

# THE NEW AERO DART CARRIER ROCKET

## INTRODUCTION

The Aero-Dart carrier rocket is capable of reaching altitudes far in excess of 1000 feet, carrying a 3 to 5 ounce payload, when powered by an 'F' type Hercules rocket engine. The 9 cubic inch payload compartment can be used to carry radio transmitters, mechanical measuring devices such as accelerometers, or small biological specimens.

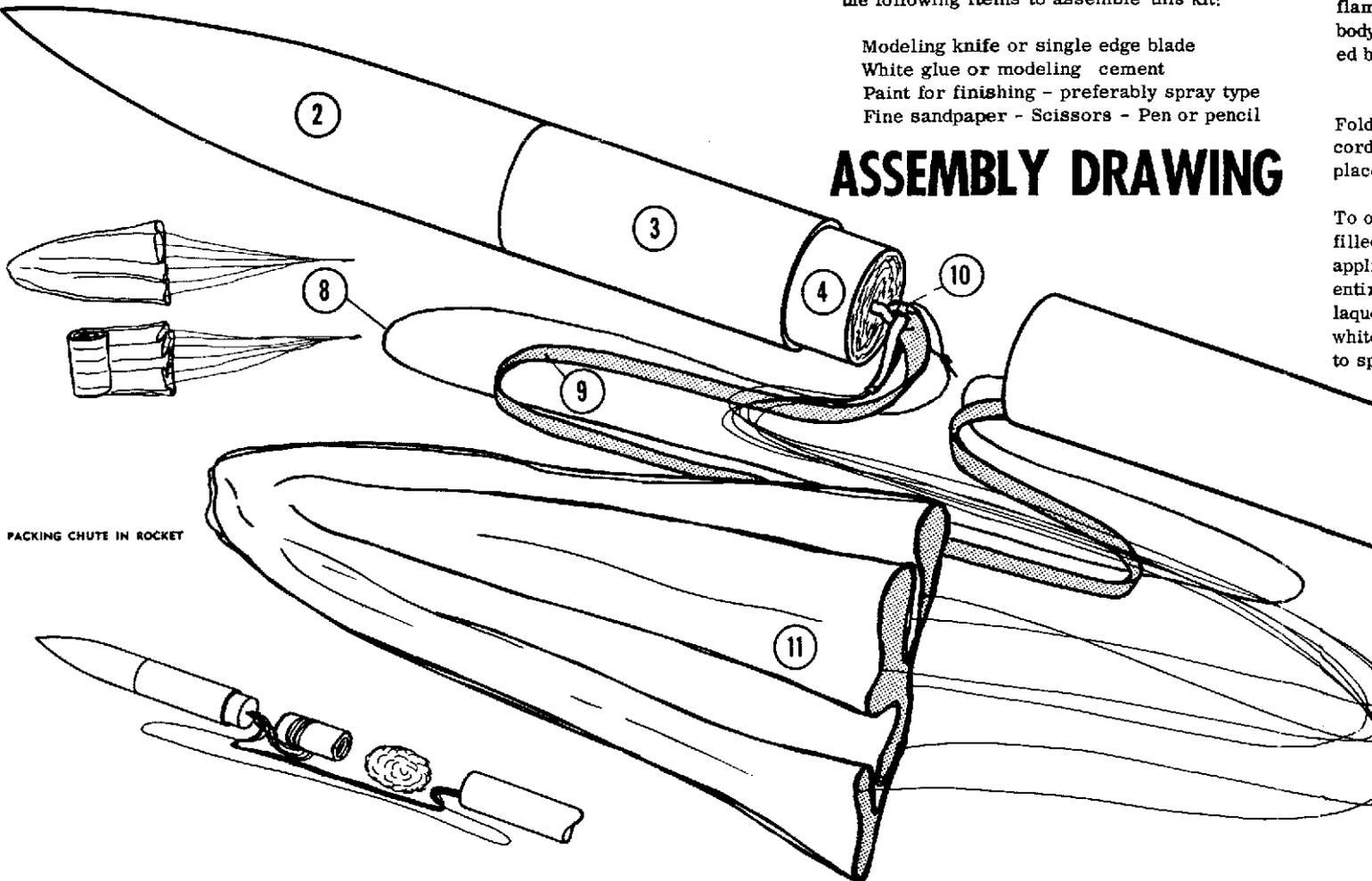
Upon ignition, the Aero-Dart streaks to maximum altitude, ejects a parachute, and returns safely to be flown again.

PART NO.	PART NAME
1	Body Tube
2	Nose Cone
3	Capsule Tube
4	Balsa Connector
5	Engine Mount
6	Stabilizer Fins
7	Launch Lug
8	Secure Cable
9	Shock Cord
10	Screw Eye
11	Parachute

In addition to the parts supplied, you will need the following items to assemble this kit:

Modeling knife or single edge blade  
White glue or modeling cement  
Paint for finishing - preferably spray type  
Fine sandpaper - Scissors - Pen or pencil

## ASSEMBLY DRAWING



## ASSEMBLY INSTRUCTIONS

The engine <sup>mount</sup> has been installed for you. Each engine mount consists of two centering rings and one forward stop.

### ATTACH STABILIZER FINS

The Aero-Dart's composite fin design is made up of two balsa pieces. Cut out and glue part B to part A for each fin, as shown in the Assembly Drawing. When the glue has thoroughly dried, sand each fin as shown above. Round the leading and tip edges, and taper the trailing edge. Do not sand the root chord edge.

Cut out the enclosed Fin Positioning Guide, wrap it around the body tube near the aft end, and mark the fin locations with a pencil or pen.

Apply white glue or modeling cement to each fin root chord edge, one at a time, and also along the body tube where fins are to be attached. When glue has just begun to set, place fins in position along the body tube. Stand the tube on its top end and allow glue to dry. With the Fin Allignment Guide, check the angle between fins before glue has completely set. Opposite fins should be in line with each other. Adjacent fins should be at right angles to each other.

During lift-off and the subsequent accelerating period, the fins are subjected to tremendous drag pressures and buffeting. To prevent the fins from shearing off, it is necessary to reinforce them in the following manner: When the glue joint has thoroughly dried, cut out four pieces of reinforcing material about  $3\frac{1}{2}$ " square. Brush white glue or clear modeling dope onto the fin root chord and connecting body areas. Lay a piece of reinforcing material over each glued area and smooth onto the body-fin surface. Trim off any excess material and set aside to dry. After material has completely dried, sand lightly to smooth rough spots.

# NEW DART ROCKET

## ATTACH PARACHUTE & LAUNCH LUG

Snap the parachute shroud clips onto the capsule screw eye. Glue the launching lugs to the body tube about 8" apart, in the position shown. Before glue has completely set, insert the enclosed 3/16" dowell through both lugs and allign with axis of body tube.

## RIG PARACHUTE

Just prior to launching, fold and pack the parachute as shown below: Wrap the chute shrouds around the folded canopy. Insert a piece of flameproof cotton wadding, about the size of a large egg, into the body tube first. Next, insert shock cord and secure cable, followed by the folded parachute and the nose cone.

## FINISHING THE AERO-DART

Fold up the chute temporarily and insert, together with the shock cord and secure cable, into the body tube. Push the nose cone into place, and the Aero-Dart is ready for finishing.

To obtain maximum altitude flights, all model rockets should be filled in with several coats of balsa filler. Sand smooth between applications. The body tube does not require this treatment. Finish entire model with a lightweight paint such as spray type dope or laquerized enamel. To aid in tracking, use bright colors such as white, yellow, orange, or red. Flourescent colors are quite easy to spot at high altitudes.

## PREPARING THE PAYLOAD

The Aero-Dart is capable of carrying a maximum payload weight of 5 ounces. Fragile payloads should be packed in cotton or foam rubber.

## ASSEMBLE PAYLOAD CONE

The payload capsule has been pre-assembled for you. It is advisable however, to glue the balsa connector to the capsule tube so that the capsule does not open during recovery. Likewise, the nose cone should be made to fit tightly by wrapping a layer or two of cellophane tape around its base until a friction tight fit is obtained.

## LAUNCHING THE AERO-DART

The Aero-Dart can be powered by any of the following Hercules rocket engines:

F 11-3

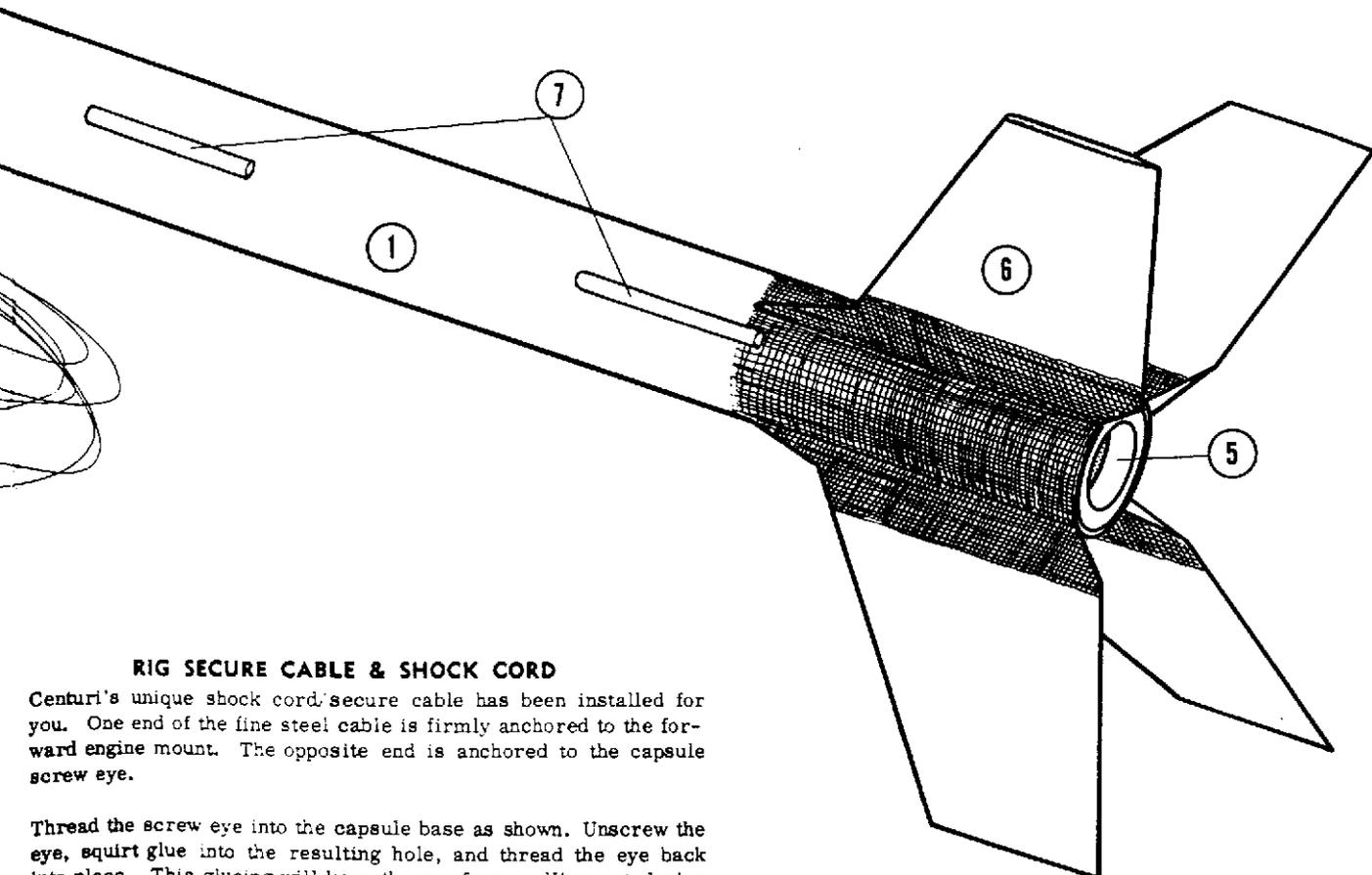
F 15-4

F 25-6

Complete mounting instructions and ignition are supplied with these engines. Read the instructions carefully before operating.

Launch the Aero-Dart from a 3/16" diameter x 36" long launching rod mounted firmly in a sturdy base block or stand, such as those shown in Centuri's catalog. Select a clear, unobstructed launch site away from houses, highways, and trees. The Aero-Dart should be launched from the center of an open field measuring at least 800 feet on a side.

Avoid launching in windy or overcast weather, as recovery under these conditions will be difficult if not impossible. Always give a short countdown before launching to alert spectators and trackers. Do not launch from a backyard or in populated areas.



## RIG SECURE CABLE & SHOCK CORD

Centuri's unique shock cord/secure cable has been installed for you. One end of the fine steel cable is firmly anchored to the forward engine mount. The opposite end is anchored to the capsule screw eye.

Thread the screw eye into the capsule base as shown. Unscrew the eye, squirt glue into the resulting hole, and thread the eye back into place. This glueing will keep the eye from pulling out during recovery.

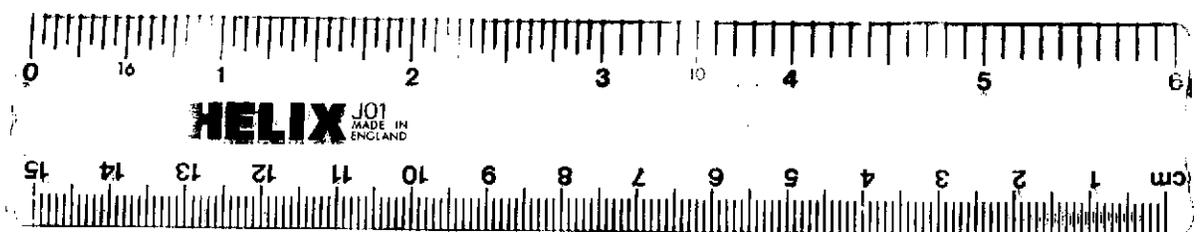
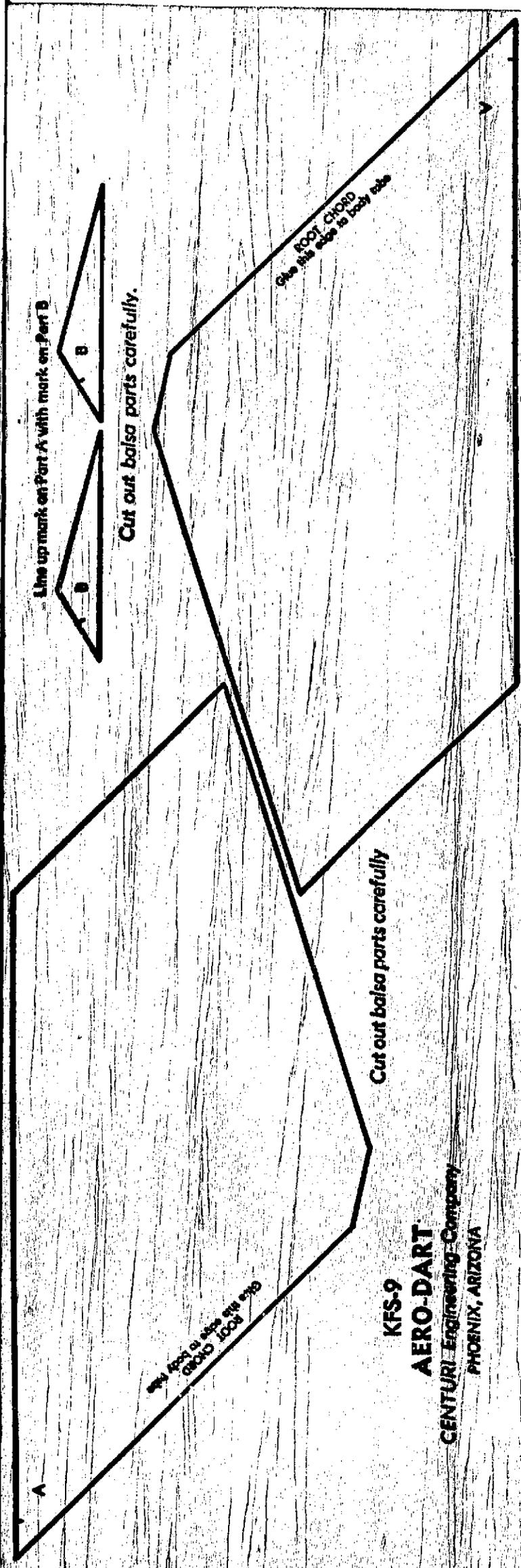
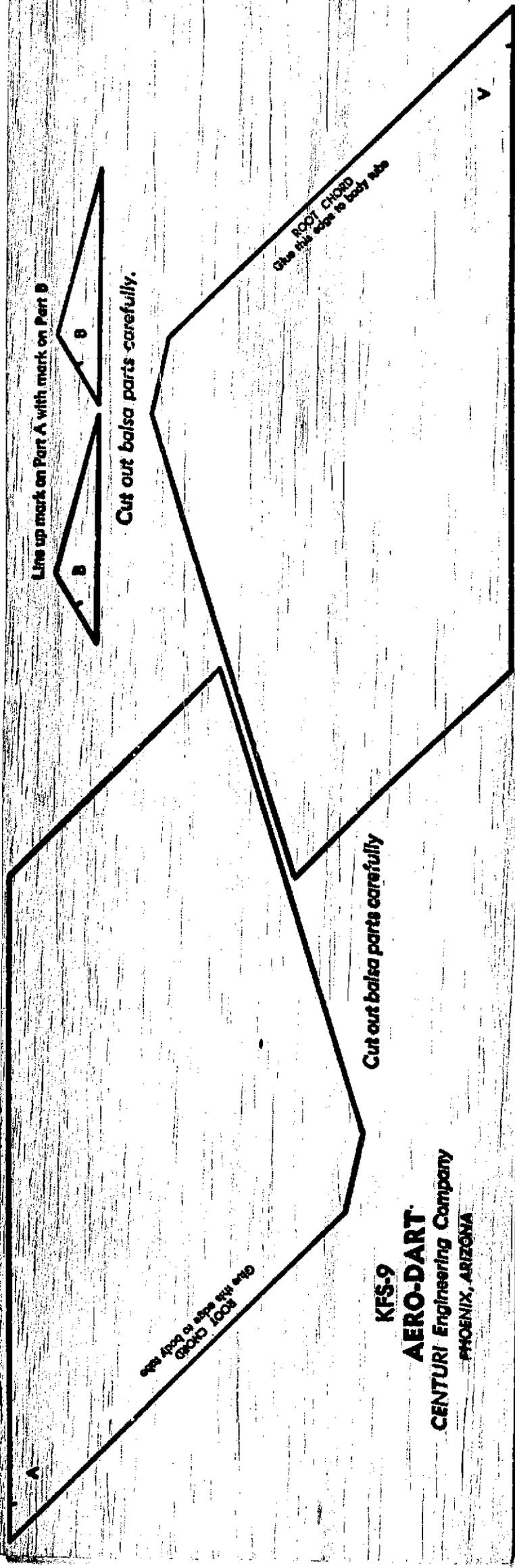
The elastic shock cord absorbs the shock created by the opening parachute while the steel secure cable secures the rocket to the recovery parachute.

For further information regarding rocket kits, engines, ignition devices, launching accessories, or replacement parts write to:

**Centuri Engineering Company**

P. O. Box 1988

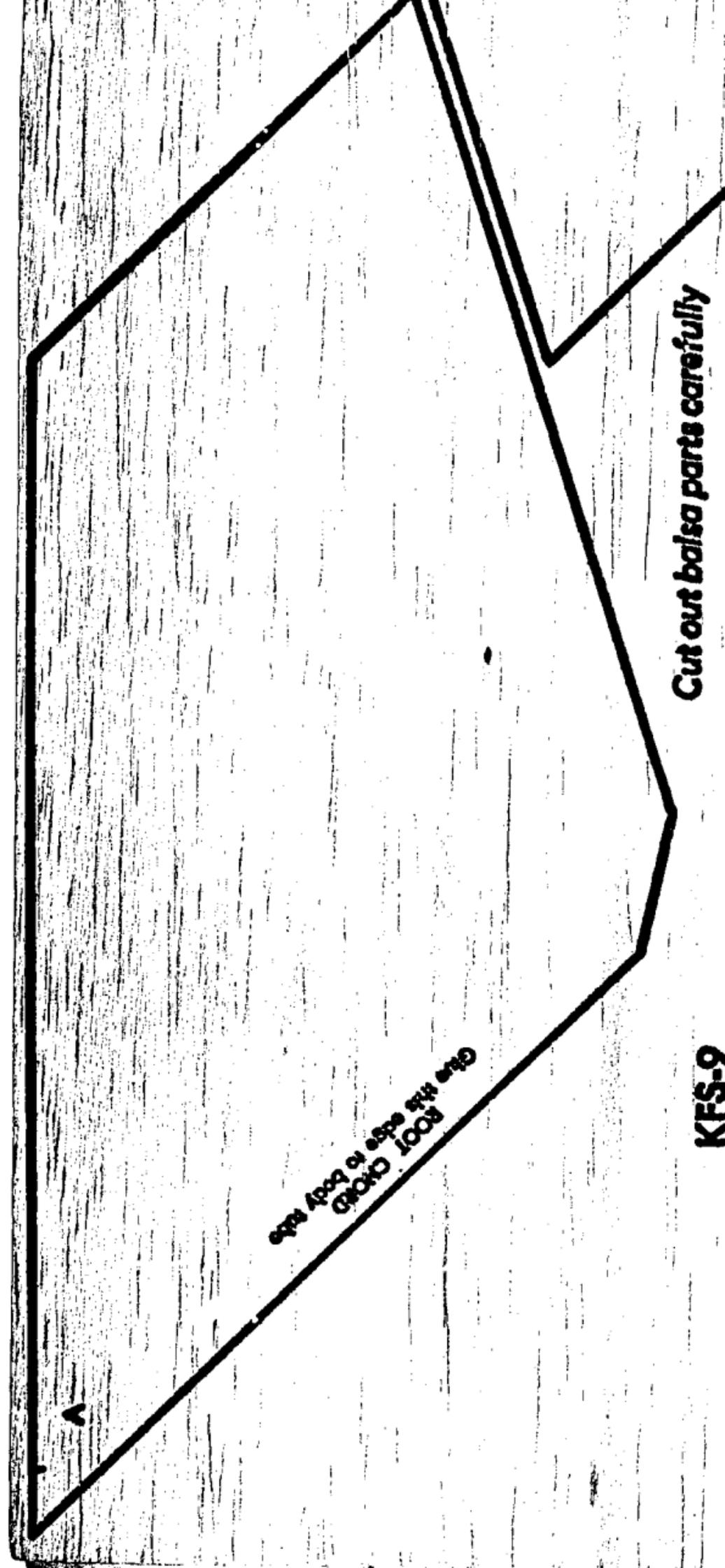
Phoenix, Arizona 85001



Glue this edge to body tube  
ROOT CHORD

Cut out balsa parts carefully

KFS-9



Centuri Aero-Dart (KF-12)

Parts list and comments by Stefan Jones (sej@aol.com)

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Updated 10/1/03:

I've built and flown my Aero-Dart clone. The first flight was with a Aerotech RMS 40/120 casing with a F22J-5 reload. It had a very good flight and recovery. I have a picture of lift-off and decent that need to be cropped and rotated. For now:

<http://www.io.com/~stefanj/aerodart.jpg>

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There were at least three models called the Aero-Dart, all called the KF-2, from as far back as 1962:

- \* The earliest version, as described in the 1962 catalog, had parallelogram-shaped fins, and a 22" long, 1.5" ID body tube.
- \* The 1964 version was similar, but added a payload section.
- \* The "classic" version, described below, was offered from 1965 - 1971. It was sold on its own, with motors, and as part of a starter set (with launch pad and motors).
- \* The final version, offered by the Enerjet division in 1972, used the standard ST-20 Centuri tube and the same plastic nose cone as the "Orion" kit.

I like the "classic" version the best. It has intrigued me since I saw it in the very first Centuri catalog I got my hands on (1971).

This version used parts especially made for Centuri's high-power line. They are rather decidedly hard to get. However, cloners should note that the Aerotech 1.9" body tube (OD 1.88") is very close in size to the LBT-175 tubing (ID 1.75", OD 1.84").

The measurements and parts list below were deduced from the 1971 Centuri catalog, the scanned-in plans, and from an actual, unbuilt, but incomplete kit made circa 1969. Two versions of the instruction sheet are available on-line: One circa 1970 (One two-sided page with step-by-step instructions), the other perhaps as old as 1965, which is a big single sheet.

Main body tube	LT-175A	22"	(ID 1.75", OD 1.84")
Payload body tube	LBT-175	6"	
Engine mount tube	LBT-115	8"	(ID 1.14", OD 1.22")
Centering rings (2)	?		1/2" long wound cardboard cylinders, ID ~1.22", OD ~1.75"
	OR:		3/4" thick balsa cylinders, ID ~1.22", OD ~1.75"
Thrust ring	TR-115		1" long black craft paper tube, OD ~1.14"
Balsa coupler	BTC-175		2.2" long balsa cylinder
Balsa nose cone	BC-175B		6.7" Cylinder-Parabola with .75" shoulder
Launch lugs (2)	LL-12		3/16" light duty lugs, each 2" long
Fins			3/16" heavy, hard balsa; pre-printed sheet
Shock cord			~18" black 3/8" fabric elastic
Secure cord			~24" braided steel cable attached to heavy screw eye
Parachute			18" hemispherical silk parachute, 8 gores, alternating red

and white.

Fin reinforcement material	Pre-cut (?) pieces of "SILRAY," which we can guess is a silk / rayon blend.
Dowel	3/16" "dowell", included as tool to align launch lugs.
Enerjet adaptors (3)	Black kraft paper tubes, to allow kit to accomodate Mini-Max E, Enerjet E, and Enerjet F motors.
Decal	Pattern unknown. Probably a roll bar.

Earlier versions (pre-1969?) of the Aero-Dart may not have had an engine mount tube. To judge from the catalogs and early plan, motors were held in place by big thick wooden centering rings and lots of tape. The change may have been made to accomodate Enerjet motors, which were shorter than the Mini-Max motors. These later kits came with a set of adaptors to allow use of MiniMax E, Enerjet E, and Enerjet F motors.

There was no indication in the directions that a decal was included, but the catalog copy suggests one. Photos and drawings depict several possible decal designs.

The balsa parts in the kit I purchased at auction were extremely hard and heavy.

The kit came with the engine mount and "chute secure harness" installed. The latter was a light-duty braided steel cable running from the engine mount to the screw eye attached to the payload compartment's balsa coupler. A length of black elastic, somewhat shorter than the cable, ran parallel to the cable. Neither is very long by today's standards.

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#### Cloning the Classic Aero-Dart

My desire to clone the Aero-Dart began when I actually obtained an incomplete kit at auction. I still plan on completing and flying that kit someday, but I wanted to "practice" on a clone.

The classic Aero-Dart is a fairly conventional kit, with relatively easy-to-obtain parts. If you wish, you could use an Aerotech motor mount, cone and bulkhead and leave things at that. I decided to go for authenticity:

\* The motor mount used a length of standard 29mm motor mount tube and balsa centering rings. I have an authentic Centuri mount for the 1.75" tube, and it had 3/4" thick balsa "plugs" for rings! I made mine by stack up three 1/4" rings that were made by BMS. I used a bit of coupler stock for the thrust ring, which will probably never be used unless I can get an FSI or Rocketflite motor. (Most flights of the clone will be with an Aerotech RMS, which has a built-in rear thrust ring.)

\* The nose cone and payload section bulkhead were balsa, turned on my drill press. I'm getting better at the process, but my cone came out a bit on the skinny side. I built up the base with glue-soaked silkspan. After filling and sanding it came out looking pretty good.

A nice "bonus": I glued a 3/8" dowel into the square balsa stock for mounting the pieces in the drill chuck. After the cone and bulkhead was complete I sawed the dowels off and sanded them flat. The stump left in the bulkhead made a nice secure place for the screw eye.

\* The fins were exact copies of the original, built from two pieces of hard, C-grain 3/16" balsa. After gluing the leading "wedge" onto the main body of the fin I reinforced the joint with silkspan.

I sanded the fins into an airfoil. The compound leading edge made this a challenge.

I attached the fins with wood glue (aliphatic resin). For a better grip, I roughed up the body tube surface and punched "fin rivet" holes.

I decided to use fiberglass and epoxy, rather than silk and white glue, for the reinforcements. I used great big squares of fiberglass and 2-hour epoxy. The squares covered the first 3/4" or so of the fin's leading and trailing edges. The fabric conformed so well that I decided to add reinforcing strips along the trailing edges.

\* I used two, 2" long 3/16" launch lugs. I mounted them on narrow rectangles (3/16" x 2") of 1/16" basswood, to raise them off the body tube surface a bit. I sanded the surfaces of these pads to have a slightly concave shape, for the launch lugs to nestle in. The pads, which are hardly noticeable on the finished kit, prevent the launch rod from marring the painted body tube surface.

\* I decided to radically modify the recovery harness. The original design just begs for destructive "snap back."

I used three yards of black 1/4" elastic, and about 12" of 300 lb. kevlar cord. I tied the anchor cord around the motor mount tube and fed it through a notch on the inside surface of the fore balsa centering ring. At the end of the anchor I tied a heavy-duty barrel swivel. I glued the motor mount in at this point. When the model was finished I shook it until the anchor cord dropped through the motor mount tube. I tied one end of the elastic to the barrel swivel and fed everything back through the motor mount tube. I tied the other end of the elastic to the payload compartment screw-eye.

\* Rather than the original 18" parachute, I used a 21" nylon 'chute made from a toy umbrella canopy. The pattern (red and white) was identical to the original, and I believe that the larger size is necessary. This proved true on the first flight. If anything, a larger 'chute may be necessary.

\* I finished the kit to look like the one shown in a color photograph on the inside back cover of the 1971 Centuri catalog. The fins and rear section of the body tube are red, the body tube white, and the payload section black. There is a white checkerboard pattern (3/8" squares, three rows) near the rear end of the payload section. Each fin sports one white stripe. There is a black and white Centuri logo on the main body tube, and a black band between the white and red portions of the body tube.

When I finish the original kit, I'll give it a black paint job and orange roll-bar, as shown in the earlier catalog images.

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