

INSTRUCTION MANUAL

# Talon 2



GIANT LEAP ROCKETRY, LLC

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2831 SW Cornelius Pass Road

Hillsboro, Oregon 97123

# TALON 2

We provide more details to help with your rocketry education

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

*-The GLR Team-*



## **THE TALON 2 IS A FANTASTIC - LEVEL 1 ROCKET BUILD!!!**

We at Giant Leap Rocketry, LLC hope you enjoy building the best looking and best flying rocket on the flying field. The Talon 2 is stylish and commands attention wherever you fly. It flies with 29mm motors as small as the Aerotech F50, or as large as the I200. The center of pressure (cp) is 34" from the tip of the GLR Pinnacle nosecone. Be certain your center of gravity (cg) is one to two diameters (2" to 4") in front of the center of pressure with 1.5 diameters being ideal. All measurements need to be done with a "full-up" rocket (including motor, recovery components and any electronics).

THE TALON 2™ is the no compromise little brother to the phenomenal TALON 4™. The original Giant Leap Rocketry, LLC TALON™ series has been copied by other high power rocket kit manufactures but none give you the quality and performance that the original Giant Leap Rocketry, LLC TALON™ provides. This rocket is fun to build and even more fun to fly. You have chosen the best and most beautiful 54mm rocket on the flight line!!! You will definitely enjoy this build. Have FUN!!! **Thanks from the GLR Team!**



The TALON 2™ comes with a 29mm motor mount so that it can be flown on motors as small as the Aerotech F50 to as large as an I200. These will propel the TALON 2™ to extremely high altitudes.

## *Specifications:*

Dry Wt. Mass (no motor load) 30oz. (Please allow for slight variation in weight due to difference in epoxies and paint thickness).

Length: 48"

Outside Diameter O.D. 54mm (2.1"

CP= 34" aft from the GLR Pinnacle Nosecone tip

CG should be less than 32" aft of GLR Pinnacle Nosecone tip

Motor Mount: 29mm

**Recommended 29mm motors:** Aerotech:

[Single use: F50-4; G80-4]

[RMS: F40-4, F52-5T, G64-4, H128, H238, H165, H210, H180, H220, H268, I200]

## **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 THIS ROCKET. FOLLOW ALL PERTI-**

**NENT 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 NOT 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:**

### **TALON 4 BODY PARTS**

1- 54mm Original Pinnacle Nose Cone

1- 1 ¼" Short Eye Bolt

1- 54mm Original GLR Pinnacle Tailcone -Slotted

1- 54mm 36" Phenolic Airframe Slotted and Tagged to Match the GLR Pinnacle Tailcone

1- 29 mm 18" Phenolic Motor Mount Tube

- 2- 54mm/29mm Centering Rings
- 3- Small 0.063" Fiberglass Pre-cut Fins
- 3- Large 0.063" Fiberglass Pre-cut Fins
- 1- 29mm Original GLR Slimline Retainer Set
- 1- 54mm Original GLR Rail Guide Pair

**Recovery Mount:**

- 1- 54mm Original GLR Hardpoint Recovery System Anchor Which Includes:

- 1- 54mm GLR Hardpoint Anchor
- 1- 1 1/2" x 1/4" Long Eye Bolt
- 2- Washers
- 1- Locknut

**Recovery Components:**

- 1- 30" Parachute
- 1- 600 lb. Swivel
- 1- 12' 1/8" GLR Kevlar® Shockcord
- 1- 2" x 1/2" GLR Kevlar® Tube Cord

**Miscellaneous Components:**

- 1- 24" Wooden Dowel



Online Assembly Instruction Booklet

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

*15 or 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)*

*GLR Glass-Mirco-Spheres*

*Masking Tape*

*Tape Measure*

*Sharp Pencil*

*#120, # 180 #250 Sandpaper*

*Paper Towels*

*Gloves*

*(Can Be Ordered Separately From GLR)*

## Rubbing Alcohol

### Drill with a 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.

## Optional Supplies

GLR FireBall Zipper Stopper.

*(Can Be Ordered Separately From GLR. Please read Section D about Recovery, in this instruction to determine if you would like to order the GLR FireBall.)*

# ASSEMBLY

## A. Building the 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 Motor Retainer on the Aft end of the 29mm 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 Slim-

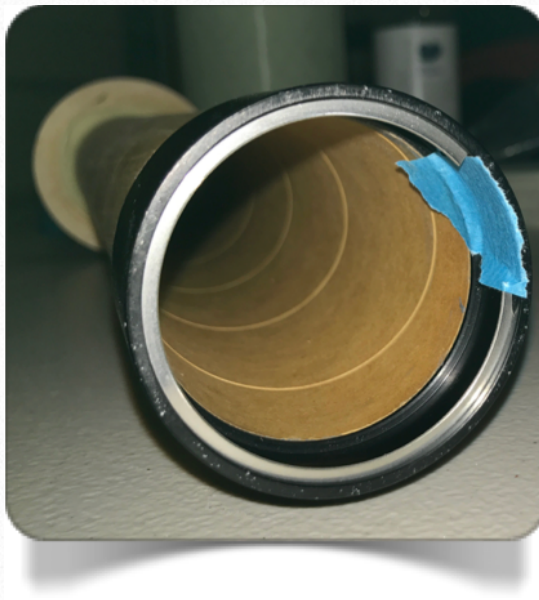
line Motor Retainer. Sand the motor tube slightly, if necessary, but just enough for a snug-tight fit. If you have a 29mm casing (Aerotech or Pro29), test fit it by placing the casing in the motor tube and inserting the retaining ring. Be sure the spacing of all components is correct before proceeding 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 Slim-**

**line 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 seating 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 com-



pletely.



the 9" mark, draw a line around the motor tube.

5. Place a generous amount GLR Aeropoxy around the motor tube the thickness of the Middle Centering Ring. Make sure that the Middle Centering Ring is level and parallel to the opening of the motor tube and allow to set completely.

6. Now that the Middle Centering Ring is fully cured it is time to place the Forward Centering Ring. Place the Forward Centering



Ring onto the motor tube. Measure from the Forward end of the motor tube (the end that is **OPPOSITE** the GLR Slimline Retainer attached) 1/2" and place a mark. Using a piece of paper wrapped around the motor tube, centered

on the mark that you made at the 1/2" mark, draw a line around the motor tube. 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. 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.

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



7. 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

**B. Securing the Motor Tube to the Airframe and GLR Pinnacle Tailcone WARNING: Once everything is set up and cured your motor tube is ready to be inserted and epoxied to the airframe and GLR Pinnacle 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 GLR Pinnacle Tailcone. Each airframe and GLR Pinnacle Tailcone are paired and cut together. You will notice as you put the GLR Pinnacle Tailcone and airframe together there is a mark on each piece. The mark should cross 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.

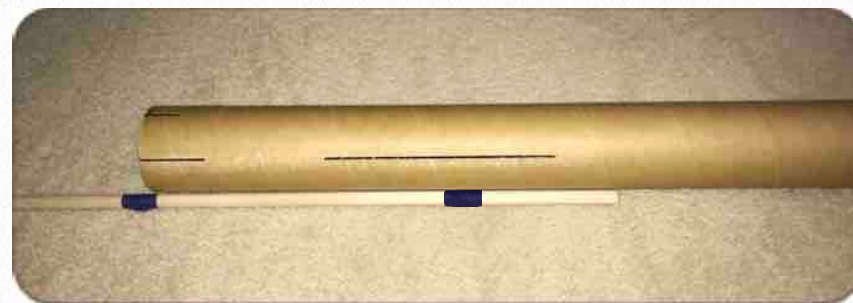
2. Separate the GLR Pinnacle Tailcone from the airframe at this time and dry fit the motor tube several times into the airframe. It should slide smoothly but snugly in and out. Sand the outer edge of the Centering Rings as needed to create a snug but smooth insertion fit. When you have this working smoothly, leave the motor tube inserted and place the GLR Pinnacle Tailcone and make sure the GLR Slimline Retainer lines up at the Aft edge of the GLR Pinnacle Tailcone. You may need to carefully remove a small amount of the internal diameter of the end of the GLR Pinnacle Tailcone if need. Please be careful, the motor tube is meant to be snug-fit. Once you feel that it is correct, (assembled motor tube is seated correctly in the airframe and the GLR Pinnacle Tailcone) and you can line up the indicating marks on the airframe and GLR Pinnacle Tailcone you are ready to insert the motor tube for real.

3. Separate the GLR Pinnacle Tailcone from the airframe and remove the motor tube. Replace the GLR Pinnacle Tailcone on the airframe. Again lay the airframe and GLR Pinnacle Tailcone piece next to the motor tube



assembly and line it up correctly. The Middle Centering Ring will be Forward of the small fin slots and the Forward Centering Ring will be Forward of the large fin slots. On the outside of the airframe make a mark with a pencil where the Forward Centering Ring is and where the Middle Centering Ring is. Disassemble the GLR Pinnacle Tailcone and airframe.

4. You will now use the included wooden dowel as a glue stick. 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 JB Weld inside the airframe in two locations: the luting position of the Forward and Middle Centering Rings. Mix a very generous portion of JB Weld. Place the JB Weld 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 JB Weld on the inside of the airframe at the level where you marked the Middle Centering Ring.

Once you have a good thick coating of JB Weld circumferentially at this location insert the motor tube the rest of the way until the motor tube is inserted correctly and the Centering Rings line up with the lines that you drew on the outside of the airframe. Place the GLR Pinnacle Tailcone onto the motor tube to make sure that the GLR Slimline Motor Retainer lines up perfectly with the Aft opening of the GLR Pinnacle 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 GLR Pinnacle Tailcone. **DO NOT EPOXY THE GLR PINNACLE TAILCONE TO THE AIRFRAME AT THIS TIME.** Let the JB Weld cure completely.

2. Sand the outside of the slotted airframe and the corresponding external area of the GLR Pinnacle Tailcone. Place some masking tape on the inside of the GLR Slimline Motor Retainer or stuff it full with paper towel - this will prevent epoxy from entering this critical area. Apply a generous amount of JB Weld to the GLR Pinnacle Tailcone. **DO NOT INSERT THE GLR PINNACLE TAILCONE INTO THE AIRFRAME JUST YET.** Mix a generous portion of JB Weld and place it on the outside of the GLR Slimline Motor Retainer. Carefully guide the GLR Pinnacle Tailcone over the motor tube and into the airframe. **MAKE SURE THAT THE INDICATING LINES LINE UP ON THE GLR PINNACLE TAILCONE AND THE AIR-**

**FRAME.** 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. Set the rocket upright resting on the GLR Pinnacle Tailcone.

### C. Attaching the Fins

You will you need to use a “fin mounting templates” to place your fins. GLR has provided a downloadable template on our website here <https://giantleaprocketry.com/instructions.aspx>.

1. Transfer the fin mounting template to a piece of cardboard or art foam board and cut out the marks for the 54mm airframe and 3 fin flight arrangement.

2. Place the Aft (small) fins into the Aft slots 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 fins. 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 transfers 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. Once you have your fins in place, slide the cardboard fin guid down the airframe onto the fins to insure their correct position. Allow to completely set.

3. On the Forward fins you will repeat the above steps. Verify that your fins are all at 90 degrees from the airframe and are lined up with each other.

4. 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 GLR Aeropoxy and GLR Glass-Micro-Spheres. Mix a generous amount of GLR 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 fillet between the airframe and the fin, completely, forward to aft. Using a gloved finger or the rounded end of the wooden epoxy mixing blade smooth the fillet to a clean transition from airframe to the fin. 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. Recovery System**

1. Install the GLR Hardpoint Recovery System Anchor.

The GLR Hardpoint Recovery System Anchor provides a simple yet tough attachment point for recovery system lines. The GLR Hardpoint's one-piece aircraft aluminum construction assures a strong, trouble-free recovery system connection, and allows free passage of ejection charge gases while being resistant to ejection charge heating effects. Using the GLR Hardpoint, you can avoid the tedious work of notching rings and gluing cords to motor tubes.



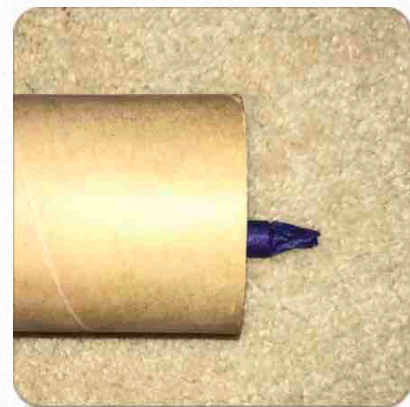
Rest assured the GLR Hardpoint will bring your Talan 2™ home!

Scuff sand the outer diameter of the GLR Hardpoint in a circumferential direction to give the adhesive a better “bite”. The GLR Hardpoint Anchor, glues into the 38mm or 54mm motor tubes. We have them in both sizes. We designed the toughest, strongest attachment possible. Made of extruded aluminum, it has three THICK intersecting ribs supporting a central hole for a ¼” eyebolt. The GLR Hardpoint is one of my very favorite rocketry components and you are going to love it too. The GLR Hardpoint kit comes with all the parts necessary to secure your recovery system. Put the Kit together by placing one washer on the eye-bolt and then place the eye-bolt through the central orifice of the anchor. Now place the other washer on the eye-bolt and secure the lock-nut onto the eye-bolt. The GLR Hardpoint is now ready for use.

Now tie one end of the ⅛” GLR Kevlar® Shock Cord on to the eye-bolt. Tape the end of the shock cord to the main line of the shock cord.



The GLR Hardpoint is now ready to be inserted into the airframe and test fit it. Hold the GLR Kevlar® shock cord and slide the GLR Hardpoint in and out of the airframe. You will want to insert the GLR Hardpoint from the Forward opening of the airframe and allow it to rest on the forward end of the motor tube. You will need to take a measurement with your glue stick dowel.



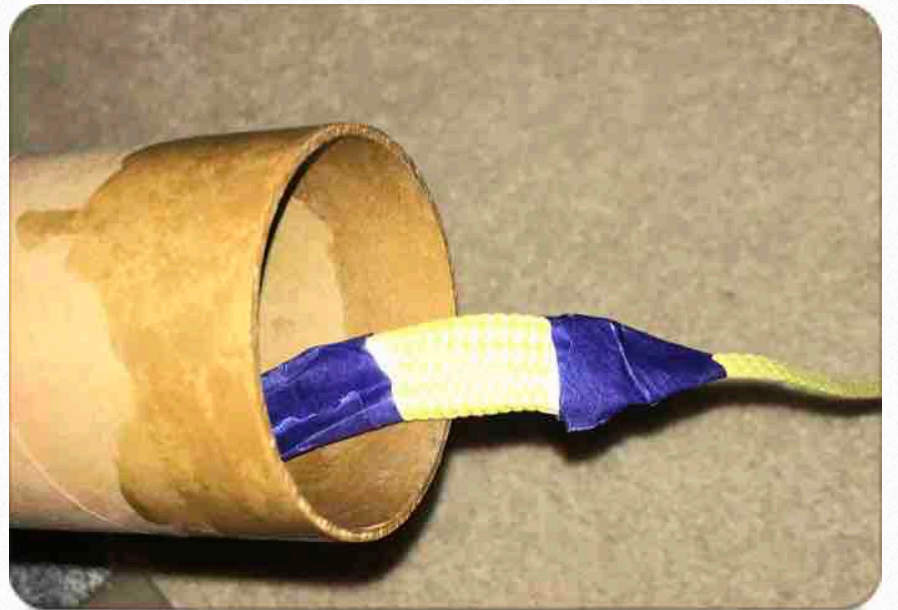
Place the dowel into the airframe and place a piece of tape where the edge of the airframe meets dowel, as seen in the photo. Then place the taped edge next to the GLR Hardpoint and place another piece of tape at a point that defines the width of the GLR Hardpoint.

**DO NOT GLUE IT IN YET!**

## 2. Shock Cord Protection.

You have been provided a small GLR Kevlar® Sock. 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 a GLR Kevlar® Shock Cord 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 this small piece of GLR Kevlar® Sock is to prevent potential damage to the GLR Kevlar® shock cords during deployment of the recovery systems. When the recovery system deploys, the GLR Kevlar® Shock Cords will rub against the sharp edge of the phenolic airframe and theoretically could wear the GLR Kevlar® Shock Cord at that location. 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. To install the GLR Kevlar® Sock first pinch open the GLR Kevlar® Sock and push one end of the GLR Kevlar® Shock Cord through the opening and slide it all the way down toward the GLR Hardpoint. Hold the GLR Kevlar® shock cord and slide the GLR Hardpoint into the airframe and allow it to slide

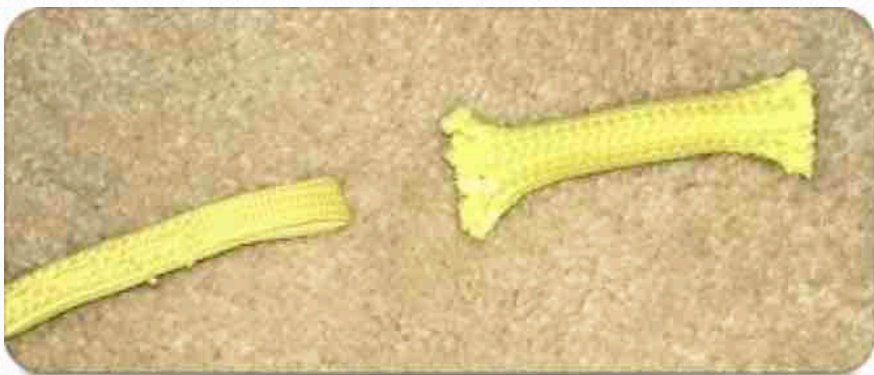


### 3. Protect the Rocket from Zippering.

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. You can eliminate the possibility of a zipper by using our Original and exclusive Fireball. The Fireball is sold separate. To strengthen the Phenolic 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.

### 4. Secure the GLR Hardpoint To the Airframe

Mix a generous amount of JB Weld. With you glue stick, deliver the JB Weld into the airframe, to the level of the tape and smear it all around the airframe. Use plenty of JB Weld -



all the way down to the Motor Tube. With one hand hold on to the GLR Kevlar® Shock Cord and with the other hand slide 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 GLR Aeropoxy.

don't scrimp. You want the GLR Hardpoint securely attached to the airframe. Hold the Kevlar® shock cord and slide the GLR Hardpoint into the airframe and allow it to slide all the way down to the Motor Tube. As the GLR Hardpoint engages the JB Weld you will feel the resistance. Using your - wiped-clean glue stick, push the GLR Hardpoint until the GLR Hardpoint is fully seated. Stand upright and allow to cure until completely set.

5. 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. Slide the 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 GLR Hardpoint inside the 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

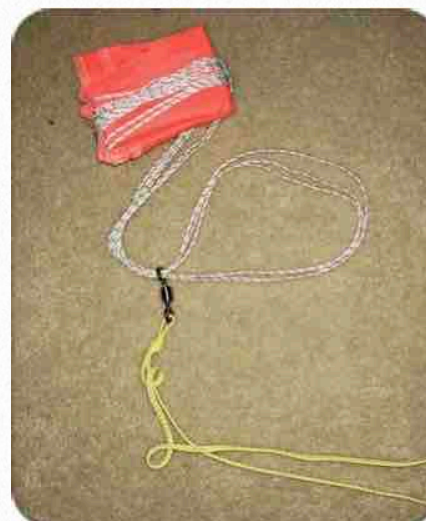
let the GLR Kevlar® Parachute Heat Shield slide freely.

6. Attach the eye bolt to the Aft end of the GLR Pinnacle Nosecone as shown in the photo.

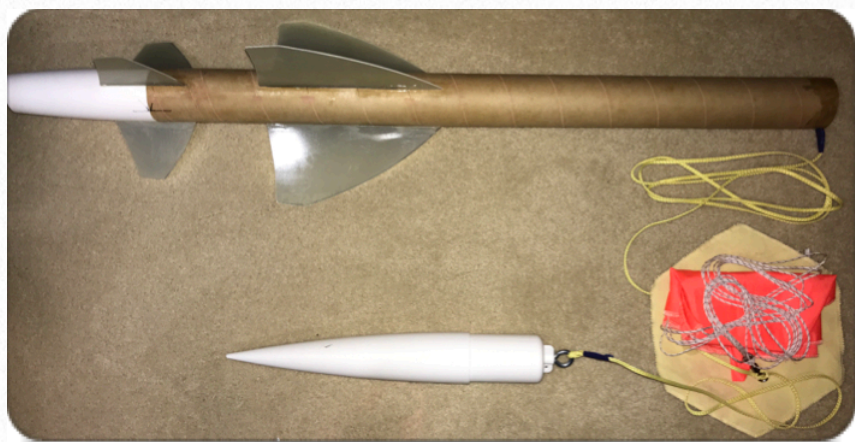


7. Attach the free end of GLR Kevlar® Shock Cord to the eye-bolt that is attached to the GLR Pinnacle Nosecone.

8. We will now describe how to install the parachute. The attachment point of the swivel is critical. Attach the 30" GLR Parachute to the GLR Kevlar® Shock Cord as follows. At about 30' from the Aft end of the GLR Pinnacle Nosecone, pinch the GLR Kevlar® Shock Cord and slide the GLR Kevlar® Shock Cord through the open end of the swivel to form a loop and wrap that loop around the swivel and then tighten the knot that is formed around the swivel. Remove the 30" GLR Parachute from



its poly bag and hold it by the evened out shroud lines. - 10' from the airframe. When the rocket descends you don't want the airframes and GLR Pinnacle Nosecone banging into each other, so there needs to be adequate and appropriate spacing of the parts. The final photos in this manual will show how the rocket will look during the deployment, 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.**



The sequence is as follows: slotted airframe containing the GLR Hardpoint, GLR Kevlar® Shock Cord, GLR Kevlar® Parachute Heat Shield, GLR Kevlar® Shock Cord, swivel, GLR Kevlar® Shock Cord, GLR Pinnacle Nosecone.

### E. Recovery System Preparation

1. To prepare the rocket for flight you must pack the parachute into the airframe. Insert most of the shock cord into the airframe first. Do this by creating accordion lengths of cord

about 3-4" long, then insert it into the tube. Leave some of the 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 on 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" too tight for the airframe, shake some corn starch on the "burrito" and it should slide much easier.

4. Slide the GLR Pinnacle Nosecone onto airframe. GLR Pinnacle Nosecone should be snug but not tight onto the airframe. If the GLR Pinnacle Nosecone is too loose, use a piece of masking tape on the shoulder of the GLR Pinnacle 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.

## F. 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 9" forward from the aft end of the rocket



and the other about 24" 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.

## G. Finishing

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, ex-





trude 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 dries, so it must be left a little high. When the DAP Plastic Wood is completely set up, sand the airframe to a smooth finish.



## **H. 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 a hole 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 24" Aft of the GLR Pinnacle Nosecone. The hole is absolutely necessary for a safe flight and deployment of the parachutes. Do not make the hole

any larger or you will risk reducing the effectiveness of the ejection charge.

## **IREcommendations**

1. 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 conse-

quential 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 sec-

ond 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.