

INSTRUCTION MANUAL

Firestorm

ready to fly
almost



GIANT LEAP ROCKETRY, LLC

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2831 SW Cornelius Pass Road

Hillsboro, Oregon 97123

FIRESTORM

54mm

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

-The GLR Team-



THE FIRESTORM IS THE PERFECT DUEL DEPLOY ROCKET!!!

EASY TO BUILD AND PUNCHES A GIANT HOLE IN THE SKY

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

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

FIRESTORM 54

We provide more details to help with your rocketry education



The FIRESTORM 54 is a perfect rocket for a level 2, dual deploy launch. The FIRESTORM is a 54mm minimum diameter rocket. This means that the airframe is the motor mount tube as well. The FIRESTORM is versatile as well: you can fly FIRESTORM as a single OR dual deploy rocket. Flying as a dual deploy typically allows the rocket to descend until the last few hundred feet, at which time a second para-

chute is deployed slowing the the decent of FIRESTORM to a safe decent speed. FIRESTORM is also adaptable down to 38mm motor using the optional GLR Slimline 38mm motor adaptor or even to a 29mm motor using BOTH the GLR Slimline 38mm and 29mm motor adapters (ordered separately From GLR). The FIRESTROM can be flown on a variety of motors to extremely high altitudes. Be certain

your center of gravity (CG) is at least 1.5 body diameters or more forward of the center of pressure (CP) when the rocket is fully loaded and ready for flight!

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) 71.5 oz. (Please allow for slight variation in weight due to difference in epoxies and paint thickness).

Length: 71.5”

Outside Diameter O.D. 2 1/4”

Inside Diameter I.D. 2 1/16 ”

CP=61.7” aft from nosecone tip

CG should be less than 58” aft of nosecone tip

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

Parachute: 36” main and 18” drogue

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

Aerotech: H123, H148, H242, I161, I357, I300, I211, I285, I284, I366, I435, J420, J350, J570

Recommended 54mm motors:

Aerotech: J90, J275, J315, J415, J135, J540, K550, K1100, K695

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 Rock-

etry, 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 PERTINENT SAFETY CODES AND DIRECTIONS AT THE LAUNCH SITE. ALWAYS WEAR EYE PROTECTION WHENEVER LOADING EJECTION CHARGES OF ANY TYPE AND KEEP SPECTATORS AWAY. MAKE A CHECK LIST TO HELP YOU PREPARE YOUR ROCKET PROPERLY SO AS NO TO OVERLOOK AN IMPORTANT STEP DURING THE EXCITEMENT AND STRESS OF PRE-FLIGHT PREPARATION. IF YOU DO NOT FEEL READY TO FLY THIS OR ANY OTHER ROCKET *DON'T*. Take your time and do it safely and correctly. REMEMBER, THE FUTURE OF THIS HOBBY ALONG WITH THE SAFETY OF THOSE AROUND YOU IS IN YOUR HANDS.

PARTS LIST:

- One-2.25" x 36" Filament-Wound Fiberglass
- One-2.25" x 24 Filament-Wound Fiberglass
- One-2.25" Pinnacle Nosecone
- One- Eye Bolt For the Nosecone

One- 54mm GLR Slimline Motor Retainer Set

One- 54mm GLR Acme FinCan

One- Pack of 2 54mm GLR Rail Guides

Two- Fifteen foot 1/8" Kevlar® Shock Cord

Four- 1/8" Quick Links

Two- Swivels

Two- KEVLAR® Parachute Heat Shields

One- 36" Parachute

One- 18" Parachute

One- 54mm GLR Hard-Point Recovery System
Anchor shock cord attachment

One- Glue stick dowel rod 18" long

One- Avionics Bay Assembly

One- Assembly Instruction

Disposable Supplies Needed by the Builder to Assemble This Kit:

30 Minute Epoxy or Aeropoxy

(Can Be Ordered Separately From GLR)

Mixing Cups and Mixing Sticks

(Can Be Ordered Separately From GLR)

J.B. Weld

(Can Be Ordered Separately From GLR)

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. You may prefer a slower setting epoxy (30 min.) if you are a novice builder, as this will allow more time to assemble the rocket.

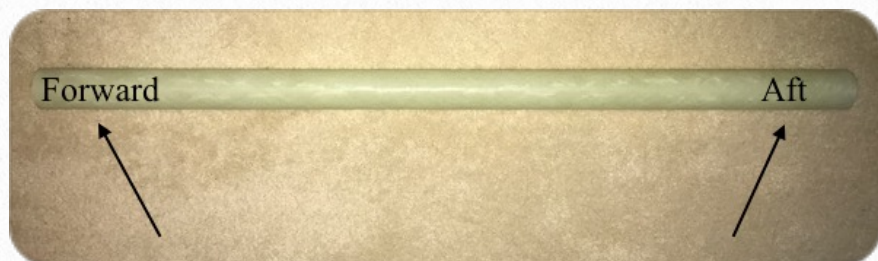


ASSEMBLY

Attaching the GLR Slimline Motor Retainer and GLR Acme FinCan Assembly

(Note: “forward” means the front of the rocket, toward the nosecone, and “aft” is the rear of the rocket, toward the fins)

1. On the 36" long 54mm airframe, with a pencil, mark one end "Forward" and the other end "Aft" and lightly sand the outside of the airframe up six inches from the Aft end to prepare for the epoxy.
2. Test fit the 54mm GLR Slimline Motor Retainer on the Aft end of the 36" section of body



tube. If during your trial fitting of the GLR Slimline Motor Retainer, the GLR Slimline Motor Retainer seems a bit too loose, simply place a SMALL amount of tape on the aft end of the airframe at distances of about 120 degrees from each other overlapping the end of the tube. This will snug up the fit and allow a proper adhesion. Once the GLR Slimline Motor Retainer is in place remove any tape that is exposed.



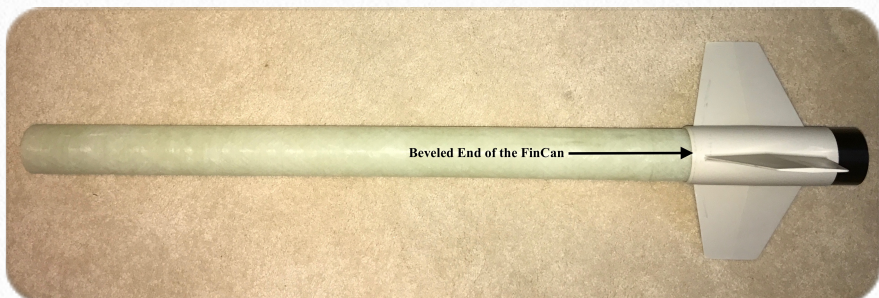
Be sure that the GLR Slimline Motor Retainer goes onto the tube all the way to the built-in shoulder stop of the GLR Slimline Motor Retainer. Sand the body tube if necessary, but just enough for a snug-tight fit. NOTE: Be sure that the coarse, threaded end of the snap ring type retainer is the part that goes onto the tube. The other end (with the single groove for the snap ring) sticks out past the end of the tube. Once you have a good fit, place a pencil mark on the tube at the forward end of the GLR Slimline Motor Retainer.



3. From the forward end of the tube (the other end), slide on the GLR Acme FinCan until it rests against the GLR Slimline Motor Retainer and place a pencil mark on the tube at the forward end of the GLR Acme FinCan. Note that the aft end of the canister is squared off, while the forward end is tapered. You should now have two marks on the tube, one for the GLR Slimline Motor Retainer and one for the GLR Acme FinCan.



4. Remove both the GLR Slimline Motor Retainer and the GLR Acme FinCan from the body tube and set them aside. Mix some J.B.Weld (and only J.B. Weld - - don't use epoxy!) and apply it to the aft end of the tube, but do not go past the pencil mark for the GLR Slimline Motor Retainer. Then, install the GLR Slimline Motor Retainer on the tube. Turn the GLR Slimline Motor Retainer while you are in-



stalling it in order to spread the J.B. Weld. Be sure that you only apply the J.B. Weld to the tube and NOT to the inside of the GLR Slimline Motor Retainer. This is important because if you apply the J.B. Weld to the inside of the GLR Slimline Motor Retainer and then try and slip it onto the tube, excess epoxy will seep into the snap ring area of the GLR Slimline Motor Retainer, making it impossible to insert a motor correctly. Also, be careful not to get any J.B. Weld on the inside of the body tube.

5. Mix some Aeropoxy and spread it on the area between the two pencil marks on the body tube (NOT on the inside of the GLR Acme FinCan). Slide the GLR Acme FinCan back on to the tube until the aft end (squared off end) of the GLR Acme FinCan butts up against the forward end of the GLR Slimline Motor Retainer. Turn the GLR Acme FinCan on the tube to spread the epoxy evenly. Be sure that the aft end of the tube is still butted against the inside shoulder of the GLR Slimline Motor Retainer. Tap it on the table top if necessary. Wipe off excess J.B.Weld and epoxy. Use alcohol with a paper towel to clean up. Set assembly aside upright, resting on the GLR Slimline Motor Retainer until the epoxies are completely cured.

6. Next, identify the GLR Hard-Point Recovery System Anchor. Place the eyebolt through the center of the device, and tighten the nut. There should be a washer on both sides of the GLR Hard-Point. Secure one end of the GLR Kevlar® Sock Cord to the eye bolt using the



1/8" quick connect. Because Giant Leap Rocketry provides heat-resistant GLR Kevlar® Shock Cord in this kit, rather than nylon, there is no need to wrap the GLR Kevlar® Shock Cord with masking tape.

INSERTING THE GLR Hard-Point Recovery System Anchor INTO THE AIRFRAME IS TRICKY. READ THESE NEXT STEPS THOROUGHLY TO UNDERSTAND THE PROCEDURE BEFORE ATTEMPTING TO COMPLETE IT.

7. Once the GLR Acme FinCan and GLR Hard-Point Recovery System Anchor are prepared and the epoxy is fully cured, you must insert the GLR Hard-Point Recovery System Anchor into the airframe as follows: You are provided a glue stick dowel. Do not snap it or otherwise alter the length because it serves as a measuring guide. Measure the dowel and make one mark on the dowel at 12" and one mark on the dowel at 11". You may also mark the airframe from the forward open as well. Mix a small amount of J.B. Weld (do not use epoxy). With one hand, hold the airframe horizontally. With the other hand, dip the glue stick into the mixed J.B. Weld and insert the glue stick into



the FORWARD opening of the AFT airframe UNTIL THE LINE ON THE END YOU ARE HOLDING IS FLUSH WITH THE FORWARD END OF THE AIRFRAME (the end OPPOSITE the GLR Acme FinCan). Apply J.B. Weld in a ring to the interior of the airframe. The ring of J.B. Weld should coat the internal circumference of the airframe from the 11" to



the 12" mark from the forward end of the airframe.

It is important to avoid getting the J.B. Weld on other areas inside the airframe, so do the best you can. You will be able to clean up some later. Repeat the procedure as necessary until you have a full-solid ring of J.B. Weld inside the airframe from the 11"- 12" mark. Remove glue stick and clean off the J.B. Weld from your glue stick.

Before the J.B. Weld cures within the airframe, insert the GLR Hard-Point Recovery System Anchor through the FORWARD end of the airframe, Hold the GLR Kevlar® Shock Cord and insert the GLR Hard-Point Recovery System

Anchor NUT SIDE IN FIRST, making sure that the free end of the GLR Kevlar® Shock Cord points Forward, or away from the GLR Acme FinCan. Using the CLEAN glue stick, push the GLR Hard-Point Recovery System Anchor all the way in **until the mark you made on the glue stick is 11” from the forward end of the airframe.** Once in place, immediately take a moistened paper towel with alcohol on the end of the glue stick and swab out the inside of the airframe removing JB Weld where it should not be. Check both the forward position and the aft position of the GLR Hard-Point Recovery System Anchor and insure all the J.B. Weld is gone. **AVOID MOVING THE JUST**

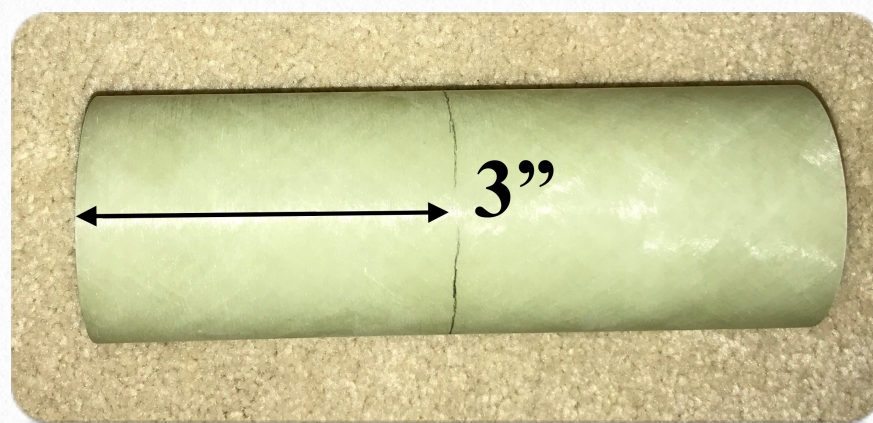
PLACED GLR Hard-Point Recovery System Anchor.

IMPORTANT: Once the GLR Hard-Point Recovery System Anchor is in place, hold the airframe upside down with the FORWARD end pointing to



the ground and the GLR Acme FinCan (AFT end) up. This prevents JB Weld from dripping down the motor tube section of the airframe (which would prevent the insertion of a motor casing). It is also a good idea to check that JB Weld is not running down the FORWARD end of the airframe as well. This could interfere

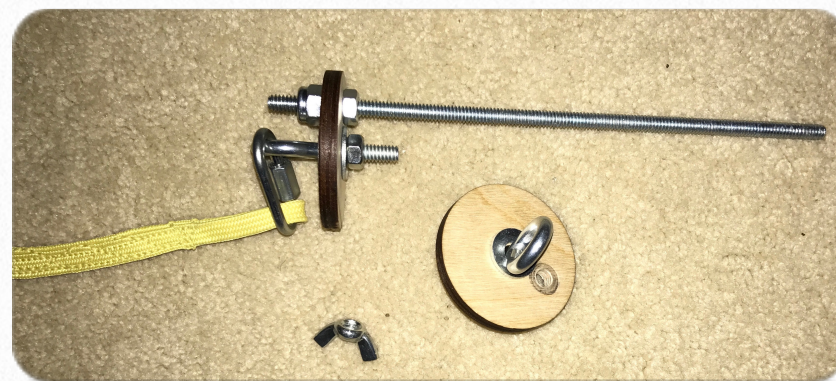
with your recovery components. If JB Weld does drip forward you can clean it as explained above. **If the GLR Hard-Point Recovery System Anchor slides forward and is not stable in the airframe, place the airframe in a more**



horizontal position. Allow the JB Weld to fully cure, which can take several hours.

B. The Upper Section and Electronics Bay (GLR E-Bay)

1. Test fit 54mm GLR E-bay Coupler (Electronics bay body) into 24” and 36”airframes and sand if necessary for a moderate slip fit.



2. Sand the two bulkheads so that they go into the airframes easily, with absolutely no resistance. They should practically fall through

the airframe. Make a pencil mark about 3" from one end of the GLR E-bay Coupler. That should leave about 3" on the other end. The GLR E-Bay is ready for epoxy, but we will need to come back to this step in a moment. Right now we need to partially assemble the GLR E-Bay.

3. On one bulkhead, insert an eyebolt in the middle hole, and secure it with a washer and nut on the backside. Make it tight and secure it with a small drop of epoxy. Do the same with the other bulkhead.



4. Secure the all-thread to the other 1/4" hole using a locknut on the eyebolt side, and a nut 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, screw down and tighten. Set these pieces aside and we will get back to adhering

the GLR E-Bay to the Forward (24") airframe.

5. Apply Aeropoxy to the 3" side of the GLR E-bay Coupler (but stay about 1/2" away from the pencil mark). Insert the GLR E-bay Coupler into the 24" long section of airframe; **but only to the pencil mark. Do NOT apply epoxy to the inside of the airframe and make sure that any epoxy that is on the edge of the GLR E-Bay Coupler is cleaned off so that the bulkheads will fit flush against the GLR E-bay Coupler.** Hold upright or vertical until epoxy sets. Do not turn upside down or some epoxy will seep into the upper airframe. Tape GLR E-bay Coupler in place if necessary to prevent it from dropping out while it is setting. Let it set (upright) before handling it further.

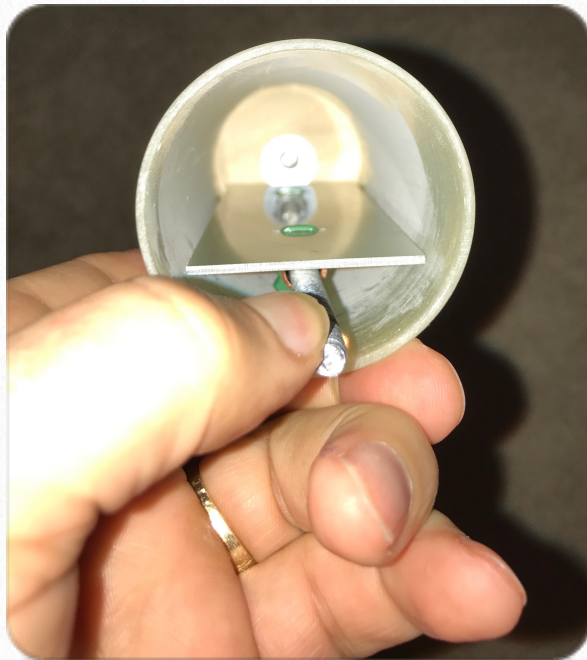


Using alcohol and a paper towel, clean up any excess epoxy. Do not leave any extra epoxy on the GLR E-Bay or it will not seat properly between the two body tubes. Let set until completely cured.

6. Slide the bulkhead attached to the all-thread



through the Forward opening in the 24" body tube. Allow it to drop down until it flush with the top of the GLR E-bay Coupler.



7. 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. Cen-

ter the tubing on the sled and mark it on either side of the tube, at about 1/2" from both ends with a Sharpie Marker®. With a power drill, drill four holes (just the size of the zip-ties you will be using) through the fiberglass sled table. Fasten each end of the tube to the sled table with zip-ties. An alternative method is to epoxy the tube to the sled or even combine the two techniques for double redun-



dancy. At this point the sled is ready to accept your electronics (sold separately).

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. 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) Start with the Drogue recovery system that will be located in the Aft Airframe. GLR provides a high quality 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.



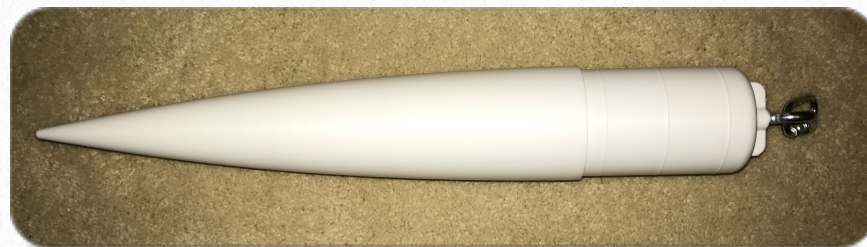
Slide the first chute protector onto the free end of the GLR Kevlar® Shock Cord that is attached to the GLR Hard-Point Recovery System Anchor inside the Aft airframe. Let it slide freely around. The pads never get anchored permanently to the line. Do not secure the pad to the cord; just let the protector slide freely.

2. Slide the swivel on to the GLR Kevlar® Shock Cord at about 15" from the end of the body tube. Tie a loop in the GLR Kevlar® Shock Cord where the swivel acts as the apex of the loop (see photo). The swivel will be the parachute attachment point.

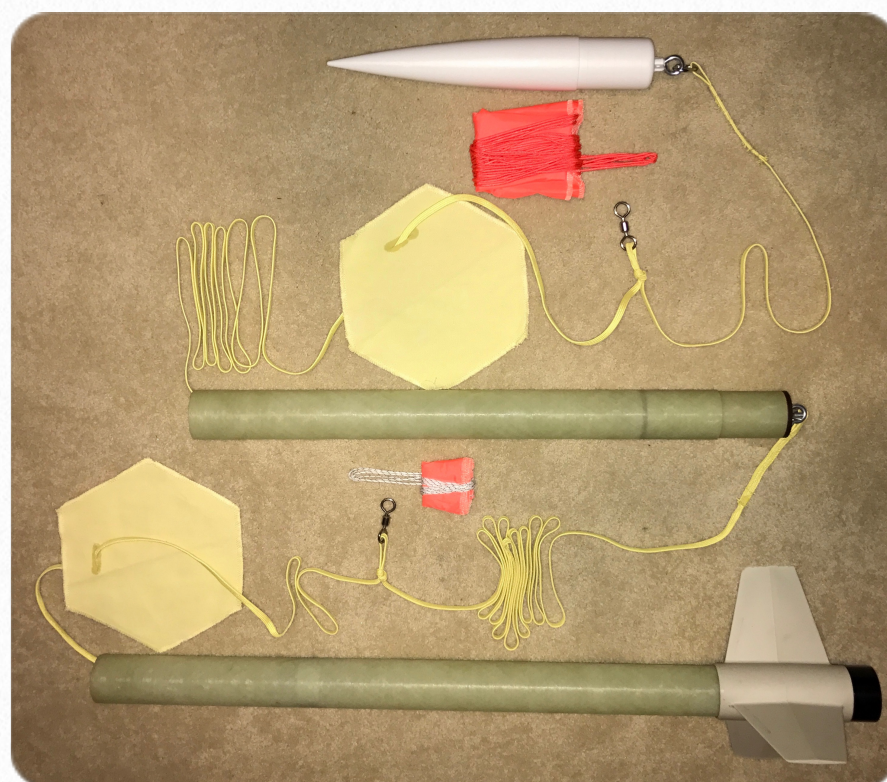


BE SURE THAT THE CHUTE PROTECTOR IS BELOW OR AFT OF THE SWIVEL. The sequence is as follows: 36" airframe containing the GLR Hard-Point Recovery System Anchor, GLR Kevlar® Shock Cord, chute protector, GLR Kevlar® Shock Cord, swivel, GLR Kevlar® Shock Cord, GLR E-Bay.

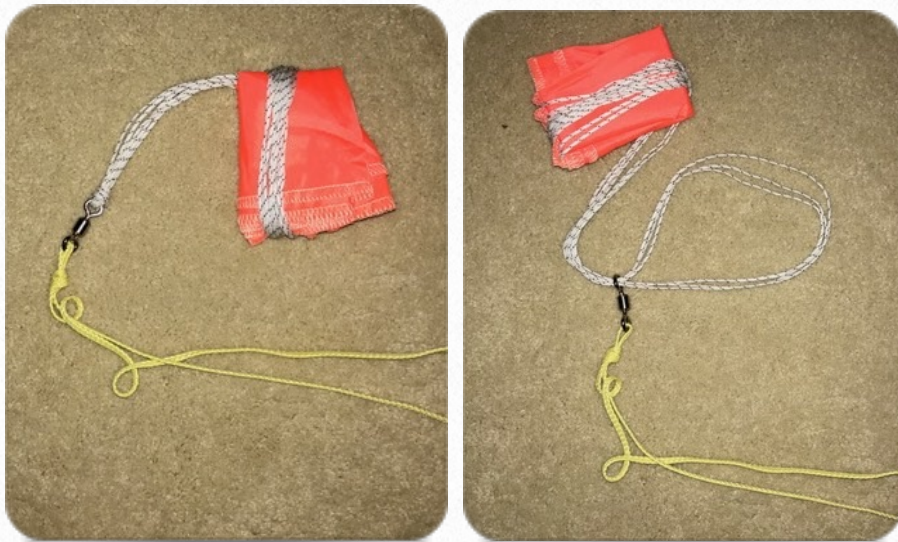
3. Attach the eye bolt to the Aft end of the Olgive Nosecone as shown in the photo and attach a quick link bolt to the eye bolt.



4. Now we will connect the the GLR E-Bay / forward body tube and the Nosecone. You will connect the pieces in the same order. Slide the second GLR Kevlar® Parachute Heart Shield onto the GLR Kevlar® Shock Cord. Again the GLR Kevlar® Parachute Heart Shield will slide freely on the GLR Kevlar® Shock Cord. Attach the second swivel to the GLR Kevlar® Shock Cord in the same fashion that first swivel was attached. This swivel should be attached to the GLR Kevlar® Shock Cord at about 30" from the nosecone. Attach the forward loop of the GLR Kevlar® Shock Cord to the quick connect bolt that is attached to the nosecone and



tighten. Your rocket should now look like the photo.



5. Attach the parachutes to the swivels. Carefully remove the parachutes from their poly bags and hold the first parachute by the shroud lines. Center or "even" the lines at the apex held with your finger. Slide the shroud lines together through the free end of the swivel and open the shroud lines enough to allow the parachute to slide through and knot down onto the swivel. Repeat this process with both parachutes. The Main (36") parachute will go on the forward swivel - closest to the nosecone the Drogue (18") parachute will go on the Aft swivel - closest to the GLR Acme FinCan.

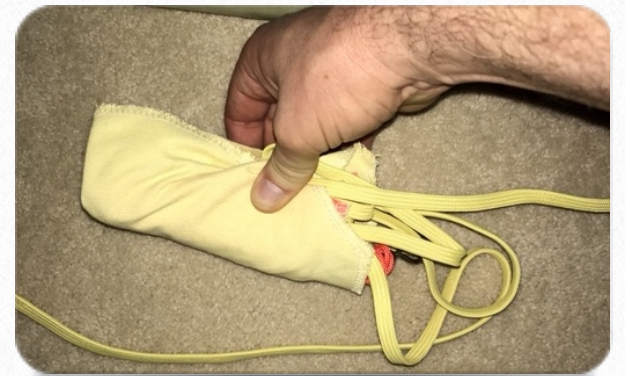
RECOVERY SYSTEM PREPARATION

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 GLR Kevlar® 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.

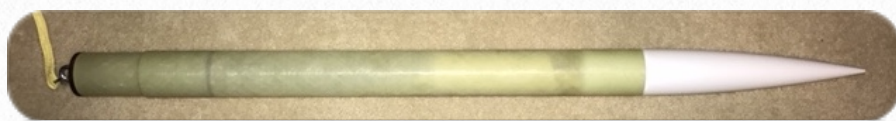
2. Roll up the parachute. Then slide up the protector towards the chute. Do NOT slide the protector all the way to the chute, but instead stop about 1 foot away. Then lay some GLR Kevlar® Shock Cord into the protector, then lay the chute in the pad too.



3. Fold the protector around the chute like a burrito and insert into airframe. You must position the GLR Kevlar® Parachute Heat Shield so that it protects the chute from scorching. Should you find the "burrito" too tight for the airframe, either try and pack it tighter or shake some corn starch on the "burrito" and it should slide much easier.



4. Slide the nosecone onto airframe. The nosecone should fit snug but not tight onto the airframe. If the nosecone is too loose, use a piece of masking tape on the shoulder of the 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 on the GLR Acme FinCan, otherwise the fins will interfere with the rail.



2. Measuring from base of the rocket to base of rail guide, place one rail guide about 11" up from the aft end of the rocket and the other about 32". Then trace each rail guide on the airframe. Remove GLR Rail Guides.

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 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 guide system as the J.B. Weld sets.

Vent Holes in Airframe - - IMPORTANT!

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 31” forward of the GLR Slimline Motor Retainer, another in the GLR E-Bay at 37” and another at 42” (all measuring from the GLR Slimline Motor Retainer). 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 reduc-



ing 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, depending on the motor chosen, you could send this rocket up with so much power that the nosecone will vibrate loose or deploy when the drogue chute deploys. Using shear pins will reduce the risk of this damage-causing early deployment. Using nylon shear pins, either nylon screws or 0.060" Styrene rods from a hobby store will work. We recommend that you place a piece of paper around the nosecone / airframe interface with marks about 2.45” apart and then mark “witness lines” on both the nosecone and the airframe. When these “witness lines are lined up you can drill the appropriate hole size about 1 ½” from the nosecone / airframe. **ALWAYS KEEP THE RELATIONSHIP OF THE WITNESS LINES!** It is usually best to do this step **AFTER** the rocket is painted. Lining up the witness lines allows for a quick delivery of the shear pins. You will deliver and retrieve the shear pins with a needle nose plier and trim them with an end cutting plier.
2. You may also want to sheer pin the E-bay in the non-epoxied section of the airframe. 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 paint.
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 ad-

vised of the possibility of such damages, or for any claim by another party. Lack of care can be dangerous. By purchasing our materials you agree to the above conditions and to use our products at your own risk. You must abide by the following safety guidelines: (for more info, see www.tripoli.org) The following is a condensed version of the NAR/TRA HIGH POWER SAFETY CODE. The complete code can be found in the handbooks of the organizations.

1. Only a person who is a certified flyer shall operate or fly a high power rocket.
2. Must comply with United States Code 1348, "Airspace Control and Facilities", Federal Aviation Act of 1958 and other applicable federal, state, and local laws, rules, regulations, statutes, and ordinances.
3. A person shall fly a high power rocket only if it has been inspected and approved for flight by a Safety Monitor for compliance with the applicable provisions of this code.
4. Motors.
 - 4.1 Use only certified commercially made rocket motors.
 - 4.2 Do not dismantle, reload, or alter a disposable or expendable high power rocket motor, not alter the components of a reloadable high power rocket motor or use the contents of a reloadable rocket motor reloading kit for a purpose other than that specified by the manufacture in the rocket motor or reloading kit instructions.
5. A high power rocket shall be constructed to withstand the operating stresses and retain structural integrity under conditions expected or known to be encountered in flight.
6. A high power rocket

vehicle intended to be propelled by one or more high power solid propellant rocket motor(s) shall be constructed using lightweight materials such as paper, wood, plastic, fiberglass, or, when necessary, ductile metal so that the rocket conforms to the other requirements of this code.

7. A person intending to operate a high power rocket shall determine its stability before flight, providing documentation of the location of the center of pressure and center of gravity of the high power rocket to the Safety Monitor, if requested.

8. Weight and Power Limits. 8.1 Ensure that the rocket weighs less than the rocket motor manufacturer's recommended maximum liftoff weight for the rocket motor(s) used for the flight. During pre-flight inspection, The Safety Monitor may request documentary proof of compliance.

8.2 Do not install a rocket motor or combination of rocket motors that will produce more than 40,960 newton-seconds of total impulse (4.448 newtons equals 1.0 pound).

9. Recovery. 9.1 Fly a high power rocket only if it contains a recovery system that will return all parts of it safely to the ground so that it may be flown again.

9.2 Install only flame resistant recovery wadding if wadding is required by the design of the rocket. 9.3 Do not attempt to catch a high power rocket as it approaches the ground.

9.4 Do not attempt to retrieve a high power rocket from a place that is hazardous to people. 10. Payloads. 10.1 Do not install or incorporate in a high power rocket a payload that is intended to be flammable, ex-

plosive, 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 from vertical. 11.4 Place the end of the launch rod or rail above eye level or cap it to prevent accidental eye injury. Store the launch rod or rail so it is capped, cased, or left in a condition where it cannot cause injury.

12. Ignition Systems. 12.1 Use an ignition system that is remotely controlled, electrically operated, and contains a launching switch that will return to "off" when released.

12.2 The ignition system shall contain a removable safety interlock device in series with the launch switch.

12.3 The launch system and igniter combination shall be designed, installed, and operated so the liftoff of the rocket shall occur within three (3) seconds of actuation of the launch system. If the rocket is propelled by a cluster of rocket motors designed to be ignited simultaneously, install an ignition scheme that has either been previously tested or has a demonstrated capability of igniting all rocket motors intended for launch ignition within one second following ignition system activation. 12.4

Install an ignition device in a high power rocket motor only at the launch site and at the last practical moment before the rocket is placed on the launcher.

13. Launch Site.

13.1 Launch a high power rocket only in an outdoor area where tall trees, power lines, and buildings will not present a hazard to the safe flight operation of a high power rocket in the opinion of the Safety Monitor.

13.2 Do not locate a launcher closer to the edge of the flying field (launch site) than one-half the radius of the minimum launch site dimension stated in Table 1.

13.3 The flying field (launch site) shall be at least as large for a given impulse as stated Table 1 of the Tripoli safety code. See www.tripoli.org <<http://www.tripoli.org>> .

14. Launcher Location

14.1 Locate the launcher more than 1,500 feet front any occupied building.

14.2 Ensure that the ground for a radius of 10 feet around the launcher is clear of brown grass, dry weeds, or other easy-to-burn materials that could be ignited during launch by the exhaust of the rocket motor.

15. Safe Distances.

15.1 No person shall be closer to the launch of a high power rocket than the person actually launching the rocket and those authorized by the Safety Monitor.

15.2 All spectators shall remain within an area determined by the Safety Monitor and behind the Safety Monitor and the person launching the rocket.

15.3 A person shall not be closer to the launch of a high power rocket than the applicable minimum safe distance set forth in Table 2 of the Tripoli Safety code. See

www.tripoli.org <<http://www.tripoli.org>> .

16. Launch Operations.

16.1 Do not ignite and launch a high power rocket horizontally, at a target, or so the rocket's flight path goes into clouds or beyond the boundaries of the flying field (launch site).

16.2 Do not launch a high power rocket if the surface wind at the launcher is more than twenty (20) miles per hour.

16.3 Do not operate a high power rocket in a manner that is hazardous to aircraft.

17. Launch Control.

17.1 Launch a high power rocket only with the immediate knowledge, permission, and attention of the Safety Monitor.

17.2 All 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 pro-

cedures 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.