then tighten the knot that is formed around the swivel. Remove the Main (72")

TAC 1 parachute from its poly bags and hold it by the swivel. Attach the 4-way Reduced Momentum Parachute



Slider (Optional or Free with the Purchase of the GLR 72" TAC1) to the shroud lines of the GLR 72" TAC 1 parachute. The GLR Reduced Momentum Parachute Slider comes with 4 "keyring" style connectors. Each of these ring connectors are attached to the shroud lines of the parachute. The purpose of the GLR Reduced Momentum Parachute Slider is to slow the deployment of the Main parachute by not allowing the shroud lines to completely expand



all at once, thus reducing the amount of force that is experienced on the rocket. This makes for a smooth, reduced momentum, safer deployment of the main parachute.

Spread out the parachute and attach one ring from the GLR Reduced Momentum Parachute Slider to one shroud line of the GLR TAC 1 and repeat this for each of the four rings.

- MAKE SURE THE SHROUD LINES DO



NOT GET TWISTED -

Once the 4-way Reduced Momentum Parachute Slider (Optional) is in place attach the Main (72") GLR TAC 1 parachute about 10 feet from the forward end of the forward body tube. Please remember the Main (72") parachute will go on the forward GLR Kevlar® Shock Cord - closest to the GLR Olgive Nosecone, the Drogue (24") parachute will go on the Aft GLR Kevlar® Shock Cord - closest to the fins. The attachments points of the swivels are critical - 10' from the airframe. 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.

**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 as follows: slotted airframe containing the motor tube, GLR Kevlar® Shock Cord, GLR Kevlar® Parachute Heat Shield, GLR Kevlar® Shock Cord, swivel, GLR Kevlar® Shock Cord, GLR E-Bay.

## 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



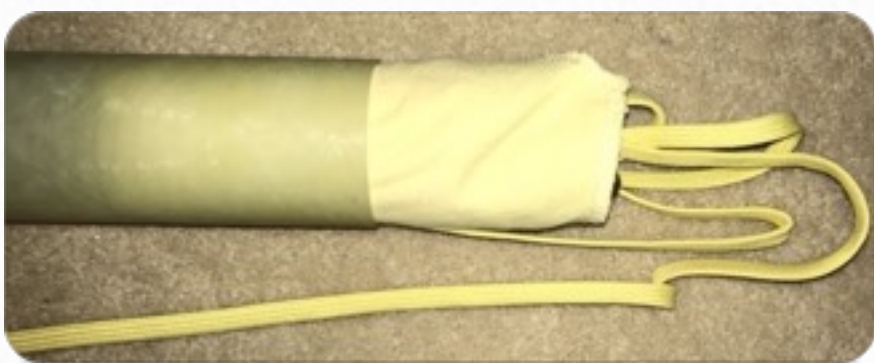


cord about 3-4" long, then insert into the tube. Leave about 3-4 feet of cord out.

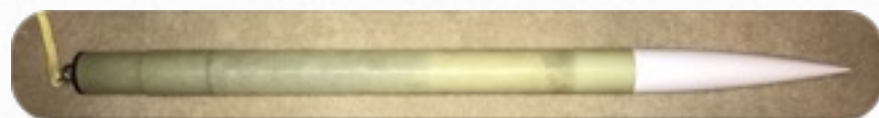
2. Roll up the parachute and place it next to the GLR Kevlar® Parachute Heat Shield. Then accordion loop GLR Kevlar® Shock Cord. Do NOT slide the protector all the way to the



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 onto airframe. GLR Olgive Nosecone should be snug but not tight onto the airframe. If the GLR Olgive Nosecone is too loose, use a piece of masking 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 too tight, not too 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 16" forward from the aft end of the rocket and the other about 44" 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 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!!!**

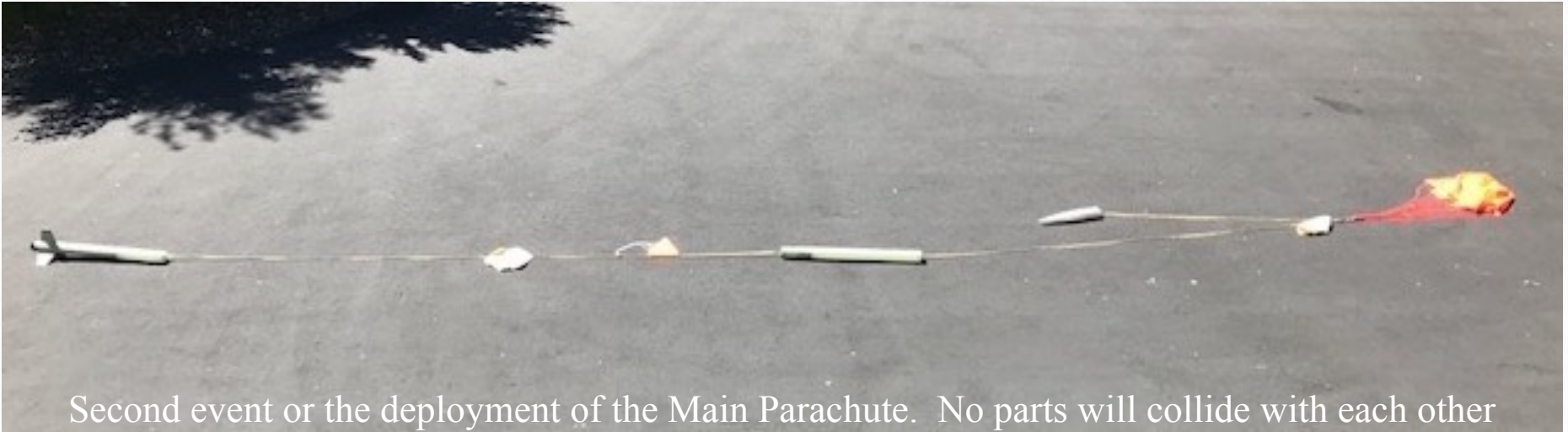
Because the air pressure is reduced at high altitudes, you will need to relieve the internal pressure in the recovery compartment; otherwise the nosecone will pop off the airframe during ascent. To avoid this, drill, **three** holes in your rocket. Using your angled aluminum draw a pencil line the length of the rocket - opposite the GLR Rail Guides. Drill one 3/32" hole about 27" Aft of the GLR nosecone, another in the GLR E-Bay at 42" and another at 49" (all measuring from the GLR nosecone). 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.

### **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,



Initial event or deployment of the drogue parachute.



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

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 1/2" from the nosecone / airframe interface. 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.

## 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](http://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 rocket.

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) <<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) <<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 persons 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 from 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.