



Model Rocket Safety Code

- Materials.** I will use only lightweight, non-metal parts for the nose, body, and fins of my rocket.
- Motors.** I will use only certified, commercially-made model rocket motors, and will not tamper with these motors or use them for any purposes except those recommended by the manufacturer.
- Ignition System.** I will launch my rockets with an electrical launch system and electrical motor igniters. My launch system will have a safety interlock in series with the launch switch, and will use a launch switch that returns to the "off" position when released.
- Misfires.** If my rocket does not launch when I press the button of my electrical launch system, I will remove the launcher's safety interlock or disconnect its battery, and will wait 60 seconds after the last launch attempt before allowing anyone to approach the rocket.
- Launch Safety.** I will use a countdown before launch, and will ensure that everyone is paying attention and is a safe distance of at least 15 feet away when I launch rockets with D motors or smaller, and 30 feet when I launch larger rockets. If I am uncertain about the safety or stability of an untested rocket, I will check the stability before flight and will fly it only after warning spectators and clearing them away to a safe distance.
- Launcher.** I will launch my rocket from a launch rod, tower, or rail that is pointed to within 30 degrees of the vertical to ensure that the rocket flies nearly straight up, and I will use a blast deflector to prevent the motor's exhaust from hitting the ground. To prevent accidental eye injury, I will place launchers so that the end of the launch rod is above eye level or will cap the end of the rod when it is not in use.
- Size.** My model rocket will not weigh more than 1,500 grams (53 ounces) at liftoff and will not contain more than 125 grams (4.4 ounces) of propellant or 320 N-sec (71.9 pound-seconds) of total impulse. If my model rocket weighs more than one pound (453 grams) at liftoff or has more than four ounces (113 grams) of propellant, I will check and comply with Federal Aviation Administration regulations before flying.
- Flight Safety.** I will not launch my rocket at targets, into clouds, or near airplanes, and will not put any flammable or explosive payload in my rocket.
- Launch Site.** I will launch my rocket outdoors, in an open area at least as large as shown in the accompanying table, and in safe weather conditions with wind speeds no greater than 20 miles per hour. I will ensure that there is no dry grass close to the launch pad, and that the launch site does not present risk of grass fires.
- Recovery System.** I will use a recovery system such as a streamer or parachute in my rocket so that it returns safely and undamaged and can be flown again, and I will use only flame-resistant or fireproof recovery system wadding in my rocket.
- Recovery Safety.** I will not attempt to recover my rocket from power lines, tall trees, or other dangerous places.

LAUNCH SITE DIMENSIONS

Installed Total Impulse (N-sec)	Equivalent Motor Type	Minimum Site Dimensions (ft.)
0.00 — 1.25	1/4A	50
1.26 — 2.50	A	100
2.51 — 5.00	B	200
5.01 — 10.00	C	400
10.01 — 20.00	D	500
20.01 — 40.00	E	1000
40.01 — 80.00	F	1000
80.01 — 160.00	G	1000
160.01 — 320.00	2 Gs	1500

goliath

1969
SEMROC

BUILD THREE WAYS:
3 ENGINE CLUSTER
OR
SINGLE ENGINE
OR
"D" ENGINE

LARGE PAYLOAD

TWO PARACHUTES

LASER CUT FINS

FLYING MODEL ROCKET KIT

SEMROC

Made in the U.S.A. by Semroc Astronautics Corporation - Knightdale, N.C. 27545

GOLIATH Kit No. KV-28

Specifications	Engine	Approx. Altitude
Body Diameter	C6-5	500'
Length	D12-5	900'
Fin Span	C6-7 (3)	1350'
Net Weight		

PARACHUTE RECOVERY

What is a Retro-Repro?

A Retro-Repro is a retro reproduction of an out-of-production model rocket kit. It is a close approximation of a full scale model of an early historically significant model rocket kit from one of the many companies that pioneered the hobby over the past half century. A Retro-Repro is not a true clone or identical copy of the original. It incorporates improvements using modern technology, while keeping the flavor and build appeal of the early kits.

About Semroc Astronautics Corporation

Semroc Astronautics Corporation was started by Carl McLawhorn in his college dorm at North Carolina State University in November, 1967. Convincing a small group of investors in his home town of Ayden, North Carolina to invest in a small corporation, the company was re-incorporated as Semroc Astronautics Corporation on December 31, 1969.

Semroc produced a full line of model rocket kits and engines. At its peak, Semroc had twenty-five full time employees working at two facilities. One was for research and development, printing, shipping, and administration. The other was outside town and handled all production and model rocket engine manufacturing. For several years, Semroc was successful selling model rocket kits, supplies, and engines by mail-order and in hobby shops. In early 1971, Semroc became insolvent and had to close its doors.

After 31 years of dreams and preparations, Semroc Astronautics Corporation was reincorporated on April 2, 2002 with a strong commitment to helping put the fun back into model rocketry.

February 11, 2004

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Box 1271 Knightdale, NC 27545 (919) 266-1977

LIMITATION OF LIABILITY

Model rockets are not toys, but are functional rockets made of lightweight materials and are launched with NAR or Tripoli safety certified model rocket motors, electrically ignited and flown in accordance with the NAR Model Rocket Safety Code. If misused, model rockets can cause serious injury and property damage. Semroc certifies that it has exercised reasonable diligence in the design and manufacture of its products. Semroc cannot assume any liability for the storage, transportation, or usage of its products. Semroc shall not be held responsible for any personal injury or property damage whatsoever arising out of the handling, storage, use, or misuse of our products. The buyer assumes all risks and liabilities therefrom and accepts and uses Semroc products on these conditions.

Your purchase and use of any Semroc products is construed as your agreement to and acceptance of these terms. If you do not agree to these terms and conditions, you must return the product, unused, for refund or credit.

100% SATISFACTION GUARANTEE

If you are not 100% satisfied with your Semroc product, we will make it right by providing whatever you consider fair, from refund to replacement.

Contact us at:

Semroc Astronautics Corporation

Customer Service Department
P.O. Box 1271
Knightdale, North Carolina 27545

JOIN THE NAR!

Sign up online at www.nar.org to join the premier model rocketry organization. Semroc fully supports the National Association of Rocketry and recognizes it as the sport's official voice. The NAR is the oldest and largest sport rocketry organization in the world. Since 1957 over 80,000 serious sport rocket modelers have joined the NAR to take advantage of the fun and excitement of organized rocketry. It is always more fun if you fly with friends. The *Sport Rocketry* magazine is one of the best ways to keep informed of new developments in the hobby. Check online at www.semroc.com/nar for promotions just for NAR members.

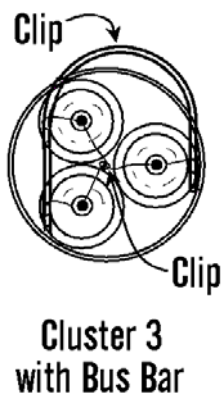


LAUNCH PREPARATION

49. Mounting the engines: If configured as a three engine cluster, all engines must be mounted securely using masking tape to keep the engines from kicking out at ejection time.

50. Refer to the model rocket engine manufacturer's instructions to complete the engine prepping. Different engines have different igniters and methods of hooking them up to the launch controllers. When firing more than one engine, always make sure you have at least a 12 volt car battery in top condition. The lead wire should be at least 16 gauge or less and no more than 20 feet in length. Make sure all connections are tight and the electrical system is in perfect order.

Hook up the igniters using bus bar as shown below or use "Clip Whips" designed for clusters.



A full tutorial on clustering is outside the scope of these instructions. If you are not experienced with clustering, a search online will yield many tutorials to get you started on one of the most challenging propulsion methods for model rocketry.

51. Pack the recovery wadding from the top of the body tube. Use a sufficient quantity to protect the parachute, but not too much that it will interfere with the proper deployment of the parachutes.

52. Fold the parachutes and pack them and the shock cord on top of the recovery wadding. Slide the payload section into place, making sure it does not pinch the shock cord or parachute.

53. Carefully check all parts of your rocket before each flight as a part of your pre-flight checklist. Launch the Goliath from a 1/8" diameter by 36" long launch rod. A longer rod will result in better flight control and stability.

About the Goliath™

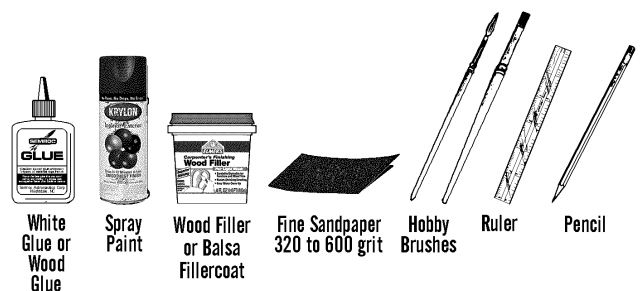
The Semroc Goliath was released in 1969 as the sixth Semroc-Kit. Designed to be an entry-level cluster payload rocket, the Goliath was inspired by the early Estes Ranger kit. Many were also built with a single standard engine to make a great demonstration rocket. At the time it was introduced, it was the largest Semroc-kit, thus it acquired the name Goliath. The Goliath was part number KB-6 and retailed for \$3.29 when it was first introduced.

The Retro-Repro Goliath is updated by using laser-cut balsa fins and a Kevlar® shock cord attachment. The original balsa nose cones, balsa tube adapter, and body tubes are still used. The design of the Goliath provides many different possibilities of engine options. Parts are included for the original three engine cluster configuration. Additional parts are provided to build the Goliath with a single standard engine for small field flying. An additional engine mount assembly is provided to allow the Goliath to be built as an entry-level 24mm "D" engine rocket.

BEFORE YOU START!

Make sure you have all the parts included in this kit that are listed in the Parts List in the center of these instructions. In addition to the parts included in this kit, you will also need the tools and materials listed below. Read the entire instructions before beginning to assemble your rocket. When you are thoroughly familiar with these instructions, begin construction. Read each step and study the accompanying drawings. Check off each step as it is completed. In each step, test-fit the parts together before applying any glue. It is sometimes necessary to sand lightly or build-up some parts to obtain a precision fit. If you are uncertain of the location of some parts, refer to the exploded view in the center of these instructions. It is important that you always ensure that you have adequate glue joints.

TOOLS: In addition to the parts supplied, you will need the following tools to assemble and finish this kit.

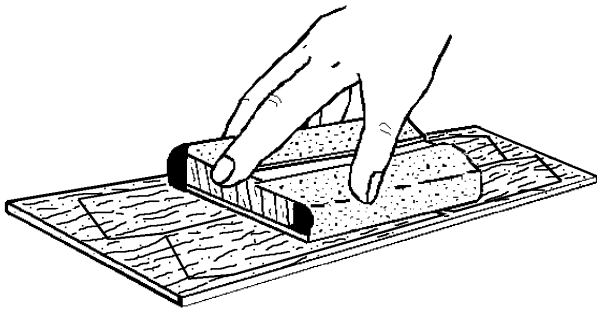


ASSEMBLY

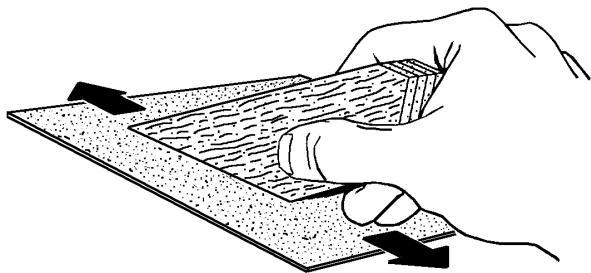
- ❑ **1.** These instructions are presented in a logical order to help you put your Goliath together quickly and efficiently. Check off each step as you complete it and we hope you enjoy putting this kit together and flying it.

FIN PREPARATION

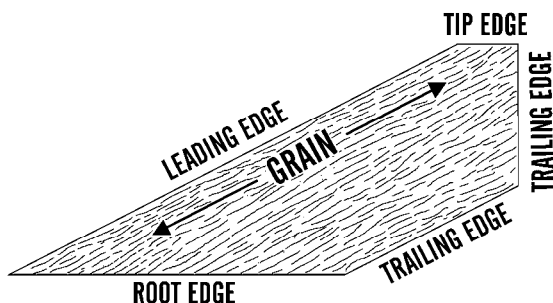
- ❑ **2.** Lightly sand each side of the sheet of laser-cut fins. Carefully push the laser-cut fins from the sheet. Start at one point on each fin and slowly and gently work around the fin.



- ❑ **3.** Stack all four fins together. Line them up squarely and sand the fins back and forth over some fine sandpaper to get rid of the hold-in tabs as shown below.



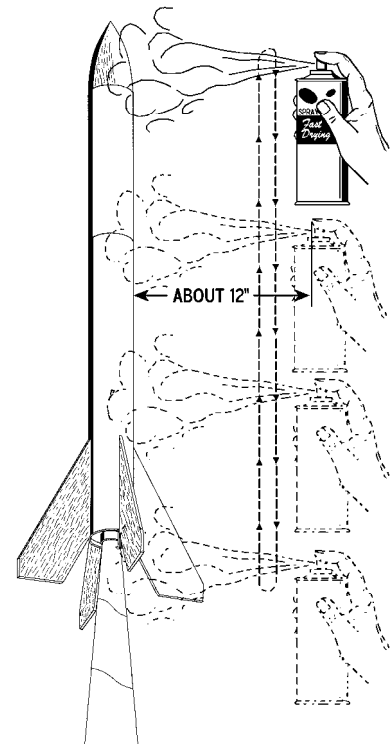
- ❑ **4.** Round all leading edges. Round or taper all trailing and tip edges. Leave the root edges flat. Use the diagram to identify edges.



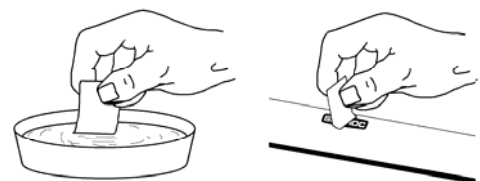
FINISHING

- ❑ **46.** If you have not sealed the fins and nose cone, now is the time to complete this part of the assembly. After all balsa dust has been prepared, wipe off all balsa dust with a dry cloth. First spray the model with an enamel primer. Choose a high visibility color combination like white and red for the final color.

- ❑ **47.** Spray painting your model with a fast-drying enamel will produce the best results. PATIENCE...is the most important ingredient. Use several thin coats, allowing each coat to completely dry before the next coat. Start each spray a few inches above the model and end a few inches below the model. Keep the can about 12" away and use quick light coats. The final coat can be a little heavier to give the model a glossy wet-looking finish.

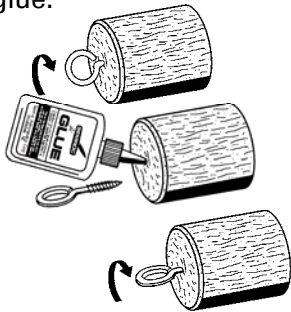


- ❑ **48.** After the paint has dried, the decal may be applied. The decal supplied with the Goliath is a waterslide decal. Cut around the decal and place in in a dish of water. When it is loose on the paper backing, slide it onto the payload section.



PAYLOAD SECTION

- ❑ **41.** Turn the screw eye into the center of the base of the nose block. Unscrew it and squirt glue into the hole. Reinstall the screw eye and wipe off any excess glue.



- ❑ **42.** Check the nose block for fit. It may be necessary to sand it gently if the fit is too tight or build it up with masking tape if too loose. Mark the nose block 3/4" from one end. Apply glue to the inside the remaining body tube at a distance of 1/4" from one end.



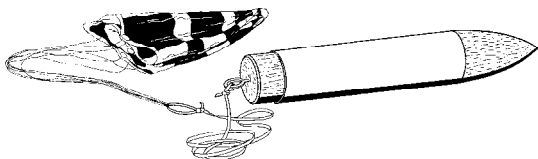
- ❑ **43.** Slide the nose block, with screw eye pointing out, into the body tube until the mark is even with the end of the body tube. Do not stop until the nose block is in place or the glue may set prematurely.



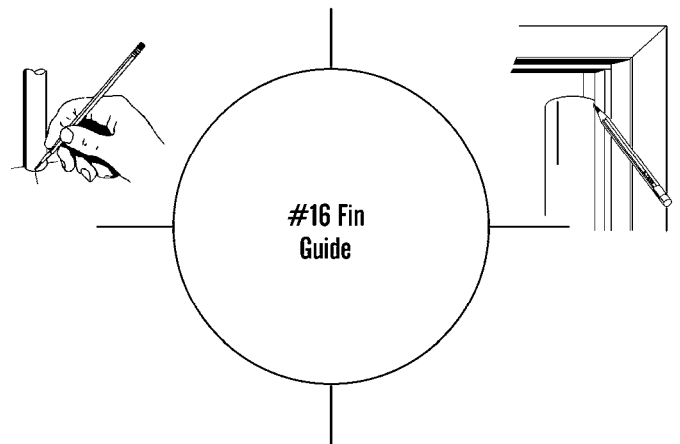
- ❑ **44.** Insert the nose cone in the body tube and check for proper fit. The nose cone should be snug to hold itself in alignment. If it is too loose, add masking tape. If it is too tight, sand the shoulder slightly. Do not glue the nose cone so you can access the payload area.



- ❑ **45.** Finish the payload assembly by tying one end of the other elastic cord to the screw eye. Tie a 1" loop in the other end and attach the final chute through the loop as was done for the main chutes.



- ❑ **5.** Stand the longest body tube on the fin guide below and make the fin position marks on the sides of the tube. Find a convenient channel or groove such as a partially open drawer, a door jamb (as shown,) or a piece of molding. Using the channel, extend the marks the full length of the tube to provide lines for aligning the fins.



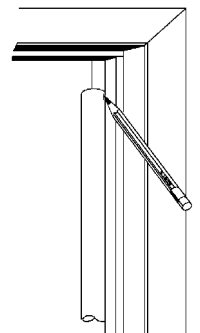
ENGINE MOUNT

STOP!

There are parts for building any one of three engine mount configurations. You must choose which of the three mounts to use with your Goliath. Pick one of the three options that follow.

Option A Three Engine Cluster

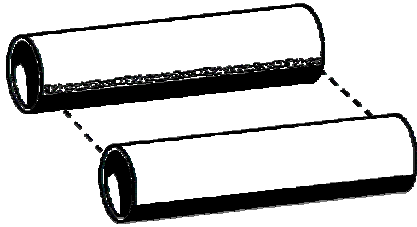
- ❑ **6.** Find a convenient channel or groove such as a partially open drawer, a door jamb (as shown), or a piece of molding. Using the channel, mark the full length of one of the three smallest body tubes to provide a line for applying a bead of glue.



- ❑ **7.** Place the tube on a flat, smooth surface with the bead of glue as shown.



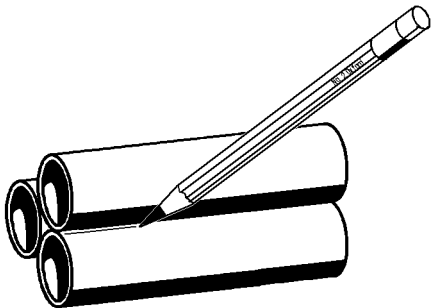
- 8.** Glue the second tube to the first by aligning it along the bead of glue. A single sheet of newspaper or wax paper under the tubes will keep glue off your work surface.



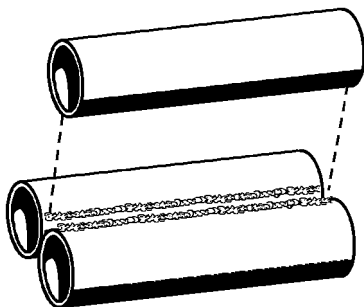
- 9.** Make sure both tubes touch and are laying flat on the work surface. Both ends should also be even. Getting these first two tubes aligned properly is very important. In each step, make sure the ends are even and the tubes are in good parallel alignment. Allow these first two tubes to dry.



- 10.** Test fit the third tube on the first two tubes. Using a pencil, mark the intersection of the third (top) tube with each of the two bottom tubes.

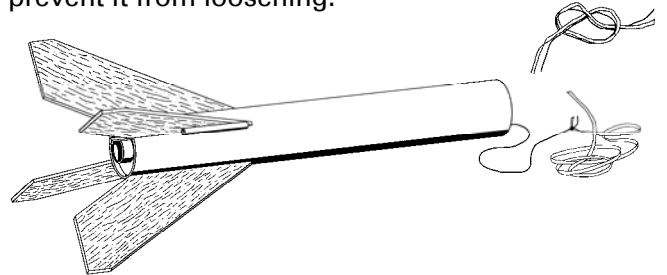


- 11.** Apply two beads of glue along each of the lines marked on the bottom tubes. Place the third tube on the first two. Rotate it slightly to smooth the glue and make a tight fit.

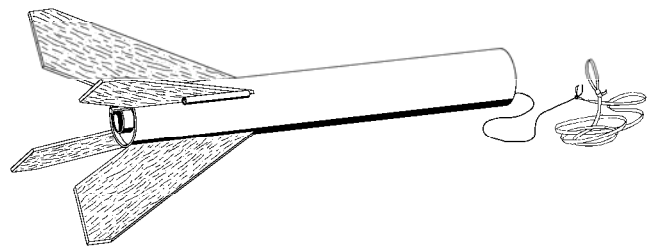


MAIN FINAL ASSEMBLY

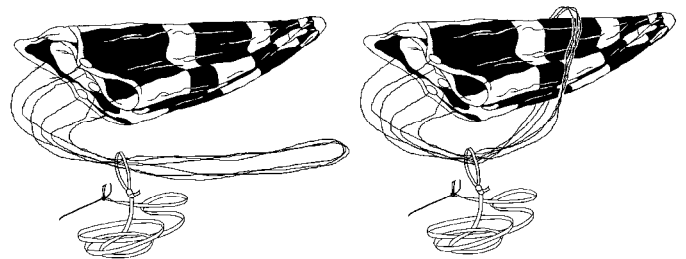
- 37.** Prepare the main shock cord as follows. Line up one end of the elastic shock cord with the free end of the Kevlar cord and tie an overhand knot at the end of the two cords. Pull the knot tight and place a small drop of white glue on the knot to prevent it from loosening.



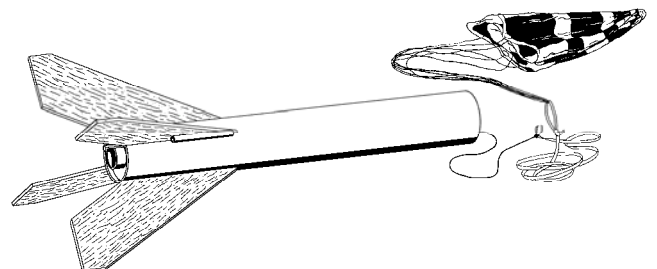
- 38.** Place a loop about 1" in diameter in the free end of the elastic cord. The main chute will be attached to this loop.



- 39.** Assemble both chutes using instructions printed on canopy. Attach one chute by passing the lines through the loop in the elastic cord and then passing the chute through the shroud line loop as shown.

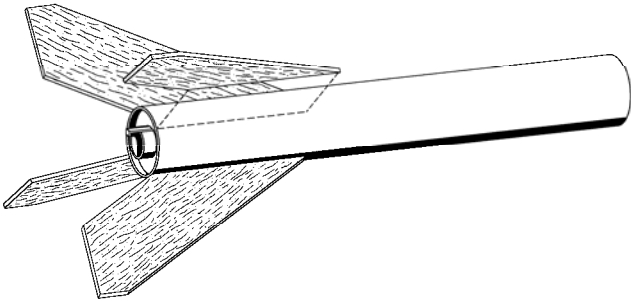


- 40.** This completes the assembly of the main section.



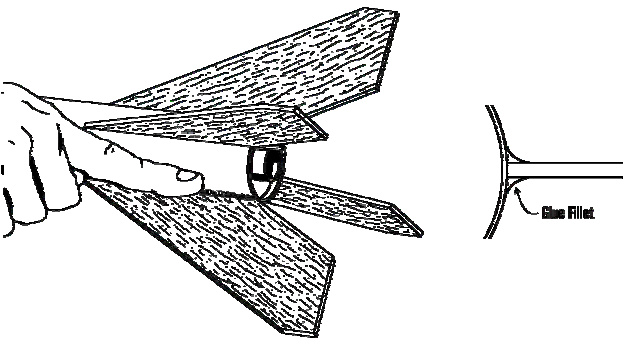
FIN ASSEMBLY

- ❑ **33.** Apply glue to the root edge of a fin and position it along one of the lines drawn on the side of the body tube. Remove, allow to dry, apply additional glue, and reposition. Repeat for the other three fins.

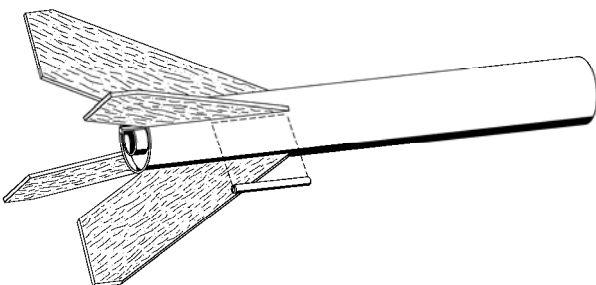


- ❑ **34.** Allow to dry standing vertically, checking for alignment visually while the assembly dries. Stuff the shock cord and Kevlar® cord into the body tube so it will remain vertical.

- ❑ **35.** After the fin assembly is completely dry, run a small bead of glue along both sides of each fin-body tube joint. Using your forefinger, smooth the glue into fillets.



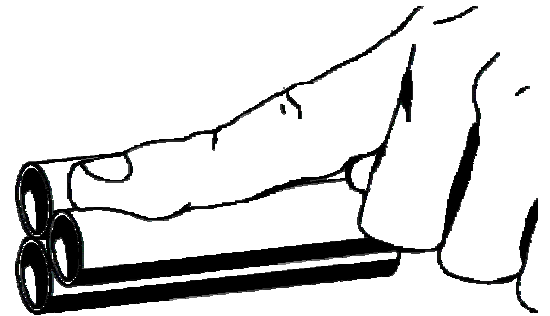
- ❑ **36.** Glue the launch lug onto the body against one of the fin joints and even with the top edge of the fin as shown. Stand the assembly vertically again and wait for the fin fillets to completely dry. Watch for runs in the glue and wipe any before they run down the tube.



- ❑ **12.** You now have all three tubes glued in place. Check from the end to make sure they are all in proper alignment. Allow to dry thoroughly.



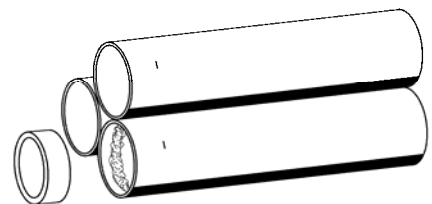
- ❑ **13.** When this assembly has dried completely, place a thin fillet of glue along each of the exposed joints and smooth with your finger. Fill the inner cavity between the three tubes with glue.



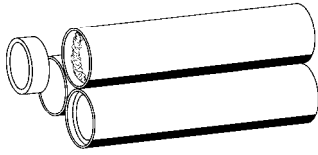
- ❑ **14.** Tie one end of the yellow Kevlar® cord to one of the thrust rings by forming a loop around the ring and tying an overhand knot in the two ends. Pull the knot tight and place a drop of white glue on the knot.



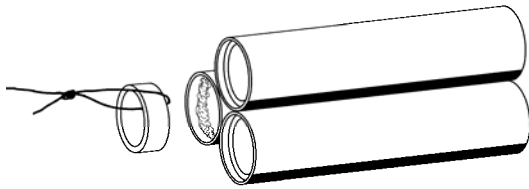
- ❑ **15.** Apply a bead of glue about 1/4" inside one of the engine mount tubes. Insert one of the thrust rings in the engine mount tube until it is about 1/8" from the edge of the tube.



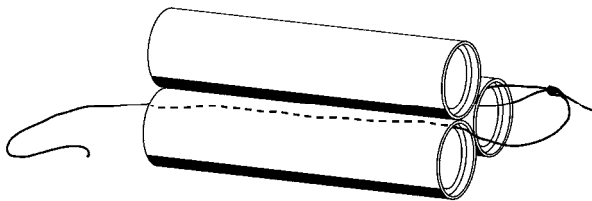
- ❑ **16.** Apply a bead of glue about 1/4" inside another engine mount tube. Insert a second thrust ring in the engine mount tube until it is about 1/8" from the edge of the tube.



- ❑ **17.** Apply a bead of glue about 1/4" inside the final engine mount tube. Insert the final thrust ring with the Kevlar® cord in the engine mount tube until it is about 1/8" from the edge of the tube.



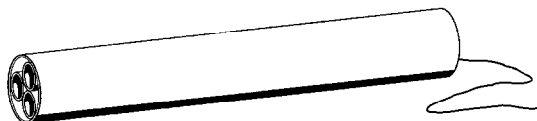
- ❑ **18.** Thread the yellow Kevlar® cord back through the bottom of the engine tube.



- ❑ **19.** Apply a bead of glue about 1/4" inside the largest body tube. Insert the engine mount assembly until it is flush with the bottom of the tube. This is a tight fit, so make sure you do not stop inserting the engine mount until it is in the proper position. Fill all the cracks between engine tubes with tissue paper and glue.

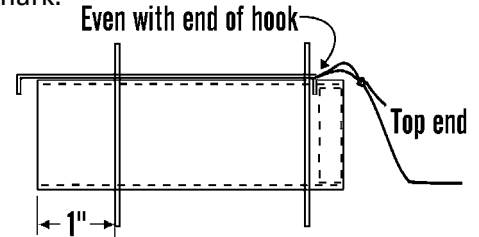


- ❑ **20.** Feed the yellow Kevlar® cord back through the engine mount tube until it comes out the opposite end. Make sure it is pulled all the way through the engine mount. It may be necessary to shake the tube or pull the cord through with a coat hanger or long, thin wood dowel.

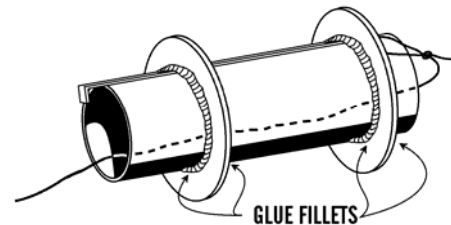


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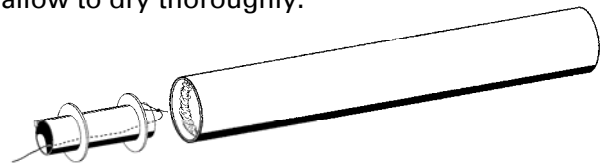
- ❑ **28.** Glue the two centering rings with the largest inner holes on the engine mount tube as follows. Slide the first ring from the bottom until it is even with the end of the engine hook. Make sure the yellow Kevlar® cord is free and comes out from the top of the tube as shown below. Mark 1" from the bottom of the engine mount tube and slide the other centering ring from the bottom until it is even with the mark.



- ❑ **29.** When centering rings are positioned properly, apply glue fillets around the engine mount tube at all four joints as shown. Pull the cord back through the engine tube.



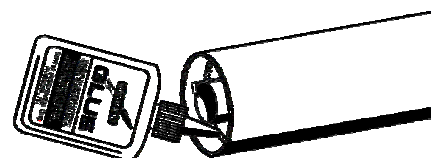
- ❑ **30.** Apply a bead of glue about 1/4" inside the longest body tube. Insert the engine mount assembly until it is flush with the bottom of the tube. Stand the tube on end with the engine mount down and allow to dry thoroughly.



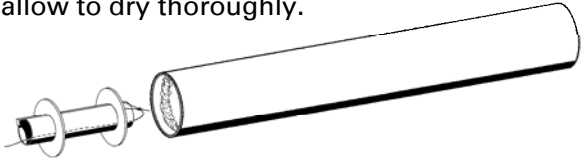
- ❑ **31.** Feed the yellow Kevlar® cord back through the engine mount tube until it comes out the opposite end. Make sure it is pulled all the way through the engine mount. It may be necessary to shake the tube or pull the cord through with a coat hanger or long, thin wood dowel.



- ❑ **32.** Apply a bead of glue around the bottom centering ring. Stand the assembly on end with the engine mount upward and allow to dry thoroughly.



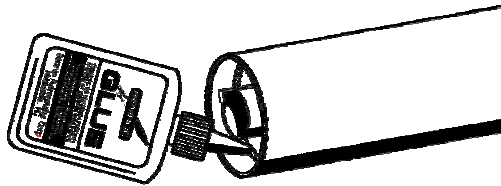
- ❑ **24.** Apply a bead of glue about 1/4" inside the large body tube. Insert the engine mount assembly until it is flush with the bottom of the tube. Stand the tube on end with the engine mount down and allow to dry thoroughly.



- ❑ **25.** Feed the yellow Kevlar® cord back through the engine mount tube until it comes out the opposite end. Make sure it is pulled all the way through the engine mount. It may be necessary to shake the tube or pull the cord through with a coat hanger or long, thin wood dowel.



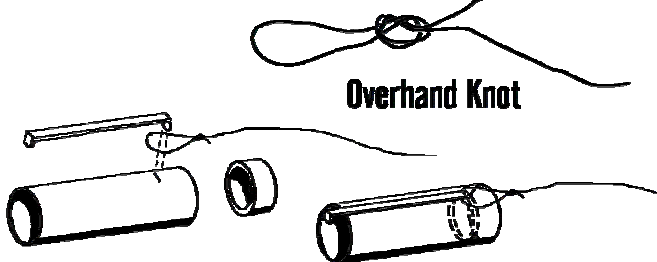
- ❑ **26.** Apply a bead of glue around the bottom centering ring. Stand the assembly on end with the engine mount upward and allow to dry thoroughly.



Skip to Step 33

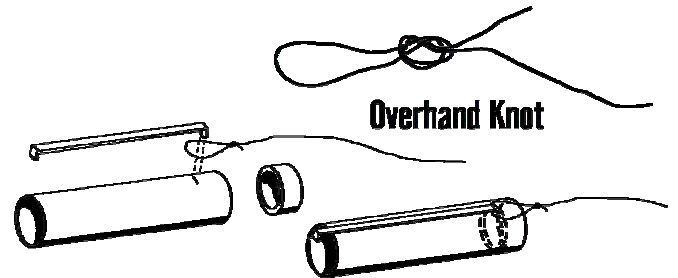
Option C Single D (24mm) Engine

- ❑ **27.** Tie a loop in one end of the yellow Kevlar® cord. Insert one end of the engine hook through the loop and into the pre-punched large engine tube (ST-930E.) Glue the large thrust ring in place on top of the engine hook as shown.

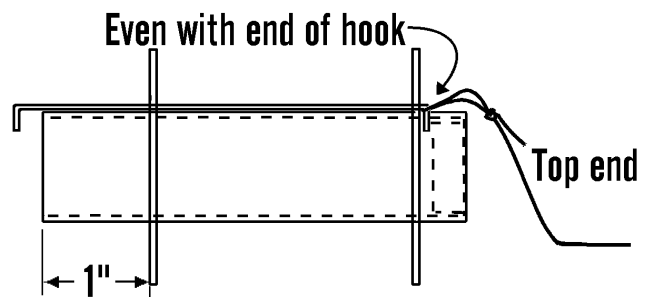


Option B Single Standard Engine

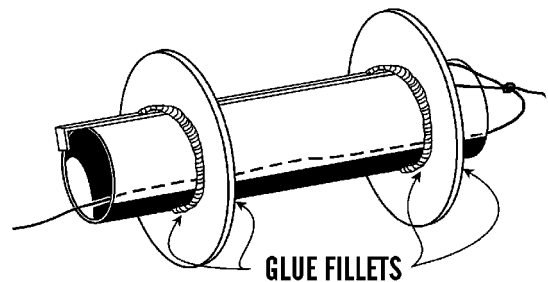
- ❑ **21.** Tie a loop in one end of the yellow Kevlar® cord. Insert one end of the engine hook through the loop and into one of the three pre-punched small engine tubes. Glue the thrust ring in place on top of the engine hook as shown. The other two small engine tubes and the larger engine tube are not needed in this option.



- ❑ **22.** Glue the two centering rings with the smallest inner holes on the engine mount tube as follows. Slide the first ring from the bottom until it is even with the end of the engine hook. Make sure the yellow Kevlar® cord is free and comes out from the top of the tube as shown below. Mark 1" from the bottom of the engine mount tube and slide the other centering ring from the bottom until it is even with the mark.



- ❑ **23.** When the centering rings are positioned properly, apply glue fillets around the engine mount tube at all four joints as shown. Pull the cord back through the engine tube.



Parts List

EXPLODED VIEW

- A 1 Body Tube ST-16120
- B 1 Body Tube ST-1660
- C 3 Body Tubes..... ST-730E
- D 1 Body Tube ST-930E
- E 1 Balsa Nose Cone BC-1631
- F 1 Balsa Tube Coupler..... BTC-16
- G 1 Laser Cut Fin Set FV-28
- H 1 Centering Ring Set CR-KV-28
- I 1 Centering Ring CR-79
- J 3 Thrust Rings..... TR-7
- K 1 Launch Lug..... LL-122
- L 1 Engine Hook EH-28
- M 1 Screw Eye SE-10
- N 2 Elastic Cords..... EC-124
- O 1 Kevlar Thread..... SCK-24
- P 2 Plastic Parachutes RC-12
- Q 2 Tape Discs TD-6
- R 2 Shroud Lines..... SLT-6
- S 1 Decal..... DKV-28

