ARMBRUST

antitank-weapon

by Clyde Barrow

I - INTRODUCTION

The MBB ARMBRUST is truly unique among current AT (Anti Tank) weapons. The name ARMBRUST (German for crossbow)alludes to William Tell's famous weapon. Like its namesake, the ARMBRUST is a portable armor piercing weapon,designed to be both quiet and deadly. Developed in the early seventies by the German arms firm of Messerschmitt-Brokow-Blohm,the weapon is currently produced by the Boeing Company for U.S. distribution. The US Army was reportedly considering the ARMBRUST for use in urban combat,and it now appears that they will be buying the units produced by Boeing.

Like many modern AT weapons, the ARMBRUST is a singleshot-disposable affair which can be easily carried and fired by one man.Firing procedure is similar to using a rifle, which means, the weapon can be operated without extensive training.

The ARMBRUST design incorporates a number of unique features.

1. Firing noise is low, about the same as a pistol. This is by no means silent, but it's a great improvement over the thunderous roar of conventional AT weapons.

2. Virtually all smoke and flash is retained within the launcher.The small amount that does escape through the hole in the front piston, is diffused by the flash suppressor.The suppressor also serves as a protective cover for the nose of the projectile.

3. Very little IR (Infra Red)radiation is emitted upon firing.This protects the firer's position from being discovered at night by an observer using an IR viewer. (See "Night Vision Devices"in PMA Vol.2#2, page 48).

4. The countermass of plastic flakes readily disperses without ricocheting, allowing the ARMBRUST to be safely fired within two feet of solid wall.Most AT weapons produce a backblast which requires 20-30 feet of safe space at the rear.

5. Lack of recoil allows the use of all types of rifle sights including the delicate IR or Starlite type scopes.In the PMA version, the sight is removed from the fired weapon and reused. In the factory ARMBRUST, the sight is discarded along with the spent tube.

6. Finally, the ARMBRUST is considered to be extremely accurate, due to the solid two handed hold, the lack of recoil, and a projectile which has a very flat trajectory out to the optimum range of 300 yards.

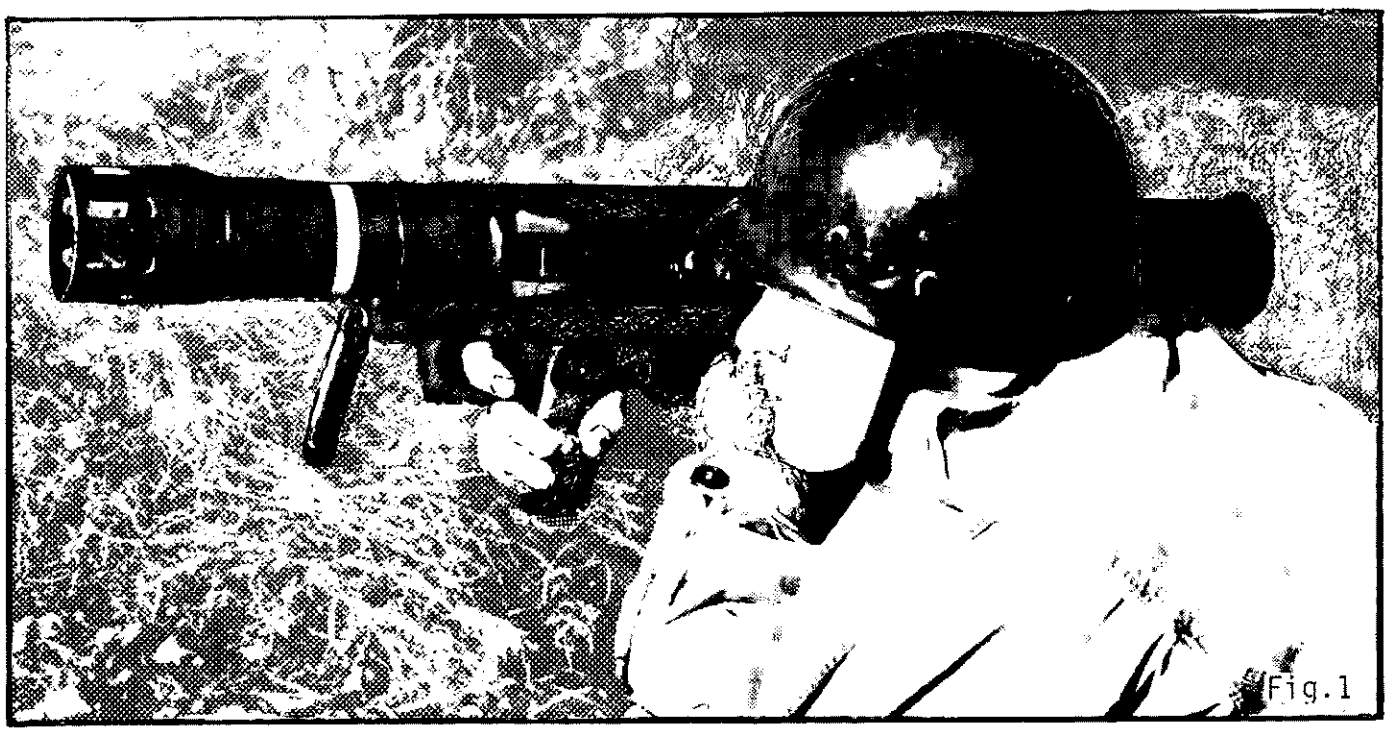


Fig.1

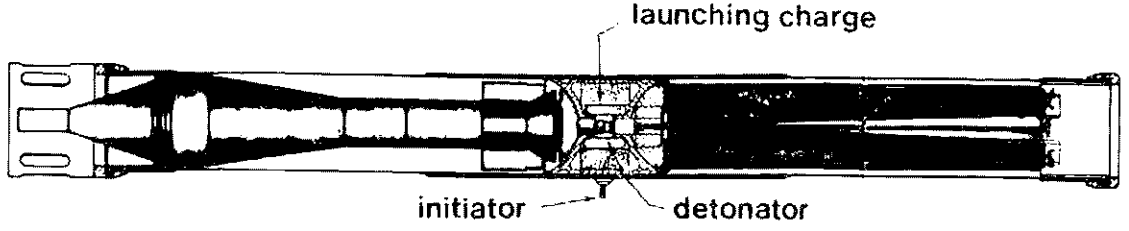
II - GENERAL DESCRIPTION / NOTES

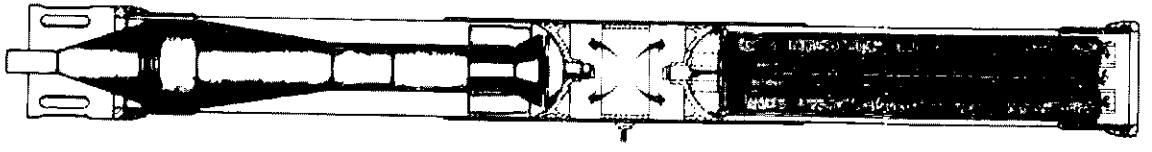
The ARMBRUST tube assembly is comprised of the launch tube, the projectile, countermass, launching charge, two pistons and two brake rings. Attached to the underside of the launch tube, is the grip assembly. This consists of the frame, grip, rear handle, shoulder rest, trigger, safety, sling, and sight assembly. Sandwiched between tube and grip assemblies are the initiator and detonator. These may be either electric or percussion fired, depending upon builder's preference.

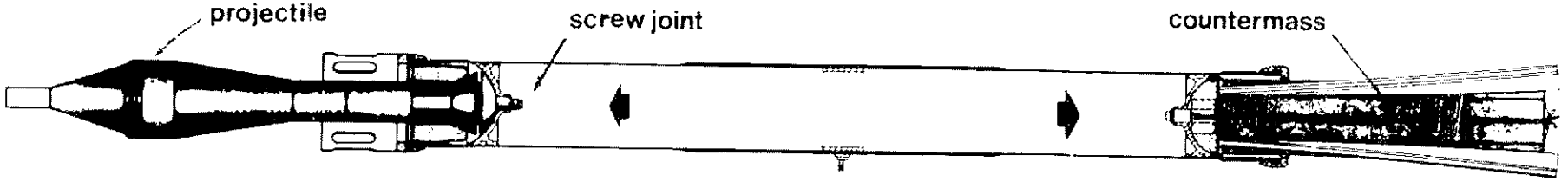
1. Functioning

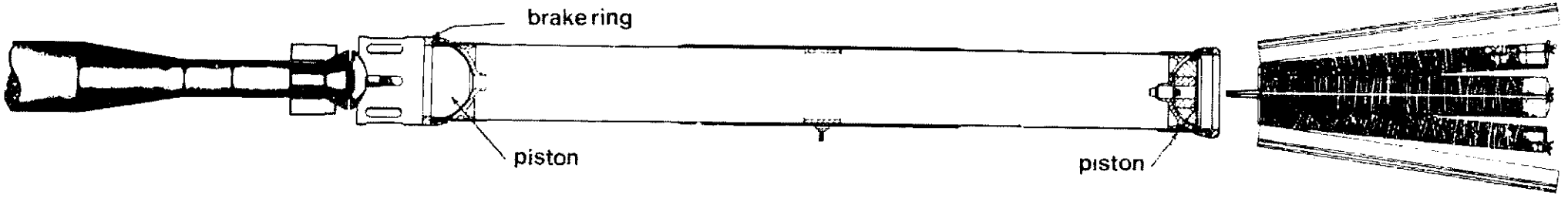
When the weapon is fired, the trigger activates the initiator. This fires the detonator, which in turn fires the main launching charge. The pressure created by the burning gases causes the notched section of the screw joining the pistons to break. When the joint is broken, the two pistons are blown to the ends of the tube, coming to rest against the brake rings. The projectile and countermass packages continue out the ends of the tube.

The projectile follows a very flat path to the target, while the countermass package disperses. The plastic flakes fall to the ground about 30 feet behind the launcher.









2. CONSTRUCTION MATERIAL AND DIMENSIONS

Specific details on materials and dimensions for the factory ARMBRUST are not available. The materials chosen here seemed the most practical for home building. Substitute materials can be used to best suit your needs.The specs given are estimates only, but should be close to those of the original design. Again these can be altered to suit your individual requirements. For the sake of simplicity, the original piezio electric initiator has been replaced with the option of using a simpler percussion or electric initiator unit. For the same reason, the flip-out disposable reflex sight has been replaced with a conventional rifle scope mount.This allows quick installation and removal of a variety of conventional scopes.

3. PROPELLANT

When making up the propellant (launching) charge, you will have to experiment to determine the optimum weight of material for both maximum accuracy and safe operating pressures. The bore sighting bench shown in figure 2 may also be used as the test fixture for holding experimentally loaded tubes.

All testing should be done with inert practice rounds only. All firing should be done remotely from a safe distance.

4. REUSE OF ONCE-FIRED TUBES

The ARMBRUST is intended to be fired once and then discarded. Multiple firings may result in a burst launch tube.A safe reloadable version of the ARMBRUST could conceivably be produced by increasing the tube's wall thickness and beefing up the brake rings. This would of course add to the final weight, and might result in a weapon too heavy for one to carry and fire.

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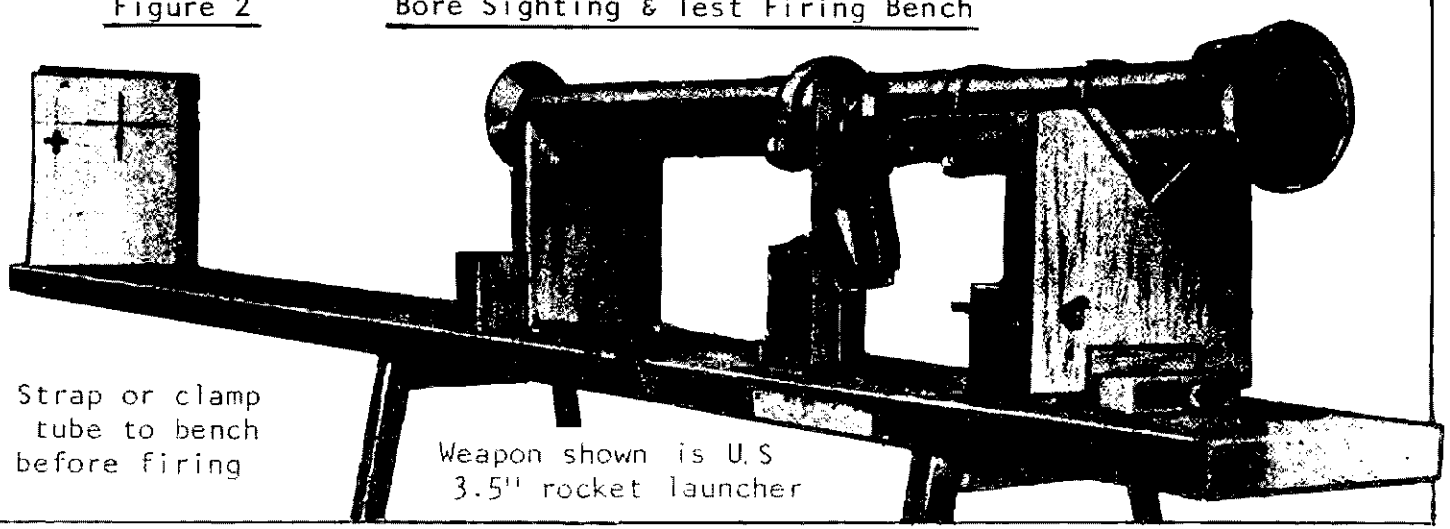
5. PROJECTILE

The factory weapon is supplied with one of three types of projectiles.The first,a signal flare, is not covered in this article. The remaining two, anti-personnel (fragmenting) and HEAT (High Explosive Anti Tank) can both be constructed by modifying M-31 Practice Rifle Grenades.

These M-31 inert rounds are readily converted into live ordnance, but are totally legal to possess in their unarmed state. M-31 inert grenades are available from several sources.(See list at end of article or scan through a current copy of Shotgun News for suppliers.) Prices range from $4 to $8 each with lower prices available on bulk sales.

Figure 2 Bore Sighting & Test Firing Bench



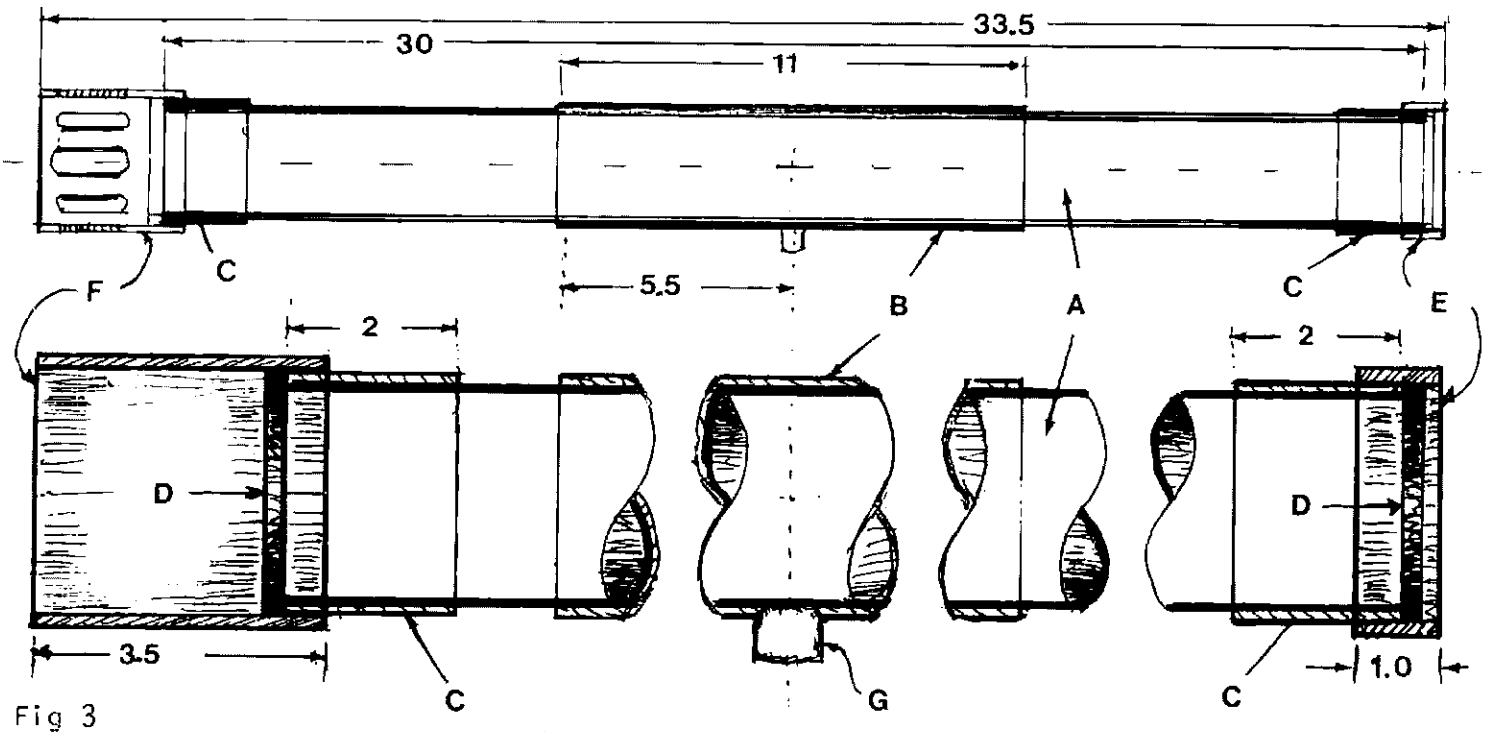


Fig 3 Section One - Launch Tube Assembly

INDIVIDUAL PARTS SPECS:

A. Launch Tube: 2.745"±.005 ID / 2.87" OD (.060 wall)x 30" long.

B. Outer Tube-Center: 2.875" ID / 2.995" OD (.060 wall)x 11" long.

C. Outer Tube Ends (2): Same ID/OD as B. Length is 2" each.

D. Brake Rings (2): 2.6875" ID / 2.995" OD x .25" long each.

E. Brake Ring Collar-Rear: 3" ID / 3.24 OD (.120 wall) x 1" long.

F. Brake Ring Collar-Front(flashhider): Same ID/OD as E. Length is 3.5". 8 slots, .375" wide x 1.5" long may be cut (optional). Locate slots at 45° intervals. Hole centers are .6875" and 1.8125" from front edge of tube.

G. Initiator Housing: Pipe Nipple, 1.2" long x .7" diameter. Trim to .5" long. Radius cut end to fit 3" OD outer tube.

III - CONSTRUCTION PROCEDURE

The ARMBRUST construction info has been divided into three parts; the launch tube, the grip assembly, and the last part covering the interior components, the projectile, countermass and propellant.

Each of these three component sections may be produced separately to be assembled just prior to firing.

Section One - Launch Tube Assembly

Refer to the diagram marked Section One

Unless otherwise specified, all of the individual pieces are cut from mild steel seamless tubing. More exotic and costly alloy tubing may be also used. In fact, the original is most likely heat treated aluminum alloy tubing. This would require heliarc welding, roll crimping, press fitting etc. To simplify, I chose the cheapest and easiest to work with of the steels. Assemble all pieces with good silver solder or a low temperature brazing rod. This will not only prevent warping, but will allow all pieces to be removed and reused if desired. None of the tube lengths specified are critical, as each piece in the design overlaps another. The only critical dimension is the ID (inside diameter) of the 30" launch tube. If the M-31 grenade body is to be used, the minimum tube ID should be held at 2.745± .005.

Note: If the tubing obtained for pieces B,C,D,E and F are not quite the right size, cut them lengthwise along one side. Increase or decrease tubing to the correct ID and repair split.

Before beginning assembly, deburr and degrease all pieces. Tight fitting pieces may be expanded slightly for installation by heating them with a torch.

1. Slide tube B over tube A and center it 9.5" from either end of A. Spot braze in place.

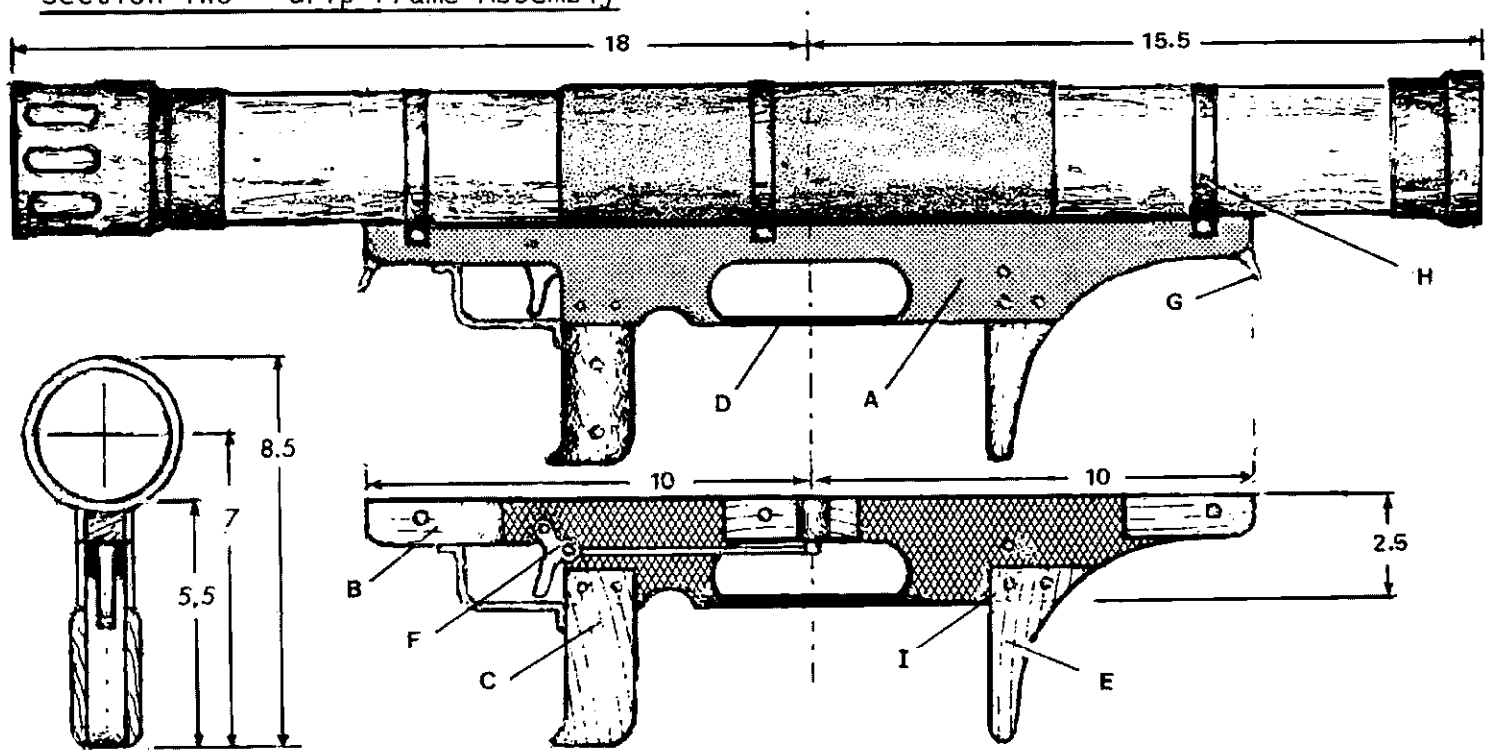
2. Install the two end tubes C flush with the ends of tube A. Spot braze in place. Place a mark .5" from the outer ends of both pieces C.

3. Slide pieces E and F .5" onto the ends of tubes C, aligning them with the marks made in step 2. Clamp or tape E and F firmly in place, DO NOT BRAZE!

4. Insert brake rings D into the ends of E and F. Tap the rings into position flush against the ends of tube A-C. Braze rings D to pieces E and F. When cool, remove assemblies D-E and D-F from the ends of the main tube.These pieces will be reinstalled after the launcher is loaded.

5. Mark completed tube assembly in the center (15" from either end) and drill a .5" diameter hole through wall of tube assembly. Deburr hole and braze housing G in place over hole.

Section Two - Grip Frame Assembly



INDIVIDUAL PARTS SPECS

A - Side Pieces (2): 1/8" masonite, 20" long x 2.5" high.

B - Spacer Blocks (3): 1" x 1" x 3" pine, fir or similar wood.

C - Front Grip: 1" x 1.5" x 4" wood (same as B). Curved grip panels; optional.

D - Rear Grip Liner: 1" wide x .25" thick x 5" long wood, metal or masonite strip.

E - Shoulder Rest: 1" x 2.5" x 4" wood (same as B).

F - Trigger & Safety: Builder designed.

G - Sling Swivels (2): Wood screw type rifle swivels.

H - Retainers (3): Flexible steel strap, .5" x 10" each

I - Shoulder Rest Hinge: Optional.

1. Cut out side pieces, using specs given in Fig.5. Drill the three .25" diameter holes where indicated.

2. Cut out the three spacer blocks and drill the three .25" diameter holes as indicated in Fig.5. The center block must also be drilled with a .75" hole to accomodate the initiator housing. Radius the top sides of the blocks to conform to the outside curve of the launch tube assembly.

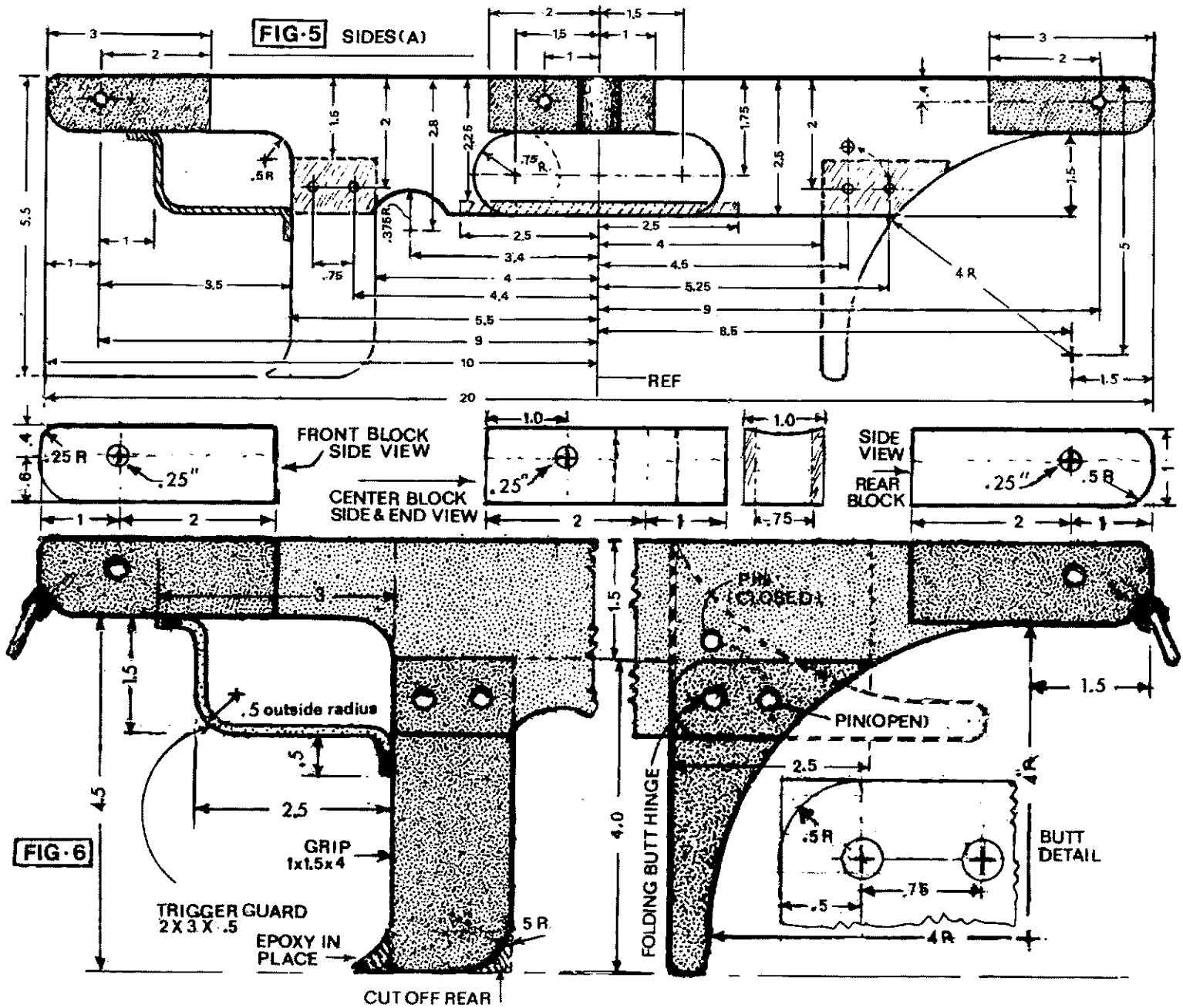
3. Apply epoxy glue to the sides of the three blocks. Assemble blocks and side pieces A, securing them with three .25" x 1½" bolts. Bolts and nuts should be waxed to allow removal after the epoxy has cured.

4. Epoxy pieces D and E between side pieces A. Clamp these pieces in place until the glue has cured. E may be reinforced with mounting screws if desired.

5. Because the type of initiator/detonator is left up to the builder,you will also have to choose the appropriate type of trigger and safety. Once these are installed, the front grip may be epoxied or screwed in place between the side pieces A.It may be necessary to drill linkage holes through the grip,so screw placement should be decided after this has been done.

6. Install wood screw type sling swivels at front and rear of completed grip frame.

7. A trigger guard (optional)may be made by bending a .5" wide aluminum strip to shape. Secure it to the bottom of the front spacer block and front of the grip.

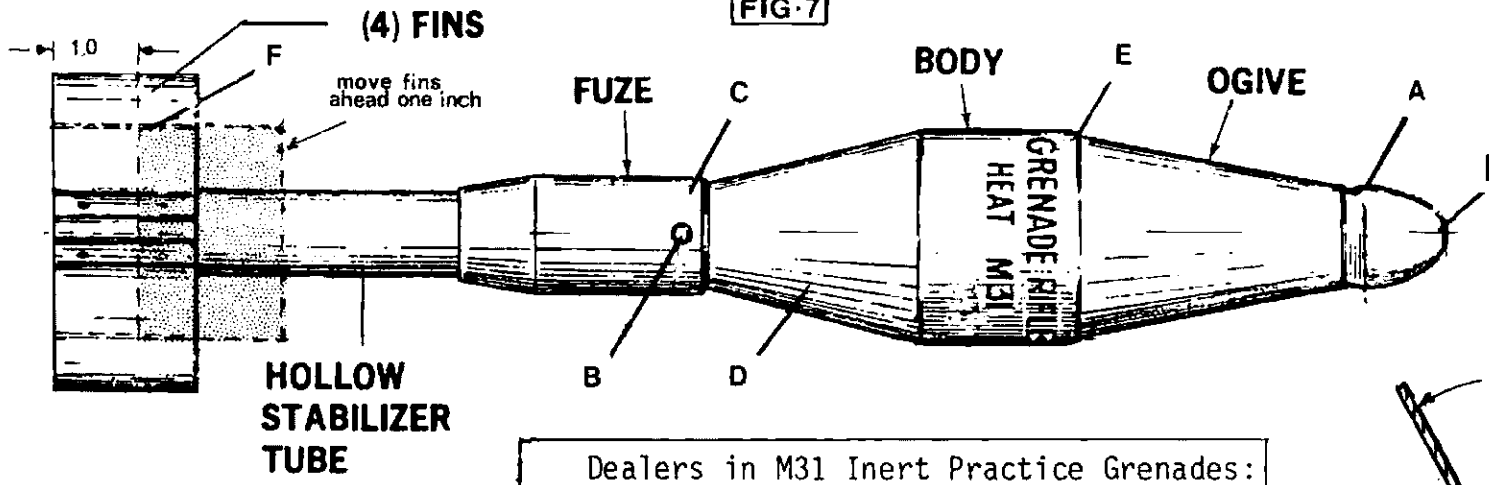


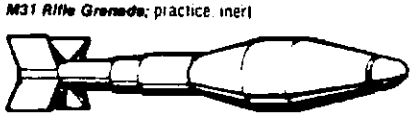
Section Three - Internal Components

A. M-31 Grenade Modification

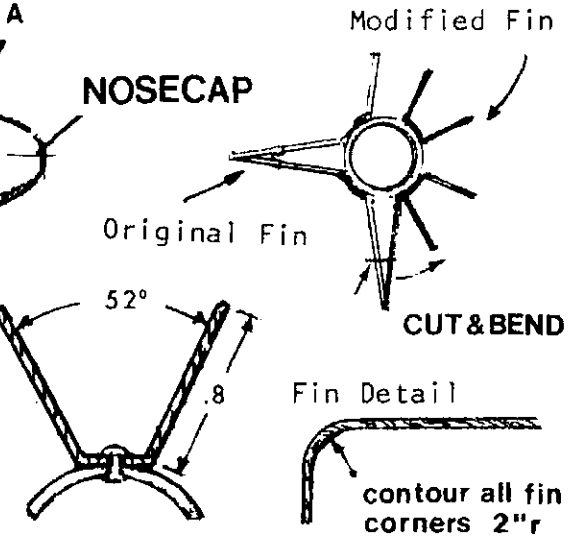
If the HEAT (shaped charge) version is to be built, disregard step 5 and go on to step 6.

FIG-7





Dealers in M31 Inert Practice Grenades:	
Rock Island Armory 111 East Exchange St. Genesco, IL 61254	B.W.Trading Co. POB 692 Newark, OH 43055



1. Remove the inert M-31 Grenade from its shipping tube. Save the container for storing the completed round.
2. File or saw through the crimp along line A and remove the nose cap. Some inert M-31's on the market contain a complete piezo-electric initiator, although the majority do not. If the piezo unit will be used, retain the nose cap and epoxy it back in place AFTER the initiator has been checked and wired into an electric detonator. If a conventional, inertia type initiator is to be used, remove all plastic and rubber parts from the nose. Braze a sheetmetal patch over the hole and reinstall the nose cap with solder or epoxy.
3. Drill out the two punch marks at B. The body and fuze sections may now be separated by melting the soldered joint at C and pulling the sections apart.
4. Remove the inert plastic filler from the body section by heating area D with a propane torch. Continue until all of the plastic melts and runs out of the bottom. An old pie plate can be used as a catch pan.
5. Melt the soldered joint at E and separate the body and ogive sections. Continue to heat the body until the copper cone can be gently driven out with a wooden dowel.

   The copper cone is not used for the Anti-Personnel (fragmenting) round.

   Line the inside of the body and ogive with pre-fragmented shrapnel material.

6. The body and ogive are now reassembled and soldered together. Seal the inside of this assembly with a heavy coat of red oxide lacquer primer. This prevents possible reactions between the explosive and the metal surface of the grenade. When dry, fill the body/ogive section with the explosive filler of your choice. Complete how-to info for several different examples of both load types have been detailed in PMA Volume One and Volume Two issue #2.

All examples of the same type of round should be nearly identical in weight and balance to maintain accuracy.

7. Drill fuze body for safety pin (inertia type only) and install either an electric or inertia type detonator in the fuze body. Secure in place with shims, spacer blocks, epoxy etc. Install safety pin and retainer if one is to be used. Reassemble the fuze and body sections with both epoxy and a pair of screws or pop rivets (holes B). Maintain proper alignment during reassembly to avoid a wobbly, inaccurate projectile.

9. Construct the tailcone, disc, and plug components as outlined in Fig.10 . Remove the four rear fin screws and slide the above pieces into position. Drill four screw holes through the tail tube into the plug assembly and reinstall the four rear screws. To insure a strong joint, the plug should be coated with epoxy before insertion into the tube.

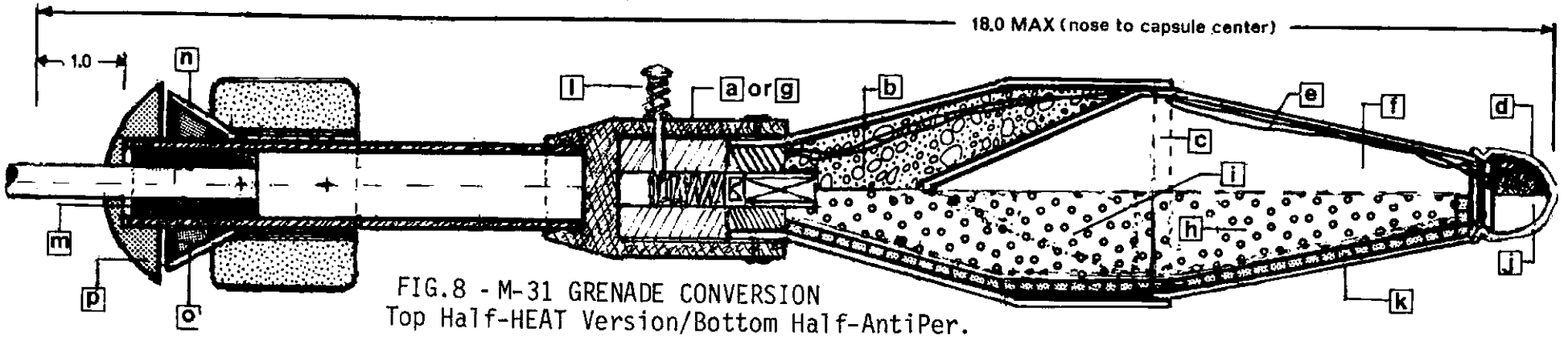


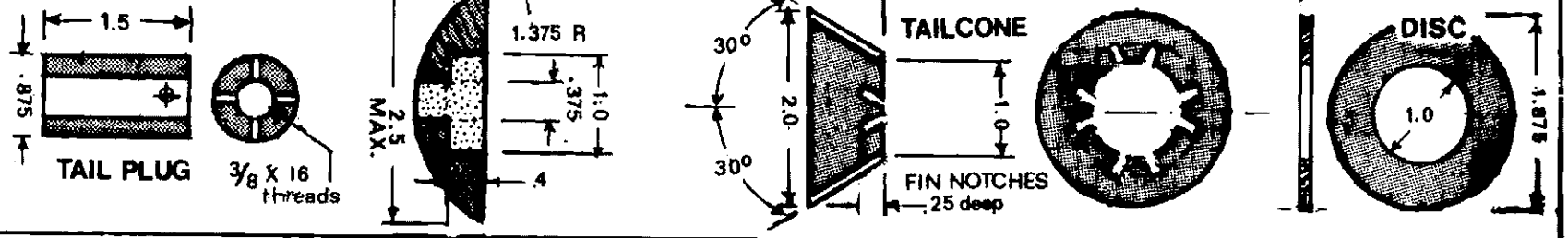
FIG.8 - M-31 GRENADE CONVERSION
Top Half-HEAT Version/Bottom Half-AntiPer.

a - electric fuze
b - explosive filler
c - copper cone
d - piezio elec. initiator
e - fuze wires
f - empty space
g - inertia fuze
h - flash powder
i - cone removed
j - empty space
k - pre-frangmented liner
l - bore safety

FIG. 9 - INERTIA FUZE
(See PMA Vol. 1 - pg. 21)

FIG. 10 - TAIL COMPONENTS

M - tail plug
N - tail cone
O - disc
P - rubber seal



8. Drill or punch out the eight small fin rivets. Move fin assembly forward one inch and mark/drill new front holes in the tail tube. Remove the fin assembly and use tin snips to cut the fins along line F. Spread and space each fin as shown. Carefully trim each fin to the correct dimensions and reinstall on tail tube. Use small screws instead of rivets, as they will be removed and replaced later on. (see pp 142)

10. The M-31 round is now loaded and ready for use. It may be loaded into the launcher (see Section Four - Final Assembly) or stored in its tube until needed.

Note: All live rounds, as well as their containers, should be clearly stenciled: LIVE/HEAT or LIVE/AntiPersonnel.

B - PROPELLANT PACKAGE

I. - General

The propellant package (explosive capsule) is made up of the following pieces:

a-Outer Casing	e-Detonator Liner
b-Front Piston	f-Propellant Filler
c-Rear Piston	g-Locater Tube
d-Detonator	h-Screw Joint

When assembled, the package should be 3.6" to 3.625" long. To prevent assembly difficulties and possible piston jamming, the OD of the finished package must not exceed 2.74" OD.

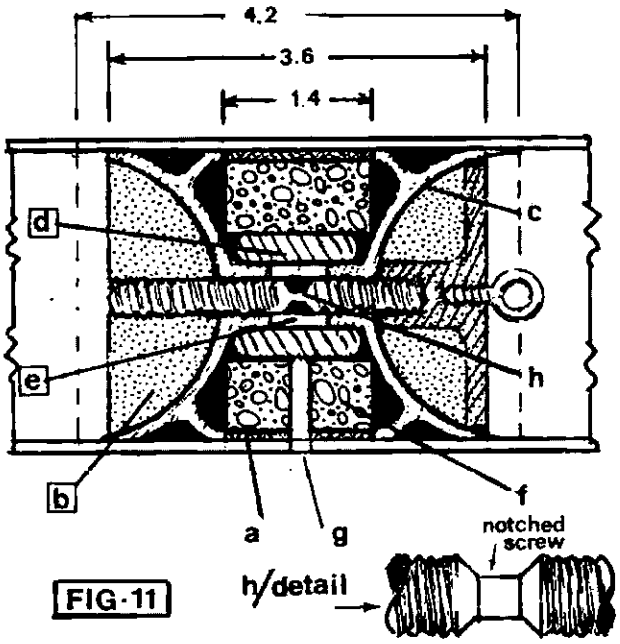


FIG-11

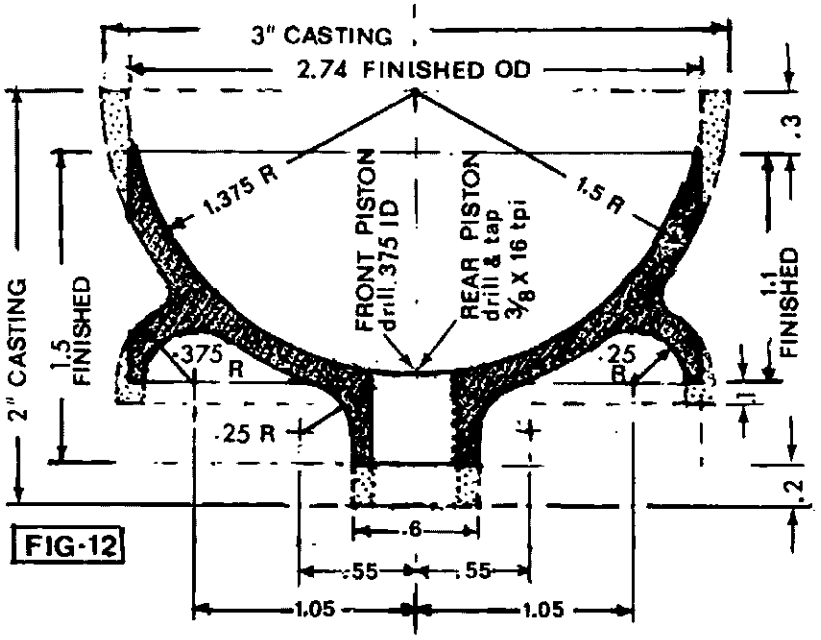


FIG-12

II. - Individual Parts Specs

a - Outer Casing: 2.74" OD/ 2.62" ID x 1.4" long.

Material may be steel tubing, but seamless aluminum is preferred.

b - Front Piston; c - Rear Piston ;

Single sets of pistons can be easily turned on the lathe from a solid piece of 3" OD aluminum round stock. Large batches are best produced as oversized aluminum sand castings which require a minimum of machining for completion. Figure 12 has specs for both cast blanks and the completed piston.

d - Detonator: 1.20" OD/.65" ID x 1.2" long.

Actual material is the builder's choice. Ideally, a castable explosive will be molded around the steel liner (e).

e - Detonator Liner: .625" OD x .6" long.

The liner is made from a section of seamless steel tubing. It functions as a shield for the screw joint and also helps to direct the force of the detonator toward the propellant filler.

f - Propellant Filler:

Specific propellant type and amount are left up to the builder. Three possibilities are;

1. Model Rocket Motors
Soak in water and peel off/discard the nozzle and cardboard body tube. Cut sticks to shape and glue into the outer casing.

2. Black Powder
Try several of the slower burning (larger grained) grades. Powder may be sealed into 'Baggies' before loading.

3. Improvised White or Red Powder Propellant (See PMA Vol.1,pg.131)

Maximum propellant length is 1.25"

g - Locater Tube: .5" OD/.65" wall

Tube may be cut from either steel or aluminum commercial tubing.

h - Screw Joint:

The type of material used for the factory screw is unknown. We've chosen 3/8" x 16 threaded brass rod. Note that the center section is prenotched to break under pressure. The correct diameter of the notched area will have to be determined by testing. The screw should hold the pistons together until the propellant is fully ignited, yet it MUST break before excess pressure ruptures the casing.

III-Assembly of Propellant Package

1. Apply epoxy to the inner faces of both pistons and to the edges of the outer casing.

2. Screw the threaded rod into position in the rear piston.

3. Slide outer casing and detonator assemblies over the rod and into position against the rear piston.

4. Install the front piston over the threaded rod and position it flush against the edge of the outer casing.There are no threads in the front piston,so a temporary clamp is set up with a 3/8" nut and a large flat washer.

5. Use a scrap piece of launch tube as an alignment jig. Insert the propellant package in the tube and tighten temporary clamp nut on front piston.

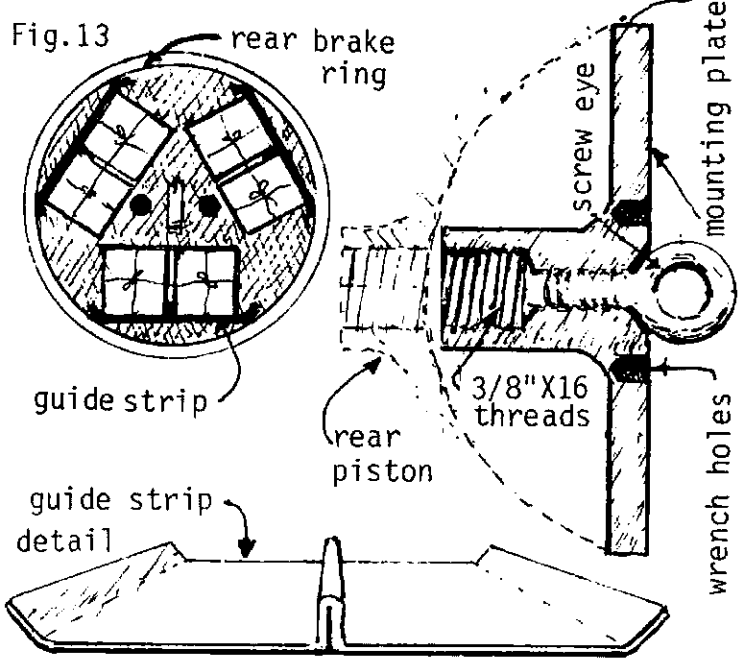
6. When the adhesive has cured,remove the finished assembly from the jig.Loosen and remove the clamp nut and washer.

C - COUNTERMASS ASSEMBLY

The countermass assembly consists of the following pieces:

a - Plastic Flakes

Approximately 5,000 flakes are cut from .014" thick plastic between .6" and .65" square. Flakes are bundled and tied into three double stacks (total of six) roughly 11.5" long.Each stack contains about 830 flakes.



b - Guide Strips (3)

Three guide strips separate the double stacks of flakes and help to guide them over the brake ring. Each strip is 12" long X 2.0" wide. Material is cardboard or plastic sheet. Fold each strip down the center line to form a "W" shape as shown.

c - Mounting Plate

Cast aluminum, see Fig.13 for specs. This piece threads onto the rear of the screw joint, and rests against the curved inner wall of the rear piston. An "eye" is provided for tying the bundles of plastic flakes into place. Two wrench holes are drilled for installing the completed countermass assembly into the launch tube.

Note: Because the Mounting Plate remains within the launch tube upon firing, it should not be included when calculating the total weight of the countermass assy..

Section Four - Final Assembly

1. Slide the propellant package into the center of the launch tube. Align the .5" diameter hole with the initiator housing. Lock these two assemblies together by inserting the locater tube into housing.

2. Slip the front and rear brake ring/collar assemblies onto the launch tube ends. Tap into final position with a wooden block if necessary. Protect the central tube area with a damp towel before welding the front and rear collars into place.

3. Run a bead of silicone adhesive along the tops of the grip frame's spacer blocks and side panels. Place the launch tube onto the grip frame and press together to spread the adhesive. Install the three retaining straps and tighten them into position.

4. Paint the completed tube/frame assembly with olive drab lacquer.

5. Insert the projectile and countermass assemblies into their respective ends of the launcher. Carefully feed them over the brake rings and into the tube until they rest against the protruding ends of the screw joint. Thread both projectile and countermass onto the screw and continue to tighten until both are a snug fit against the outer faces of the pistons.