# "IRIS"* SOUNDING ROCKET

**"IRIS" is a registered trademark of Atlantic Research Corporation, Alexandria, Virginia.*

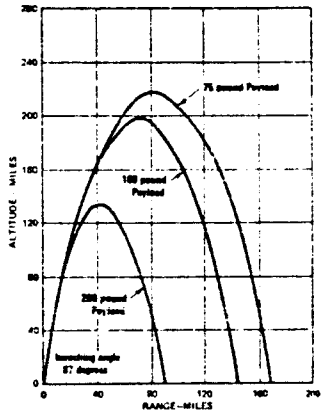
## INTRODUCTION

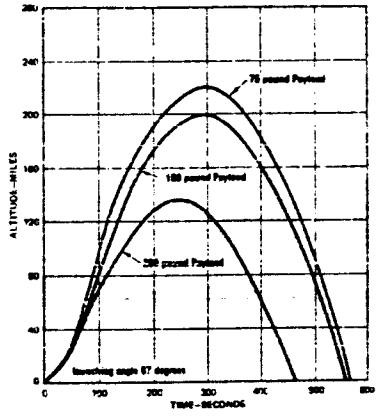
The actual "IRIS" rocket is a single stage, solid propellant fin stabilizing sounding rocket measuring 12.75 inches in diameter and stands 19 feet 11 inches tall. It is designed to carry experimental scientific payloads to altitudes as high as 240 miles. The payloads often include telemetry equipment which transmits valuable information back to Earth for study. Typical uses for "IRIS" include:

**ATMOSPHERIC COMPOSITION STUDIES**
**MICROMETEORITE INVESTIGATIONS**
**IONIZATION & NUCLEAR RADIATION MEASUREMENTS**
**MAGNETIC FIELD DETERMINATION**
**AEROMEDICAL EXPERIMENTS**
**HIGH ALTITUDE PHOTOGRAPHIC TELEVISION**
**STUDY RE-ENTRY PROBLEMS**
**TESTING COMMUNICATIONS SYSTEMS**
**COMPONENT TESTING**
**SOLAR AND AURORAL RADIATION**
**COSMIC RAY STUDIES**

The "IRIS" was designed and developed by the Atlantic Research Corporation for NASA and the Naval Research Laboratories. It was first launched from Wallops Station, Virginia on October 18, 1960 at which time it carried a 125 pound payload to 140 miles altitude.

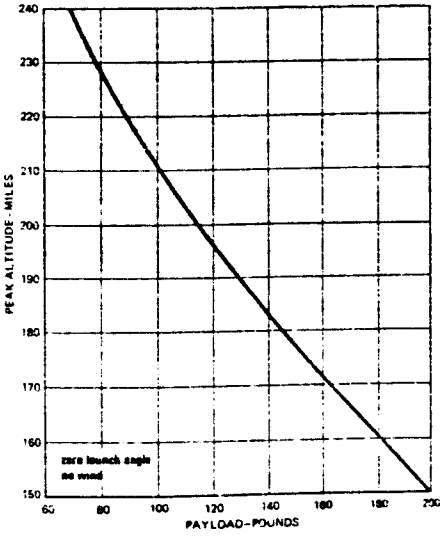
The "IRIS" is launched from a 160 foot high, four rail tower at Wallops Station, Virginia, and from three rail towers at Elgin Air Force Base, White Sands Proving Grounds, and Fort Churchill, Canada. Both three and four finned versions of IRIS have been flown.

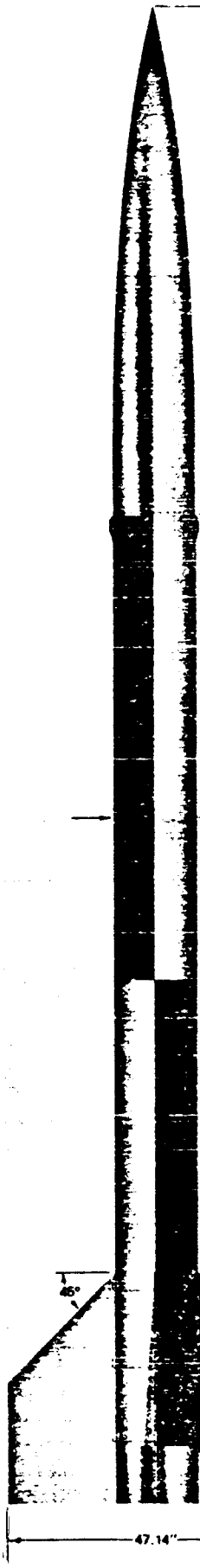


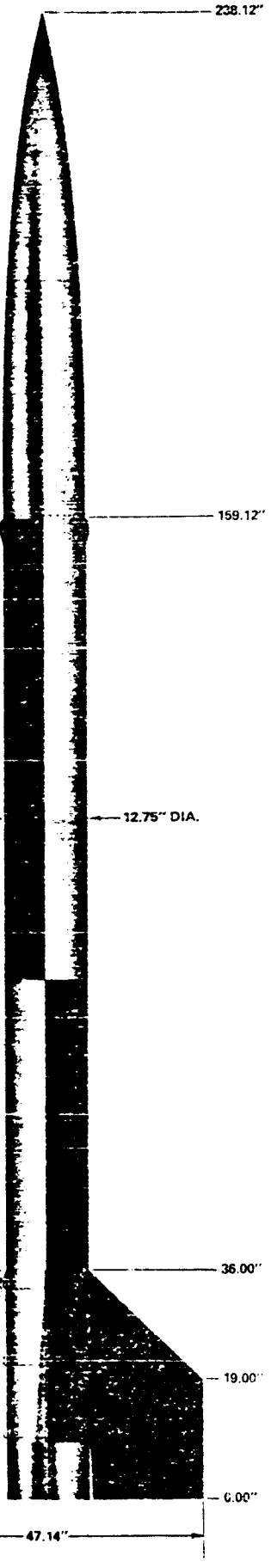




| | Payload Weight, pounds | | |
|---|---|---|---|
| | 75 | 100 | 200 |
| Maximum acceleration, g | 15 | 15 | 15 |
| *Launch Velocity, ft/sec | 300 | 300 | 300 |
| Maximum velocity, ft/sec | 7,675 | 7,256 | 5,873 |
| **Peak altitude, feet | 1,150,000 | 1,050,000 | 730,000 |
| miles | 230 | 210 | 146 |
| Time to peak altitude, seconds | 302 | 288 | 237 |
| Maximum nose cone skin temperature, °F | 600 | 700 | 800 |
| ***Maximum horizontal range, feet | 1,800 000 | 1,650 000 | 1,110,000 |
| miles | 360 | 330 | 222 |

*Launched from 160 foot tower.
**Vertical launch.
***80 degree launch.






## PROPULSION SYSTEM

The "IRIS" is powered by a high performance, end burning solid propellant rocket motor supplying nearly 4,000 pounds of thrust for 56 seconds. In addition, a separate booster unit is used to increase the launching tower exit velocity. The unit shown in the accompanying photo consists of a cluster of seven 4 inch diameter rocket motors, burning for 0.8 seconds. The ignition system incorporates a time delay relay to insure that the booster motors ignite before the sustainer does. Not attached to the main "IRIS" vehicle by mechanical means, the booster's thrust ring fits directly against the boat-tail of the main "IRIS". This booster unit falls away immediately after the "IRIS" clears the launching tower.

## ROCKET MOTOR DATA

**DIMENSIONS**

| | |
|---|---|
| Overall Length (inches) | 238.12 |
| Motor Length (inches) | 159.12 |
| Diameter Maximum (inches) | 12.75 |
| Diameter Nominal (inches) | 12.12 |
| Fin Span (inches) | 47.14 |

**WEIGHTS**

| | |
|---|---|
| Weight of loaded rocket motor (lbs) | 1202.5 |
| Weight of nose cone (lbs) | 11.5 |
| Total rocket weight (100 lb. payload) (lbs) | 1313.5 |

## BALLISTIC PERFORMANCE DATA

| | |
|---|---|
| Burning time (seconds | 56 |
| Chamber pressure (psi) | 1200 |
| Thrust (lbs.) | 4000 |
| Total impulse (lb-sec) | 210,000 |

## PAYLOADS

The aluminum "IRIS" nose cone has a tangent ogive configuration 80 inches long and containing 7,860 cubic inches of volume. For larger payloads, a 20" cylindrical extension is added to increase the payload volume to 10,120 cubic inches.

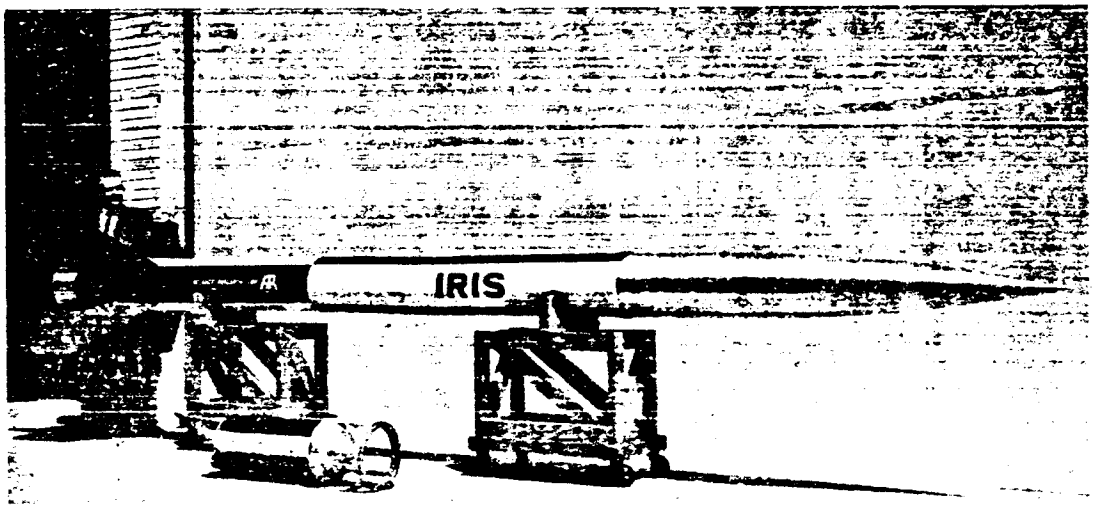
The "IRIS's" long duration thrust motor allows it to reach extremely high altitudes but with only moderate acceleration loading. In this way, delicate payloads are protected. Many different payloads are carried in "IRIS" rockets, some of which include:

- SPECTROSCOPES
- CLOUD CHAMBERS
- GEIGER–MULLER COUNTERS
- ION TRAPS
- LANGMUIR PROBES
- MAGNETOMETERS
- COLD CATHODE PRESSURE GAUGES
- HOT CATHODE PRESSURE GAUGES

Safe aerodynamic stability margin is maintained with payloads as light as 75 pounds. Maximum allowable payload weight is 200 pounds. Traveling at a velocity approaching Mach 8, the nose cone skin temperature reaches nearly 900 degrees Farnheit from aerodynamic friction heating.

## PAINT PATTERNS AND MARKINGS

| | |
|---|---|
| **NOSE CONE** | Silver |
| **MOTOR PORTION** | Black and white checkerboard broken at body tube mid-point and divided into four color areas around the tube. |
| **FINS** | (Two known versions.)<br>1. All fins red.<br>2. Black and white to correspond with the color on the motor section immediately adjacent to it. |
| **MARKINGS** | "IRIS" - black<br>"ATLANTIC RESEARCH CORP"<br>Trademark - white on rear black section of motor tube. |



## INTRODUCTION & BACKGROUND

The actual full-scale IRIS® Sounding Rocket, built by the Atlantic Research Corporation of Alexandria, Virginia, was designed and developed for scientific experimentation with heavy payloads at high altitudes. Altitudes of up to 240 miles can be reached by the IRIS as a vertical probe. It will carry payloads weighing from 75 to 200 pounds.

"Sounding", as applied to rockets, means to investigate or examine. A "Sounding rocket" is a meteorological rocket used to gather atmospheric data such as temperature, pressure, radiation, and wind velocity. Sensitive instruments within the nose cone and payload compartment are exposed to the upper atmosphere for purposes of measuring the above mentioned objects of study. This information is sometimes recorded within the rocket itself, but is most often telemetered back to earth by means of radio transmitters within the payload compartment.

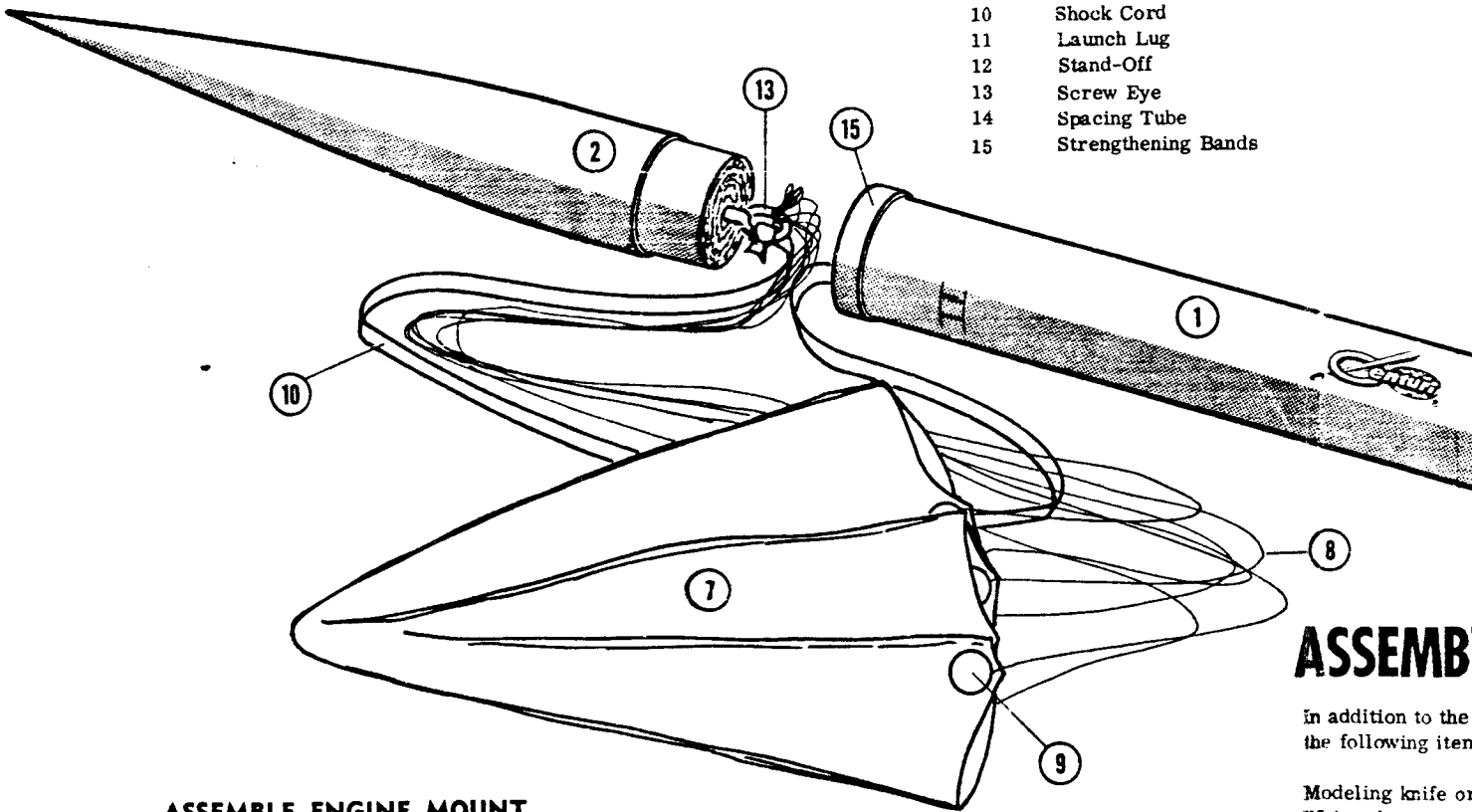
When properly assembled, the IRIS model will soar straight as an arrow to its maximum altitude (apogee), eject a parachute, and float gently back to earth to be flown again and again.

# SCALE MODEL IRI

## ASSEMBLY INSTI

## PARTS LIST

| PART NO. | PART NAME |
|---|---|
| 1 | Body Tube |
| 2 | Nose Cone |
| 3 | Stabilizer Fins |
| 4 | Mounting Tube |
| 5 | Centering Rings |
| 6 | Thrust Ring |
| 7 | Chute Canopy |
| 8 | Shroud Line |
| 9 | Tape Discs |
| 10 | Shock Cord |
| 11 | Launch Lug |
| 12 | Stand-Off |
| 13 | Screw Eye |
| 14 | Spacing Tube |
| 15 | Strengthening Bands |




## ASSEMB

In addition to the
the following iten

Modeling knife or
White glue or mo
Paint for finishin
Fine Sandpaper -

## ASSEMBLE ENGINE MOUNT

The engine mount consists of one mounting tube, two centering rings, and one thrust ring. Assemble these parts with glue as shown in the Engine Mount Detail. First, glue the centering rings securely to the mounting tube. Next, glue the thrust ring inside the forward end of the mounting tube, as shown above. The end of the ring should be even with the end of the tube. Set aside and allow to dry.

After the mount has completely dried, apply a heavy bead of white glue around the top outer rim of both centering rings, as shown above. Insert the spacing tube into the mount and push the mount into the body tube until the end of the spacing tube is even with the end of the body tube.

To force the glue into the tube/ring joints, roll the tube around slowly and hammer it against your hand. Set the tube/mount assembly on the mount end and allow to dry.

## ATTACH MOTOR BANDS

From the printed paper stock, cut out the two motor bands. One at a time, apply white glue to one side of each band and carefully wrap band around body tube in the position shown in the assembly drawing.

## ATTACH STABILIZER FINS

From the printed balsa sheet, carefully cut out the four fins. With fine sandpaper, round the leading and tip edges, and taper the trailing edges of all fins. Square the root chord edge.

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

# IS® SOUNDING ROCKET

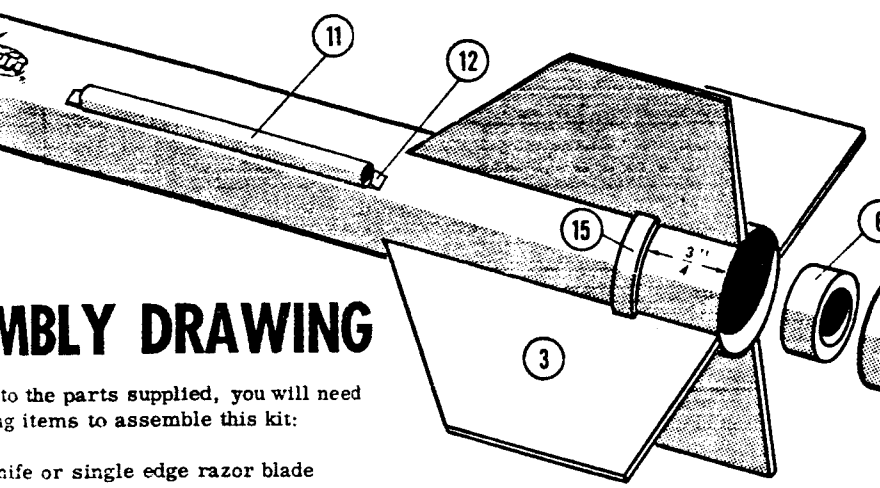
# ISTRUCTIONS

## RIG PARACHUTE & SHOCK CORD

Assemble the parachute as shown in the enclosed Chute Assembly Directions. Attach one end of the rubber shock cord to the body tube as shown below. Cut two slits, about 3/8" long and 3/8" apart, in the body tube one inch down from the top end. Insert one end of the rubber cord into the tube from the top end, and depress the tube paper between the slits. Bring the cord out through the first slit, and back into the body tube through the second slit. Apply glue to the connection to form a strong bond.

Thread the screw eye into the nose cone base, and unscrew the eye from the cone. Squirt glue into the resulting hole and re-thread the eye into the cone. Now tie the shroud ends to the screw eye together with the rubber shock cord as shown in the assembly drawing. Fold the chute temporarily, insert into the top of the body tube, and place nose cone on tube.

Because of the protruding strengthening bands it is necessary to space the launch lug away from the body tube with the use of a balsa strip called a "lug stand-off". Glue the launch lug to the stand-off, then glue assembly to the body tube in the position shown. To assure a straight lift-off from the launch rod, it is important that the launch lug is lined up with the body tube axis. Before the glue has hardened, sight down the rocket from one end to the other, like a rifle sight, and line up lug.




# MBLY DRAWING

to the parts supplied, you will need
g items to assemble this kit:

nife or single edge razor blade
or modeling cement
nishing - preferrably spray type
aper - Scissors - Pen or pencil

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 tube on top end and allow 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, and adjacent fins should be exactly 90 degrees apart.

For increased fin strength, run a narrow fillet of glue along each fin/tube joint after the initial glueing has thoroughly dried.

## FINISHING THE IRIS

For maximum altitude flights and ideal appearance, the grain texture of the nose cone and fins should be filled in with several coats of balsa filler. Sand smooth between applications. The body tube does not require this special treatment. Finish with lightweight paint such as spray dope or laquerized enamel. For ease of tracking, use bright colors such as white, yellow, or red. Flourescent colors are extremely easy to spot at high altitudes.

Accurate scale detail coloring of the IRIS is as follows: Black and white checkerboard on the motor portion, broken at body tube midpoint and divided into four color areas around the tube. Fins are also checkerboard to correspond with the color on the motor section immediately adjacent to it. For example, where the rear section of the motor is black, the sides of the fins facing the black section are also black. The nose cone is silver.

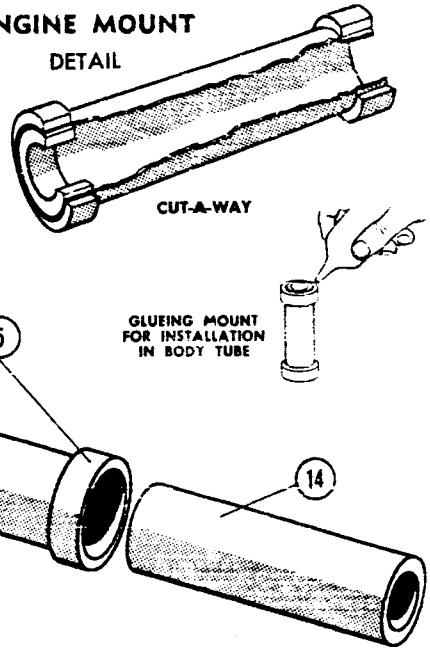
## LAUNCHING THE IRIS

The IRIS single stage model can be powered by any of the following engines:

½A6-2 A5-4 B6-6 B14-5 C6-7

The engine must remain in place during the entire flight. Friction fit the engine into the mount until snug. It may be necessary to wrap a layer or two of tape around the engine to obtain this snug fit. If the engine is too tight to begin with, sand down the paper casing just enough to permit a snug friction fit.

Complete ignition and launching instructions are included with all Centuri rocket engines. Launch the IRIS from a 1/8" diameter x 36" long launching rod. Use electrical ignition only, as outlined in the Engine Operating Instructions.




The IRIS should be launched from the center of an open field measuring at least 500 feet on a side or having the equivalent area. Choose a clear, unobstructed launch site away from houses, highways, and trees. Do not launch model rockets in backyards or in city streets. Always give a short countdown to alert spectators before launching.

For further information concerning rocket engines, kits, ignition devices, launching apparatus, or accessories, write to:


**Centuri Engineering Company**
P. O. Box 1988
Phoenix, Arizona 85001


#14-29

# IRIS

IRIS

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THE QUALITY LEADER IN HIGH FLYING MODEL ROCKETS

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M-301

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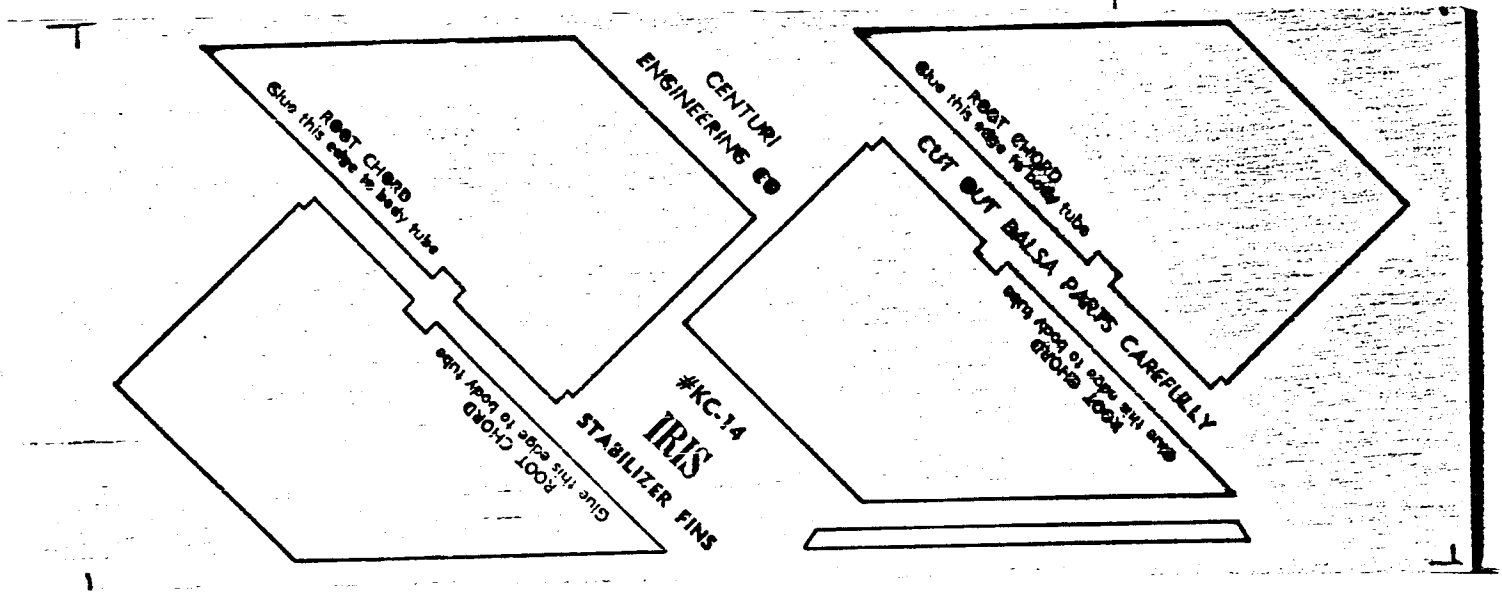
## IRIS MOTOR STRENGTHENING BANDS




## FIN POSITIONING GUIDE

Cut out on solid line - - - -
Wrap around body tube base
tape end flap closed - mark
fin locations and remove.

D

#15-16

## FIN ALLIGNMENT GUIDE

For 4-fin arrangement
on #8 Series Body Tubes.
Cut out on solid line.