



Model Rocket Safety Code

1. Materials. I will use only lightweight, non-metal parts for the nose, body, and fins of my rocket.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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.

8. 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.

9. 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.

10. 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.

11. 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

FIREFLY™



1968
OrionRepro

**SMALL
TWO-STAGE
DESIGN**

**OUT-OF-SIGHT
FLIGHTS!**

**FLY AS SINGLE
STAGE ONLY**

**FLYING MODEL
ROCKET KIT**



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

**FIREFLY™
Kit No. KV-31**

Specifications

Body Diameter .908" (2.3cm)
Length 9.0" (22.9cm)
Fin Span 4.9" (12.5cm)
Net Weight 1.5 oz. (42.6g)

Engine 1/2A3-4T **Approx. Altitude** 225 feet
A10-OT,A10-3T 600 feet

STREAMER 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 Centuri Engineering Company

Centuri Engineering Company was started in 1961 by Leroy (Lee) Piester in his garage while he was still in college in Phoenix, Arizona. With his wife, Betty, they built Centuri into one of the largest model rocket companies ever.

Centuri was known for its unusual and innovative designs, producing over 140 different kits with something for every model rocketeer. They also produced model rocket engines and pioneered the modern composite high powered engines with their Enerjet line.

Centuri Engineering was sold to Damon in the late 1960's and shared the same parent corporation with Estes Industries, the largest model rocket company in the world. The Centuri product line was kept separate from the Estes line until 1983. A few of the old kits have been reissued by Estes since then, but for the most part, Centuri Engineering Company lives today only in the dreams of the senior members of the model rocket community.

March 25, 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

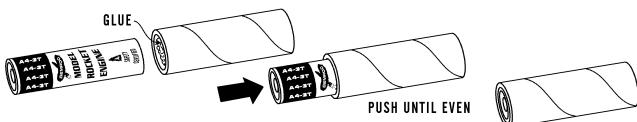
JOIN THE NAR!

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.

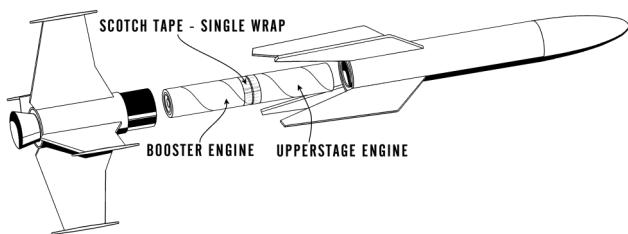


FLIGHT PREPPING

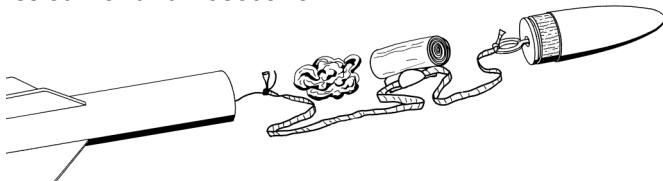
- 31.** Adapters are provided to convert mini-engines into "Shorty" engines. Apply a bead of glue inside one casing. Slide the engine into the casing until the ends are even. **Do not stop or the engine will "freeze" in place.**



- 32.** Tape the engines together using one wrap of scotch tape. Install the igniter in the booster engine. Slide the booster stage over the booster engine and into the sustainer engine until both body tubes are flush. Both engines should fit snug. Use masking tape if the engines are loose. The upper stage of the Firefly™ can also be flown without the booster as a single stage.



- 33.** Pack the recovery wadding from the top of the body tube. Use a sufficient quantity to protect the streamer, but leave enough room for the streamer and nosecone.



- 34.** Roll the streamer and pack it and the shock cord on top of the recovery wadding. Slide the adapter into place, making sure it does not pinch the shock cord or streamer.

- 35.** 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.

- 36.** Carefully check all parts of your rocket before each flight as a part of your pre-flight checklist. Launch the Firefly™ from a 1/8" diameter by 36" long launch rod.

About the Firefly™

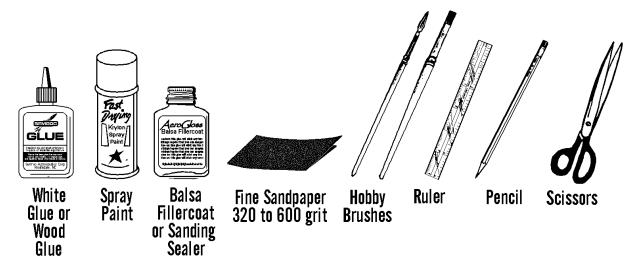
The Firefly was first released in a 1968 Centuri flyer as "the world's smallest two-stage rocket." It was designed around the new "Shorty" engines that were one inch shorter than standard engines. This allowed the Firefly to be several inches smaller than most of the two-stage rocket kits of the time. It incorporated the "Dual Lock" stage coupling for more reliable upper stage ignition. The Firefly was Centuri #KA-6 and was introduced with a price of \$1.50.

The Retro-Repro™ Firefly™ is updated by replacing the pre-marked fins with precision laser-cut fins. The original balsa nose cone and body tube sizes are used. The original nose weight has been replaced with a heavier version to improve stability. The original rubber shock cord is replaced with an elastic cord for longer life. The original method of attaching the shock cord has been replaced by a Kevlar® cord for greater reliability. "Shorty" engines are no longer available, so adapters are provided to convert mini-engines into "Shorty" engines.

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.

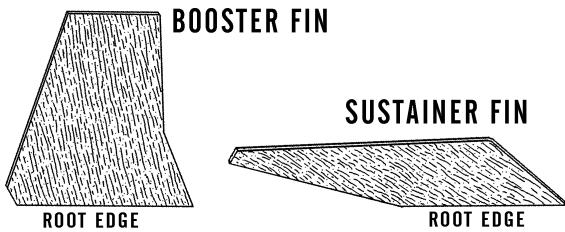


ASSEMBLY

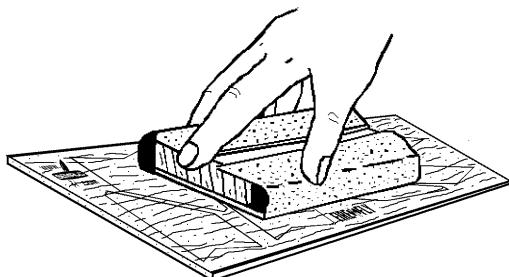
1. These instructions are presented in a logical order to help you put your Firefly™ together quickly and efficiently. Check off each step as you complete it and we hope you enjoy putting this kit together and flying it.

PREPARE FINS

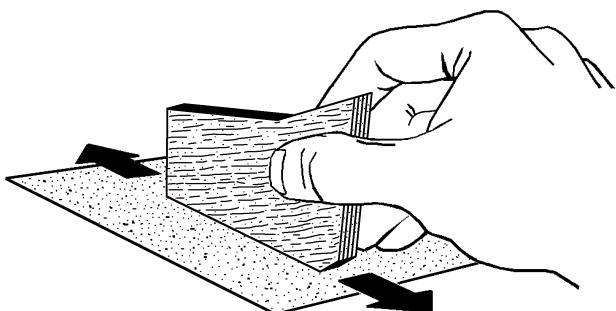
2. There are two different fin sets on the laser-cut sheet for the booster and upper stages. Use the guide below to identify the parts that are called out in these instructions.



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

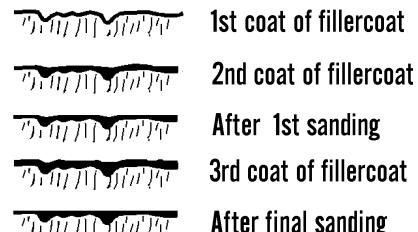


4. Stack all the fins in groups of four fins each. Line each group up squarely and sand the fins back and forth over some fine sandpaper to get rid of the hold-in tabs as shown below. Round all edges except the root edges which will be glued to the body tubes.



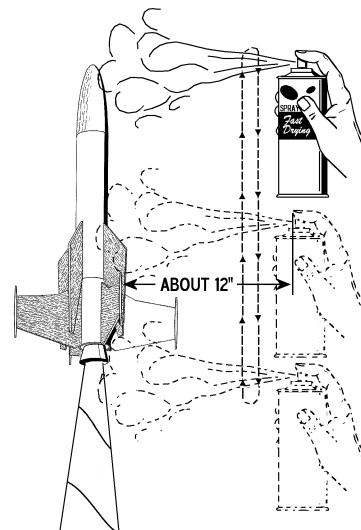
FINISHING

27. When the fillets have dried, prepare balsa surfaces for a smooth professional looking finish. Fill the wood grain with balsa fillercoat or sanding sealer. When dry, sand with fine sandpaper. Repeat until smooth.



28. After all balsa surfaces have 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.

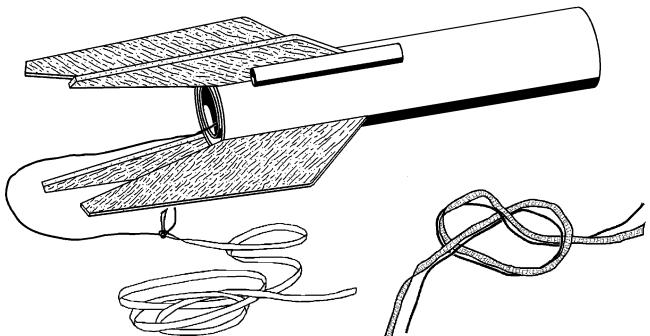
29. Spray painting your model with a fast-drying enamel will produce the best results. PATIENCE...is the most important ingredient. Use several thin coats, allowing each coat to completely dry before the next coat. Start each spray a few inches above the model and end a few inches below the model. Keep 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.



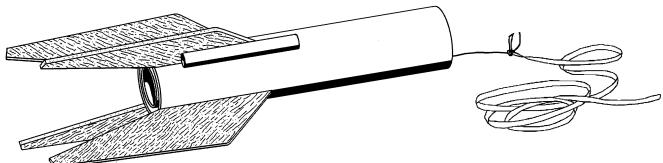
30. After the paint has dried, decals should be applied. The decals supplied with the Firefly™ are waterslide decals. Each decal should be cut separately from the sheet. Apply each decal before starting the next. Think about where you want to apply each decal and check for fit before wetting the decal. Use the cover photo as a guide for applying decals.

FINAL ASSEMBLY

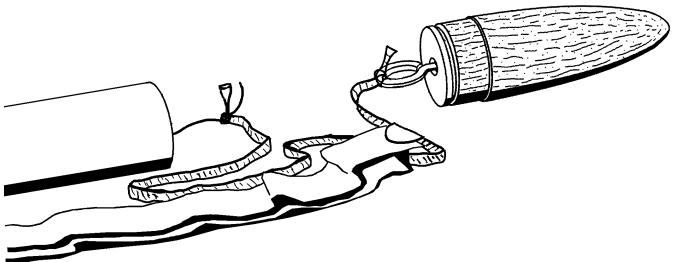
- 24.** Prepare the shock cord as follows. Line up one end of the elastic shock cord with the free end of the Kevlar® cord and tie an overhand knot at the end of the two cords. Pull the knot tight and place a small drop of white glue on the knot to prevent it from loosening.



- 25.** Feed the shock cord and yellow Kevlar® cord back through the engine mount tube and sustainer body tube until they come out the opposite end. It may be necessary to shake the tube or pull the shock cord through with a coat hanger or small wood dowel.



- 26.** Tie the free end of the shock cord to the screw eye in the nose cone. Using the tape disc provided, attach one end of the streamer to the shock cord as shown.

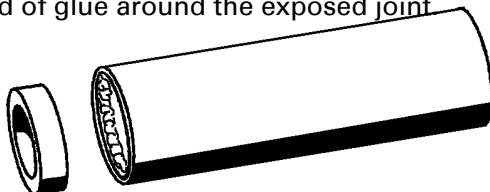


This completes the assembly of your

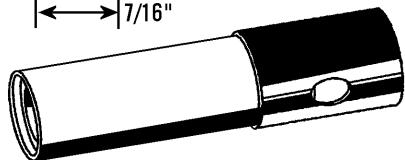
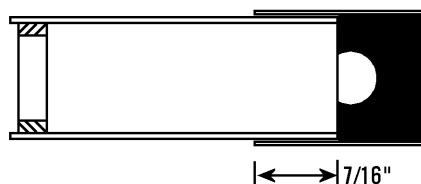
FIREFLY

BOOSTER MOUNT

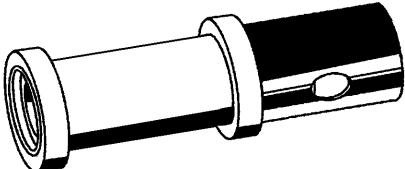
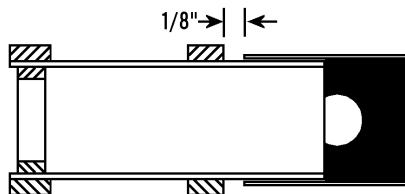
- 5.** Apply a bead of glue inside the aft end of one of the small engine mounting tubes (ST-720). Glue one of the thrust blocks just inside the motor tube. It should be recessed no more than 1/16". Run a bead of glue around the exposed joint.



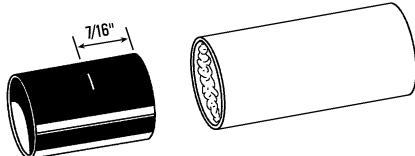
- 6.** Place a mark at 7/16" from the forward end of the engine mounting tube. Apply a bead of glue around the forward end of the tube and slide the smaller tubing coupler (with holes) over the end of the engine mount tube.



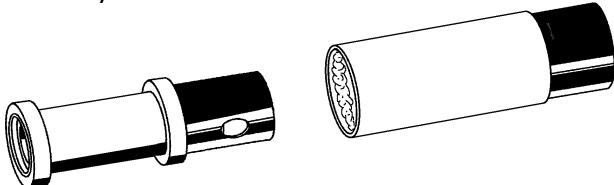
- 7.** Place a mark on the engine mounting tube $1\frac{1}{8}$ " from the tubing coupler. Glue one centering ring with the front edge even with the mark. Glue the second centering ring even with the aft end of the engine mounting tube. Apply a bead at each joint between the centering rings and the mounting tube.



- 8.** Place a mark $\frac{7}{16}$ " from one end of the remaining (larger) tubing coupler. Apply a bead of glue around the inside of the short body tube. Slide the tubing coupler into the body tube until the edge of the body tube is even with the mark on the tubing coupler.

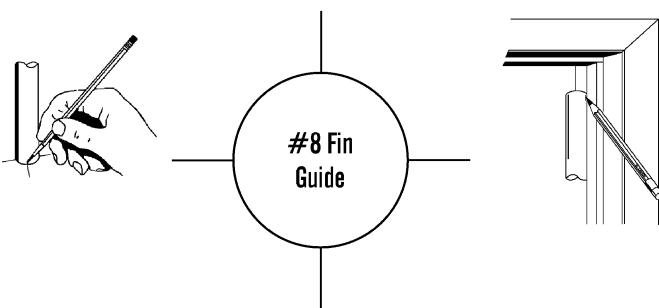


- 9.** Apply a bead of glue inside the booster body tube (ST-820). Slide the booster engine mount in the body tube until both ends are even.

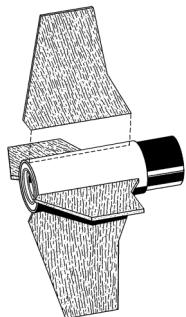


BOOSTER FINS

- 10.** Stand the booster 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. Repeat for the sustainer body tube (ST-845).

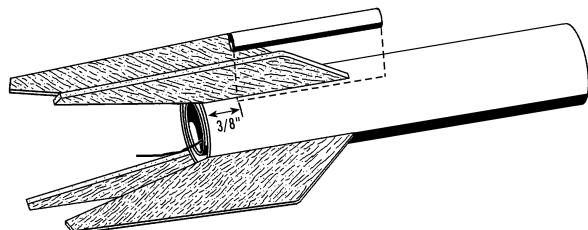


- 11.** Apply glue to the root edge of a booster fin and position it along one of the lines drawn on the side of the body tube. Remove, allow to dry, apply additional glue, and reposition. Repeat for the other three fins.

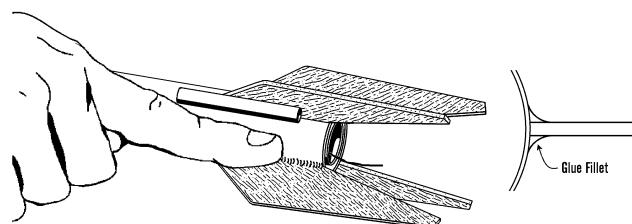


- 12.** After the fin assembly is completely dry, run a small bead of glue along both sides of each fin-body tube joint. Using your forefinger, smooth the glue into fillets.

- 21.** Apply a bead of glue to one of the fin joints on the sustainer. Glue the launch lug 3/8" from the bottom of the sustainer.

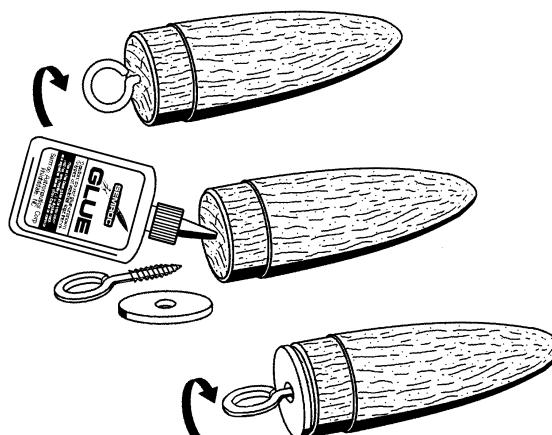


- 22.** After the fin assembly is completely dry, run a small bead of glue along both sides of each fin-body tube joint. Using your forefinger, smooth the glue into fillets.



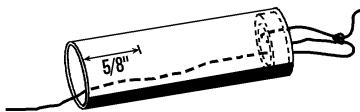
NOSE CONE

- 23.** Turn the screw eye into the center of the base of the nose cone. Unscrew it and squirt glue into the hole. Insert the screw eye into the nose weight. Reinstall the screw eye snug against the nose weight and wipe off any excess glue.

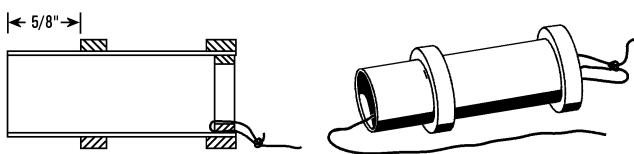




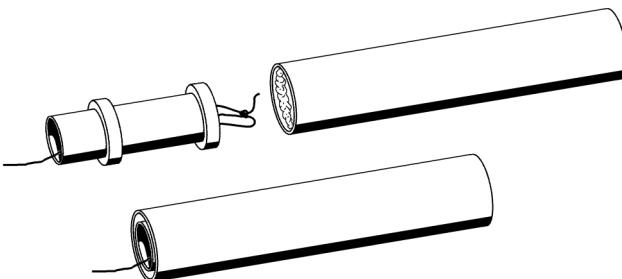
17. Pull the Kevlar® cord back through the engine mounting tube. Place a mark $5/8"$ from the aft end of the tube.



18. Glue one centering ring with the rear edge even with the mark. Glue the second centering ring even with the forward end of the engine mounting tube. Apply a bead at each joint between the centering rings and the mounting tube.

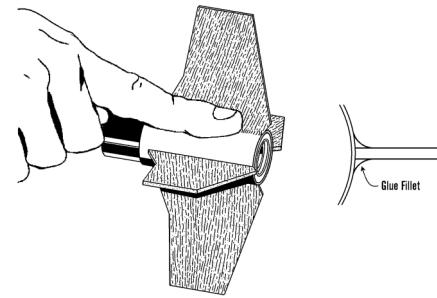
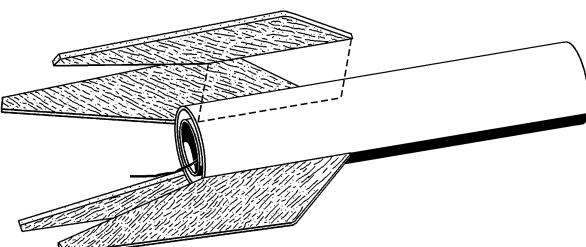


19. Apply a bead of glue inside the sustainer body tube (ST-845). Slide the sustainer engine mount in the body tube until the aft end of the mounting tube is even with the end of the sustainer body tube.

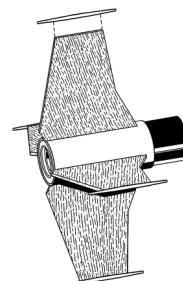


SUSTAINER FINS

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



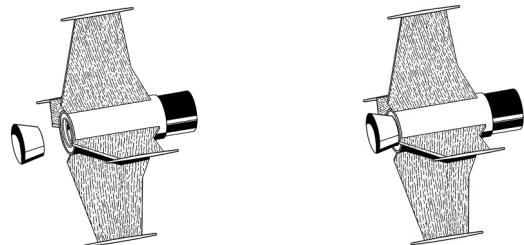
13. CAUTION: If small children are likely to come in contact with the finished rocket, skip this step. Slightly round the ends of the fin spikes with sandpaper. This will make the rocket safer to handle. Glue the spikes on the tips of each of the booster fins. Center each spike.



14. Carefully cut out the paper shroud. Roll the shroud carefully forming it into a ring. Form this carefully to avoid creasing the paper. Apply glue on the indicated section, line up the edge with the dotted line and press together on a flat surface. Set the adapter nozzle cone aside to dry.



15. Glue the nozzle cone to the aft end of the booster. Run a fillet of glue around the outside edge.



SUSTAINER MOUNT

16. Tie one end of the yellow Kevlar® cord to the remaining thrust block. Apply a bead of glue just inside one end of the second engine mounting tube. Insert the thrust block in the tube until it is even with the end of the tube.

Parts List

EXPLODED VIEW

A	1	Body Tube	.....	ST-845
B	1	Body Tube	.....	ST-820
C	2	Body Tubes	.....	ST-720
D	1	Balsa Nose Cone	.....	BC-821
E	1	Laser Cut Fins	.....	FV-31
F	1	Tubing Coupler	.....	HTC-8
G	1	Tubing Coupler	.....	HTC-7B
H	4	Centering Rings	.....	CR-78
I	2	Thrust Blocks	.....	TB-7
J	1	Launch Lug	.....	LL-115
K	1	Screw Eye	.....	SE-12
L	1	Elastic Cord	.....	EC-118
M	1	Kevlar Thread	.....	SCK-12
N	1	Streamer	.....	RS-36
O	1	Tape Disc	.....	TD-1
P	4	Wood Dowels	.....	WD-23
Q	1	Decal	.....	DKV-31
R	1	Shroud	.....	IKV-31S
S	1	Washer Weight	.....	WW-8
T	4	Empty Casings	.....	MC-717

