# ADVANCED FUZE & EXPLOSIVE ORDNANCE BULLETIN No. 12

JANUARY 1945

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# ROCKETS

RESTRICTED

## SPIN STABILIZED ROCKETS

INTRODUCTION

All of the earlier rocket weapons adopted by the United States were of the fin stabilized type. This was partly because of their use by the British and partly because of the inherent simplicity associated with fin stabilization. Because fins on rockets exert an appreciable restoring force in flight only at a high velocity, a fin stabilized rocket is more accurate if launched at high velocities as from aircraft or when most of the acceleration occurs on the launcher.

The use of spin to stabilize the flight of a rocket leads to a number of advantages from the standpoint of ground or amphibious use. Because the forces tending to produce deviation in flight are cancelled out to a considerable extent by the rotation, spinning rockets are in general more accurate than corresponding fin stabilized rockets at short ranges. Since no fins are required, and since the projectile may be made short and chunky without loss of accuracy, they are more convenient to handle and stow and make for more compact launching gear.

Hence, for ground or amphibious use at comparatively short ranges, spin stabilized rockets have definite advantages over the fin stabilized design. However, the accuracy of spin stabilized rockets does not approach that of projectiles fired from guns.

There are currently available in limited quantities three types of 5"0 spin stabilized rockets.

| | (1) General Purpose | (2) Common | (3) High Capacity |
|---|---|---|---|
| Body | 5"0 Mk 7 All Mods | 5"0 Mk 8 All Mods | 5"0 Mk 10 All Mods |
| Motor | 5"0 Mk 3 All Mods | 5"0 Mk 3 All Mods | 5"0 Mk 4 All Mods |
| Fuses: | | | |
| Nose | Mk 100 Mod 0 | None | Mk 30 Mod 3 |
| Base | None | Mk 31 Mod 0* | None |
| Aux. Det. | Mk 44 Mod 2 | None | Mk 44 Mod 1 |
| Range(45° Quad. Angle) | 11,000 yards | 11,000 yards | 5,250 yards |
| Velocity | 1,530 ft/sec | 1,560 ft/sec | 830 ft/sec |

PURPOSE

Spin stabilized rockets are intended primarily for shipboard use. The General Purpose and Common rounds are particularly adapted to P.T. boat attacks at ranges of 600 yards and less against Jap barges, shore installations, light unarmored craft, etc. The eight tube launcher designed for P. T. boat use is the Mark 50 Mod 0 shown in Fig. 3.

The High Capacity spin stabilized rockets are suitable for barrages from landing craft at range of 3,000 - 5,000 yards. For this purpose, the Mk 51 Mod 0 Launcher, Fig. 2, is used. The Mk 51 is a twelve round automatic type similar to the Mk 7 automatic launcher for 4"5 barrage rockets.

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* It was reported in AFEO Bulletin No. 11, page 1, that the Base Fuse Mk 36 was to be used in this assembly. While this was the original plan, it was found that the .01 second delay of the Mk 36 gave too much penetration; hence, use of the non-delay Mk 31 Mod 0.

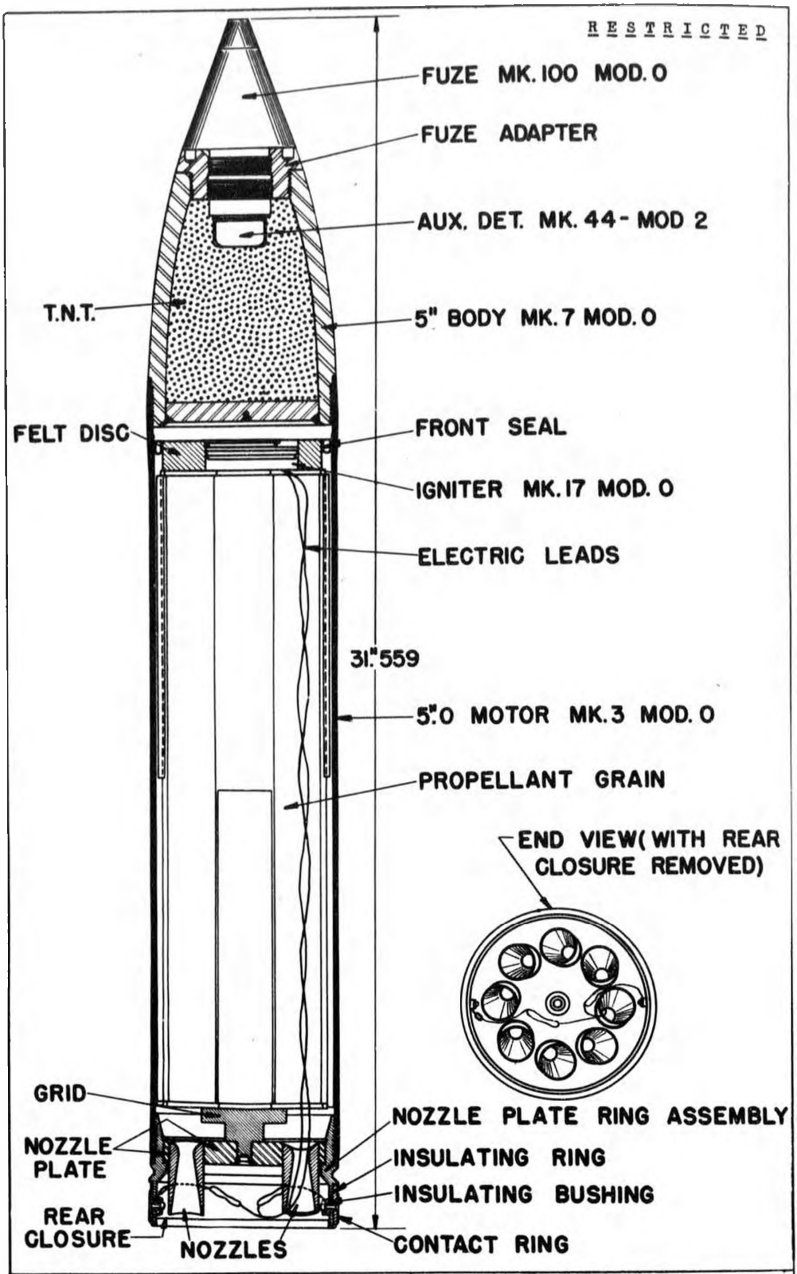



FIG. 1 5".0 SPIN STABILIZED ROCKET WITH BODY MK. 7 MOD. 0 (GENERAL PURPOSE) AND MOTOR MK. 3 MOD. 0

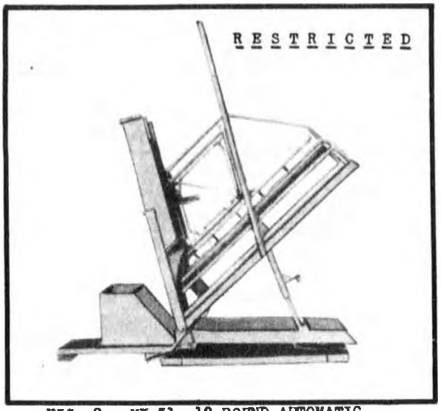



FIG. 2. MK 51 12 ROUND AUTOMATIC LAUNCHER FOR 5"O SPIN STABILIZED ROCKETS. THIS LAUNCHER IS SIMILAR TO THE MK 7, FOR 4"5 BARRAGE ROCKETS.

## 5"O SPINNER ROCKET MOTORS

### 5"O ROCKET MOTOR MK 3 AND MODS

The motor Mk 3 and Mods, Fig. 1, as used with rocket bodies Mk 7 and Mk 8 consist of the following parts:

1. MOTOR TUBE

The motor tube consists of a seamless steel tube with internal threads at both ends. It is 22" long and acts as a combustion chamber for the propellant. It is machined with a bourrelet ring at each end. The bourrelet acts as a bearing surface when fired from the tubular launcher.

2. SHIPPING CAP

The shipping cap is located in the forward end and must be removed when fitting the body to the motor.

3. FRONT CLOSURE

The front closure is a steel disc pressed in position near the front end of the motor tube. Its purpose is to seal the front end from moisture, dirt, etc., and also retains the igniter and propellant grain in place. A thin felt pad cushions any contact between the front closure and the igniter.

4. IGNITER MK 17 MOD 0

This igniter consists of a flat tin case containing 35 grams of black powder and an electric squib. Two leads from the squib pass to the rear of the motor tube where one lead is connected to the contact ring and the other lead is grounded to the motor tube at the nozzle plate ring.

5. FELT DISC

A felt disc 1" thick protects the grain from accidental shock. It has an eccentrically placed hole which houses and forms a snug fit for the igniter case.

6. PROPELLANT GRAIN

The propellant is an inhibited, cruciform-shaped, extruded grain of ballistite weighing approximately ten lbs. The surface of the grain is inhibited with plastic strips to control the burning surface of the grain.

7. NOZZLE PLATE ASSEMBLY

The nozzle plate assembly consists of eight nozzles and a grid mounted on a nozzle plate.

The cylindrical "T" shaped steel grid is pressed into place and peened in position in a center hole in the nozzle plate. It supports the propellant grain and acts as a spacer between the grain and the nozzle plate, creating a chamber which equalizes the pressure to all nozzles during firing.

The nozzles are press fitted into the nozzle plate and are canted 12° to give a clockwise rotation.

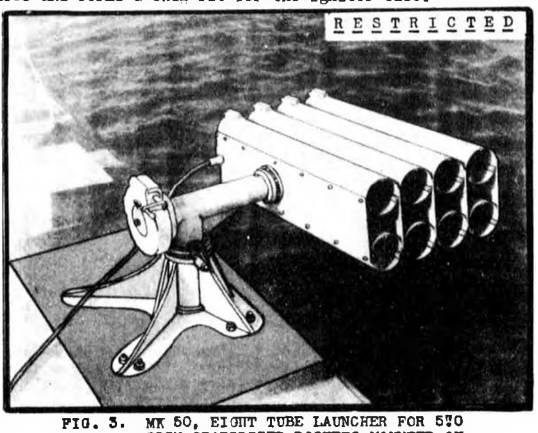



FIG. 3. MK 50, EIGHT TUBE LAUNCHER FOR 5"O SPIN STABILIZED ROCKETS MOUNTED ON P.T. BOAT.

8. NOZZLE PLATE RING ASSEMBLY

The nozzle plate ring assembly consists of a nozzle plate ring and the insulated contact ring. The contact ring is a steel band around the nozzle plate ring and is electrically insulated from it.

The nozzle plate ring and contact ring are the two terminals of the igniter electrical circuit. The rings are short circuited by a short circuiting band locked around the nozzle plate ring assembly in such a manner that it creates a short circuit between the nozzle plate ring and contact ring. The short circuiting band must be removed when preparing the rocket for firing.

9. REAR CLOSURE

The rear closure is a thin aluminum cup cemented in place at the aft end of the motor and blows out after the motor pressure builds up.

NOTE: The front and rear closures should not be tampered with.

THE 5"0 ROCKET MOTOR MK 4 AND MODS

The 5"0 rocket motor Mk 4 is similar to the Mk 3 discussed above except:

1. The motor tube is only 13"5 long or 7" shorter than the Motor Mk 3.

2. The Mk 18 igniter is used and differs only in that it has shorter leads.

3. Propellant grain Mk 22 Mod 0 is used and differs only in that it is shorter in length, and weighs approximately 5.5 lbs.

4. The nozzle in the nozzle plate assembly has a smaller throat diameter.

5"0 SPINNER ROCKET BODIES

5"0 ROCKET BODY MK 7 (GENERAL PURPOSE)

This body, as seen in Fig. 1, is threaded externally at the aft end to accommodate the motor. It is threaded internally at the forward end to accommodate the fuse adapter for rocket fuse Mk 100 Mod 0. Two spanner holes are located in the aft end of the body spaced 180 apart to facilitate assembly. The fuse adapter is internally threaded for Auxiliary Detonator Fuze Mk 44 Mod 2. The nose fuse Mk 100 Mod 0 is screwed in over the Auxiliary Detonating fuse. (NOTE: The fuse adapter and Aux. Det. Mk 44 Mod 2 are shipped installed in the body.)

The body carries 2.8 pounds of TNT and is shipped with a nose shipping plug and base shipping cap in place.

5"0 BODY MK 8 AND MODS (COMMON)

This body, Fig. 4, is internally threaded at the aft end to take base fuse Mk 31. It has two spanner holes 180° apart to facilitate assembly operations. This body holds 1.7 pounds of Explosive D and is shipped with a base shipping cap.

WARNING: Do not remove the base fuze which is shipped in place in the body.

5"0 BODY MK 10 AND MODS (HIGH CAPACITY)

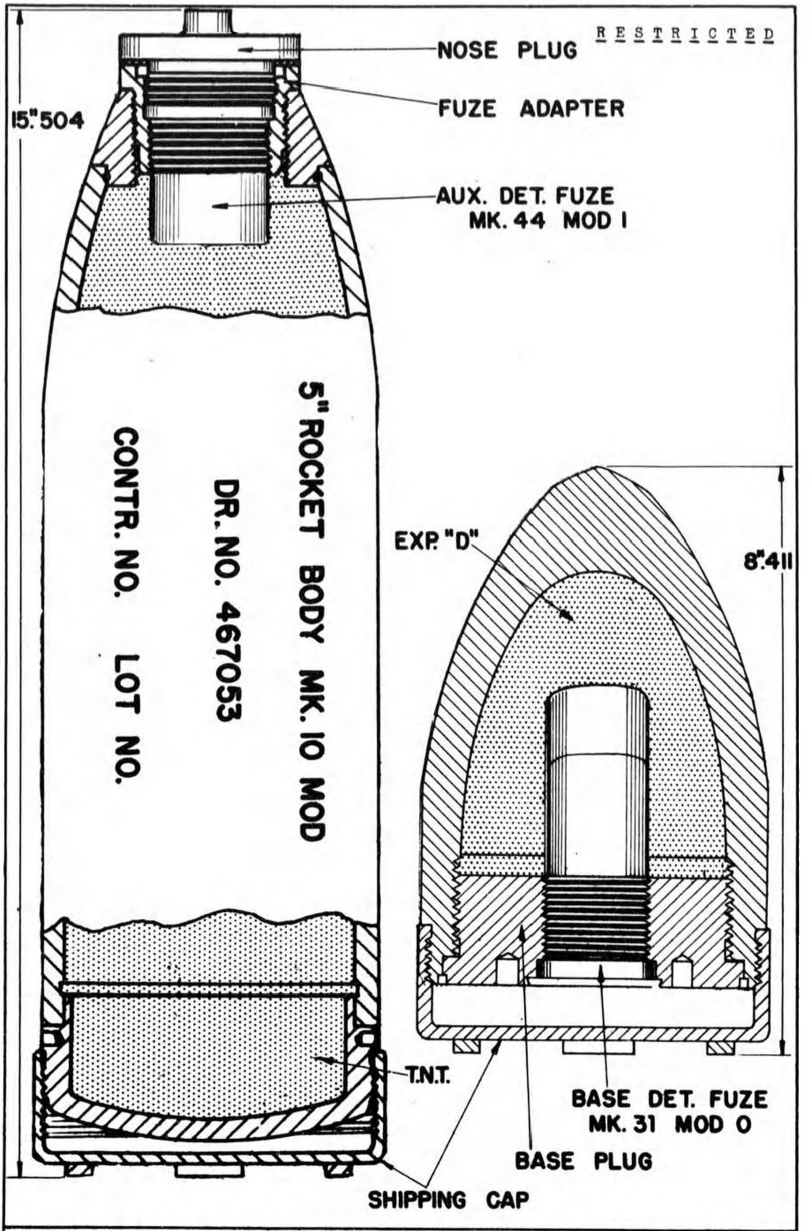
The nose of this body, Fig. 4, is internally threaded to fit nose fuse Mk 30 Mod 3 and a fuse adapter. It has two spanner holes 180° apart near the base end to facilitate assembly operations. The fuse adapter is internally threaded to hold Auxiliary Detonator Fuse Mk 44 Mod 1 and the nose fuse Mk 30 Mod 3 fits over the Auxiliary Detonator. The body carries 9.6 pounds of TNT--hence its "High Capacity" designation.

FUZES FOR SPINNER ROCKETS

All fuzes used in spin stabilized rockets are essentially projectile fuses having in some cases slight modifications. For details on these fuzes refer to "U. S. Navy Projectiles and Fuzes" dated August 1944, published by the USN Bomb Disposal School.

1. Nose Fuse Mk 100 Mod 0

This is a selective action fuse (instantaneous or 0.05 second delay) made up by combining Point Detonating Fuze Mark 29 and the 0.05




5".0 ROCKET BODY
MK.10 MOD.0
(HIGH CAPACITY)

FIG. 4

5".0 ROCKET BODY
MK.8 MOD. I
(COMMON)

second delay assembly of the Army's Point Detonating Fuze M48A2. Before firing, the fuze is set at DELAY or S.Q. (super-quick) by means of a selector in the side of the fuze body. By inserting a screw driver into a slot in the selector, the selector may be turned to set the fuze at either DELAY or S.Q. The fuze is armed by rotation in flight.

2. Base Detonating Fuze Mk 31 Mod 0

This is the standard Mk 31 Mod 0 projectile base detonating fuze which is shipped installed in the base of the rocket body.

3. Point Detonating Fuze Mark 30 Mod 3

This is an instantaneous point detonating fuze having a selector in the side of the fuze body. The selector has two positions -- OFF and S.Q. and is shipped in the OFF position. When readying the rocket, a screw driver may be used to turn the selector to the S.Q. position. The fuze arms by rotation in flight.

4. Aux. Detonating Fuze Mk 44 Mod 1

The Mk 44 Mod 1 is the same as the Mod 0 except for minor manufacturing differences. It is used with P.D.F. Mk 30 Mod 3.

5. Aux. Detonating Fuze Mk 44 Mod 2

The Mk 44 Mod 2 is the same as the Mod 1 except that a 9/64 diameter hole has been drilled in the center of the closing disc. Also, a 0.002 thick copper disc has been crimped in the fuze immediately below the closing disc to moisture-proof it. The hole in the closing disc was necessary to insure that the relay detonator in the M48A2 delay assembly (of the Mk 100 Mod 0 fuze) would initiate the detonator in the Mk 44 Mod 2 Aux. Det.

OPERATION OF SPIN STABILIZED ROCKETS

Electrical current to fire the rocket is fed to the motor by means of a contact ring at the rear of the motor. The electrical impulse passes from the contact ring through the squib causing the squib to set off the black powder in the igniter. Burning of the igniter fills the interior of the motor tube with hot burning gas under high pressure. The burning gas raises the surface of the propellant to ignition temperature. As soon as the propellant begins to burn, it generates a large quantity of gas and increases the pressure. A force is thus exerted in all directions blowing out the rear closure disc. The gas is then free to rush out of the nozzle end. The gas also exerts full force on the corresponding area of the closed forward end of the motor, creating a net force or thrust which drives the rocket forward. The 12° cant of the nozzles gives the rocket its clockwise rotation or spin, which is required to arm the fuses and stabilize the rocket in flight.

SHIPPING AND STOWAGE

According to available information the initial lots of 5"0 spin stabilized rockets will be shipped in wooden boxes as follows:

G. P. - 1 Body Mk 7 and 1 Motor Mk 3 per box

Common - 1 Body Mk 8 and 1 Motor Mk 3 per box

H. C. - 2 Bodies Mk 10 per box; 2 motors Mk 4 per box

(or) H. C. - 1 Body Mk 10 and 1 Motor Mk 4 per box

Metal containers are under development which will replace the wooden shipping boxes.

Base fuses and Auxiliary Detonating fuses are shipped installed in the rocket bodies, while nose fuses are shipped separately.

Stowage of these rockets should be carried out in accordance with Bureau of Ordnance instructions as contained in O.P. 1260. Motors are to be stowed according to regulations for smokeless powder and specifically not near or in the same compartment with radio apparatus or antenna leads. Rocket bodies may be stowed in a manner similar to projectiles.

While in stowage, the short circuiting band must be left on the motor until just prior to firing. It must be replaced if the rocket is not fired.

ASSEMBLY

Briefly, assembly of the rockets is accomplished as follows:

1. Remove base shipping cap and nose plug (if any) from rocket body.

2. If body has base fuze or auxiliary detonating fuze installed, check to see that they are securely in place but do not remove them.

3. Do not disturb forward or rear closures.

4. Screw body and motor together securely.

5. Insert proper nose fuze if required.

6. Wipe off grease from the bourrelet rings before loading in launcher.

7. Immediately prior to loading, the short circuiting band must be removed.

MISFIRED ROCKETS

Before a misfired rocket is removed from the launcher, make certain that the firing panel safety plug has been removed from the firing panel so that the electrical system is not energized. Leave the rocket in the launcher for ten minutes (with safety plug removed from panel), then the round may be removed and lowered gently into deep water.

NOTE: In case of a misfire, turn the selector from "S.Q." to "SAFE" on nose fuze Mk 30 Mod 3 in the 5"0 Rocket Body Mk 10 Mod 0 before lowering into deep water.

GENERAL SAFETY PRECAUTIONS

1. If practicable, personnel handling rockets should wear long pants, long sleeved shirts with sleeves buttoned at wrist.

2. Rockets are not to be exposed to matches or open flames.

3. Observe care in handling component parts to prevent accidental damage.

4. Never fire rockets outside the safe temperature limits indicated on motor tube. (Safe firing range is $0^{\circ}$ - $120^{\circ}$ F). Cool rockets if necessary before firing.

5. Do not stand rocket on aft end, since damage to the electrical circuit is likely to result.

6. Leave short circuiting band on the rocket until just prior to loading in launcher. If rockets are not fired, replace the band.

7. Observe ten minute wait with misfired rockets.

8. The selector on nose fuze Mk 30 Mod 3 should be on "SAFE" except when ready to fire.

9. Use good judgement and common sense.

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REFERENCE: O.P. 1260 (Preliminary).

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# BOMBS

C O N F I D E N T I A L

## BOMB, TARGET IDENTIFICATION, 100 LB. M84

GENERAL

The Bomb Target Identification 100-lb. (smoke, red) M84, Fig. 5, is intended for release by a lead or "pathfinder" plane to indicate bomb release line for bombers in formation when bombing operations are carried out above an overcast and ground targets are not discernible by visible means. On functioning, a large red cloud is formed, hanging in the air for a considerable period of time. The M84 was designed to produce a smoke cloud which would remain suspended in the air at the bursting point for a period of ten minutes under normal air conditions and would be visible for a distance of fifteen miles at an altitude of 25,000 feet depending, however, on atmospheric conditions.

DESCRIPTION

The M84 is identical to Bomb Practice Target 100-lb. M75 with the exception of the fuse and is similar to the AN-M47A2 chemical bomb. It is 50.1 inches long, including fuse, and 8.2 inches in diameter. It is a sheet metal cylindrical type bomb with box fin and filler consisting of 72 pounds of red iron oxide. The complete round weighs approximately 102 pounds. The Burster, M4, runs through the entire length of the bomb and is closed at the forward end by a closing plug. A filling plug is placed in the fin cone of the bomb body to facilitate loading of the Hematite charge (red iron oxide).

MECHANICAL TIME NOSE FUZE M147 (T55E3)

Especially designed for use in the M84 is the Mechanical Time Fuze M147, formerly the T55E3. This fuze is the same as the prototype M128 (T55), (see AFEC Bulletin No. 8, page 20), except that it incorporates a detonator holder similar to that used in the Nose Fuze AN-M126A1 instead of a booster cup. The setting range is from 5 to 98 seconds. The M147 fits in the forward end of the burster M4.

ASSEMBLY OF COMPLETE ROUND

The only assembly operations are those required to assemble the Burster, M4, and Fuze, M147, to the bomb.

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REFERENCE: Ord. Dept. Dwg. No. 82-0-121

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C O N F I D E N T I A L

## BOMB, SMOKE COLORED STREAMER, M 87

DESCRIPTION

The colored smoke streamer bomb M87, Fig. 6, consists of an M38A2 bomb case, a train tube, a grenade train, a closing plug and a fuze. The M38A2 bomb case is used in its standard form except for four holes drilled near the tail end for securing the tube train to the case. The tube train is seamless steel tubing 40 inches long having an internal diameter of 3 inches. A fuze adapter is brazed to the aft end of the tube train.

Eight modified M18 grenades filled with a fast burning smoke mixture are inserted into the tube to form the grenade train. Each grenade is modified by cutting a center hole in its base and the bouchon fuze is omitted. The top of each grenade is coated with a starter compound which acts as the igniter for the adjacent grenade. Four strands of quickmatch are knotted and inserted in the center hole of the top grenade in such a manner as to leave the knot and loose

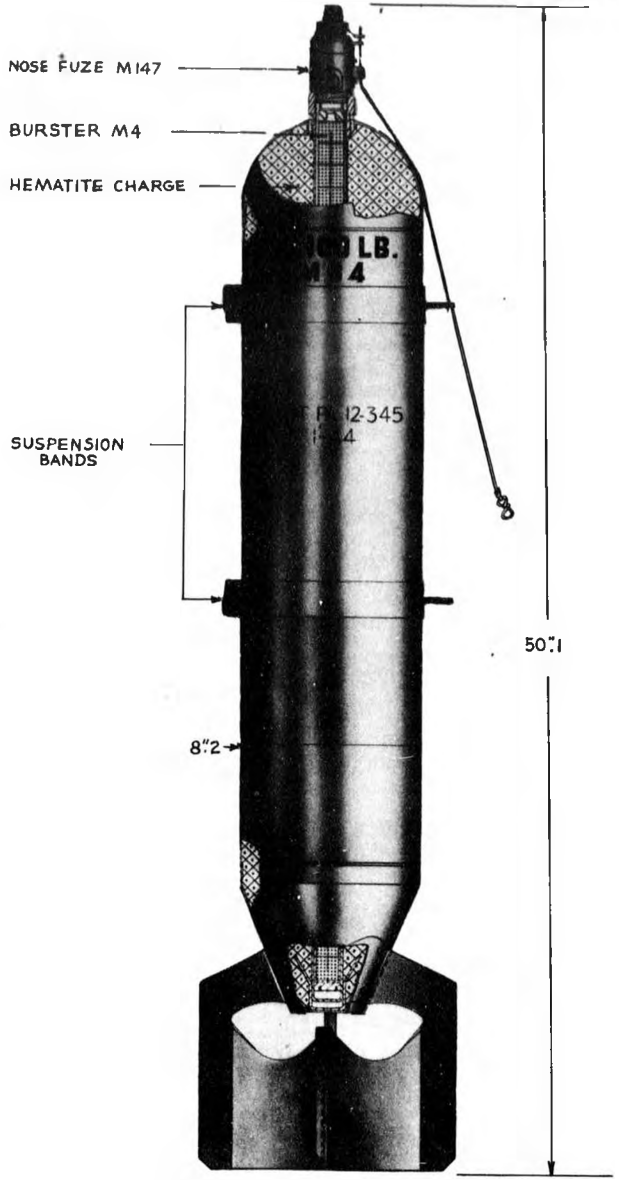


FIG. 5 100 lb. TARGET IDENTIFICATION BOMB M 84

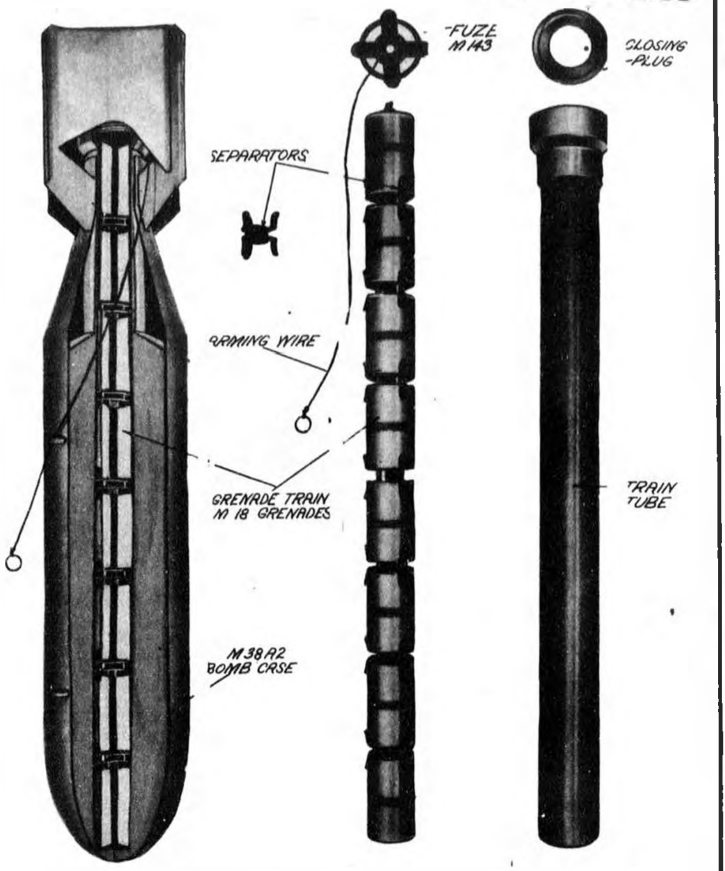


FIG. 6

BOMB, SMOKE, COLORED STREAMER, M87

ends at the top of the grenade column to receive the fuse flash.

The eight M18 grenades are held apart by spring steel separators. These separators also hold the grenade train in the center of the tube. A threaded closing plug seals the tube and protects the grenade train from entrance of moisture. This plug must be removed just prior to use of the bomb when the fuse is inserted.

The M87 is brought up to weight of approximately 98 pounds by filling the balance of internal space with sand.

FUZE, BOMB IGNITING M143

This fuze is made up of a fuze body support mounting four bouchon grenade type fuzes and an arming washer. The fuze body support is threaded to fit the fuze adapter of the train tube. The 4 bouchon fuzes are modified by removing the standard delay and substituting a short delay mixture. The arming washer is 2½" in diameter and is provided with 4 arms 3/4" wide by 1" long. The bouchon fuzes are attached to the fuze body support by hex nuts and the arming washer is placed over the bouchons. The arming wire holds the arming washer against the bouchon levers until it is withdrawn upon release of the bomb from the plane.

OPERATION

When the arming wire is pulled, the bouchon springs throw off the arming washer and handles, allowing the bouchons to fire. This action sets off the 4 strands of quickmatch inserted in the center hole of the top grenade. The top grenade is then ignited and gives off a thin smoke streamer. When the top grenade has burned through, the quickmatch between the top and the second grenade is ignited and in turn sets off the second grenade, etc.

REMARKS

The M87 colored streamer smoke bomb has been designed for use as a visual signal to be dropped by the lead plane of a bomber formation when the location of the target has been determined.

It is believed that, for the time being, the bomb will have a rather limited distribution.

The bomb igniting fuze M143 is shipped in a hermetically sealed container and should be left therein until just prior to loading the bomb in the airplane since it is susceptible to moisture.

Tests conducted on the M87 have shown that it functions accurately from altitudes as high as 30,000 feet. Smoke emission begins approximately one second after release from the plane and continues for approximately 7,000 to 10,000 feet.

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REFERENCE: "New Material", October 1944.

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R E S T R I C T E D

## BOMB, FRAGMENTATION, 220 LB., M88

The M88 220-lb. Fragmentation Bomb for all practical purposes is exactly the same as the Bomb, Fragmentation, 260-lb. M81, except for the weight factor. The essential difference between the M81 and the M88 is that the former had a 1-inch square steel coil encircling the bomb body while the latter has 3/4-inch steel coil.

Tests conducted with the M88 have shown that it gives off increased fragmentation and higher velocity of the fragments than the M81. Use of the M88 over the M81 also has an advantage in that it is 40 pounds lighter and is still capable of doing the job of the M81.

The M88 will be filled with RDX Composition B which has been designated as the standard loading explosive with Ednatol and TNT as first and second substitutes respectively. The M88, while not immediately available, will shortly be ready for service use when manufacturing facilities can be converted from the manufacture of the M81.

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REFERENCE: OCM Item No. 25956

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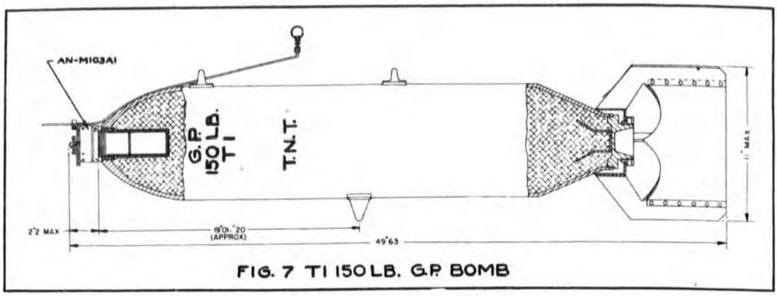


FIG. 7 T1 150 LB. G.P. BOMB

RESTRICTED

## BOMB, GENERAL PURPOSE, 150 LB. T1

The 150-lb. G.P. Bomb T1, Fig. 7, was developed by the Army for use as an intermediate substitute to alleviate a temporary shortage of 100-lb. G.P. bombs.

This bomb consists of a modified M70 chemical bomb body loaded with TNT. The body has been modified by machining the nose to accommodate an adapter so that either nose fuze AN-M103A1 or AN-Mk 219 may be installed. No provision is made for a tail fuze. Because the M70 bomb proved to be somewhat unstable when the body was filled with TNT, it was necessary to equip this body with the tail of the 260-lb. fragmentation bomb AN-M81. All 150-lb. G.P. bombs, T1, will be supplied with this tail instead of the standard M70 bomb tail.

This bomb is 49'63 long overall (including AN-M103A1) and 8'0 in diameter. When fitted with an AN-Mk 219 the overall length is increased by approximately 1/2 inch. Total weight is about 142 lbs.

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REFERENCE: OTI AV5-44

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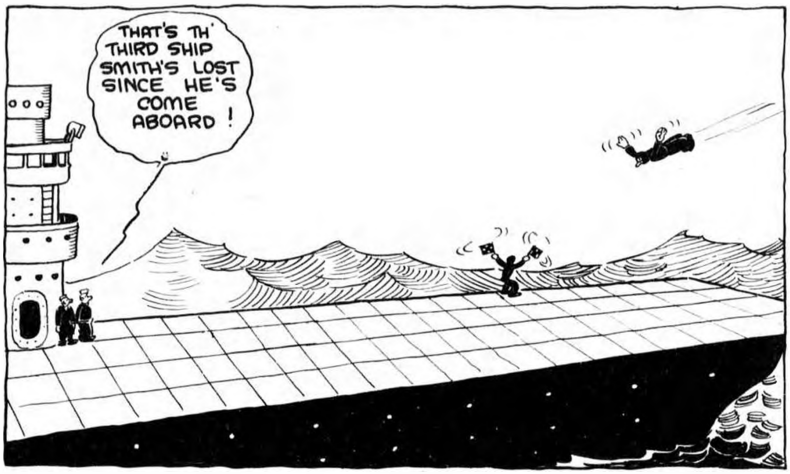

C O N F I D E N T I A L

## BOMB TAIL FUZE MARK 237 MOD. 0 & MARK 238 MOD. 0

DESCRIPTION

The tail fuzes Mark 237 Mod 0 and Mark 238 Mod 0, Fig. 8, have been designed to give long delayed action in G.P. bombs of two, ten and thirty hours. The fuzes are identical except for length, the Mark 237 Mod 0 being 13.260 overall (less vane assembly) for use in 500 lb. size bombs, and the Mark 238 Mod 0 being 17.26 long for use in 1000-2000 lb. bombs.

The long delay element in this fuze is a departure from previous type U. S. long delay fuzes using an acetone solvent in that a lead shear wire (50% lead, 50% tin) is the determining factor governing the delay time. The various delays are obtained by varying the diameter of the wire, i.e., increasing the diameter for longer delays. As seen in Fig. 9, the lead shear wire is fitted in a transverse hole in the firing pin. After the fuze has fully armed, the only restraining element that remains before the firing pin spring can drive the firing pin into the detonator is the lead shear wire.

Delay arming is obtained by means of the 30 to 1 gear reduction system which is like that of the M115 series tail fuzes. In effect, this produces only one turn of the arming stem to 30 turns of the arming vane. Upon completion of arming, the gear reduction assembly and the arming stem do not separate from the fuze but cease rotation.

A booster is not an integral part of this fuze. The detonator and booster lead-in are sufficiently powerful to set off the tetryl charge in the M115A1 adapter booster, provided that the fuze is screwed securely into the adapter booster.

The purpose of a long delay fuze can be defeated if it is not designed to have an anti-withdrawal device to hinder its removal from the bomb when an attempt is made to remove it prior to the expiration of the delay time. The anti-withdrawal feature consists of the ball locking device seen in Fig. 10. In connection with this anti-withdrawal feature it will be of interest to note that no booby-trap device is incorporated like that in the M123 series long delay time fuzes. However, the fuze body has been case hardened in order to repulse the bite of a wrench in an effort to remove the fuze from the bomb.

The ball locking device is located in an eccentric groove near the base of the fuze. The locking ball itself is fitted in a knurled steel carrier which is attached to a light coil spring leading around the eccentric to a screw on the opposite side of the fuze. The carrier is held in place in the deep part of the eccentric, by tension of the coil spring and by a small protruding pin staked to the carrier. The free end of this pin hooks into a hole in the fuze body, the hole being drilled at a slight angle. These two factors hold the ball carrier in place under normal handling conditions and installation.

Upon impact, however, the force of inertia acting on the ball carrier is sufficient to withdraw the carrier pin on the ball carrier out of its hole in the fuze body. The tension of the coil spring then pulls the ball carrier into the shallow part of the eccentric, locking the fuze in place. This type of ball locking arrangement requires impact of the bomb for proper functioning. This being the case, a bomb fuzed with a Mark 237 Mod 0 or Mark 238 Mod 0 may be safely returned to the base or carrier, and have its fuze removed for return to stowage.

OPERATION

Upon withdrawal of the arming wire the vane assembly rotates, causing the arming stem to rotate via the 30 to 1 gear reduction system. The lower end of the arming stem is encased by the firing pin housing nut which in turn is pinned to the firing pin housing. To the bottom of the firing pin housing is attached the slider stop. In addition, the firing pin is locked to the firing pin

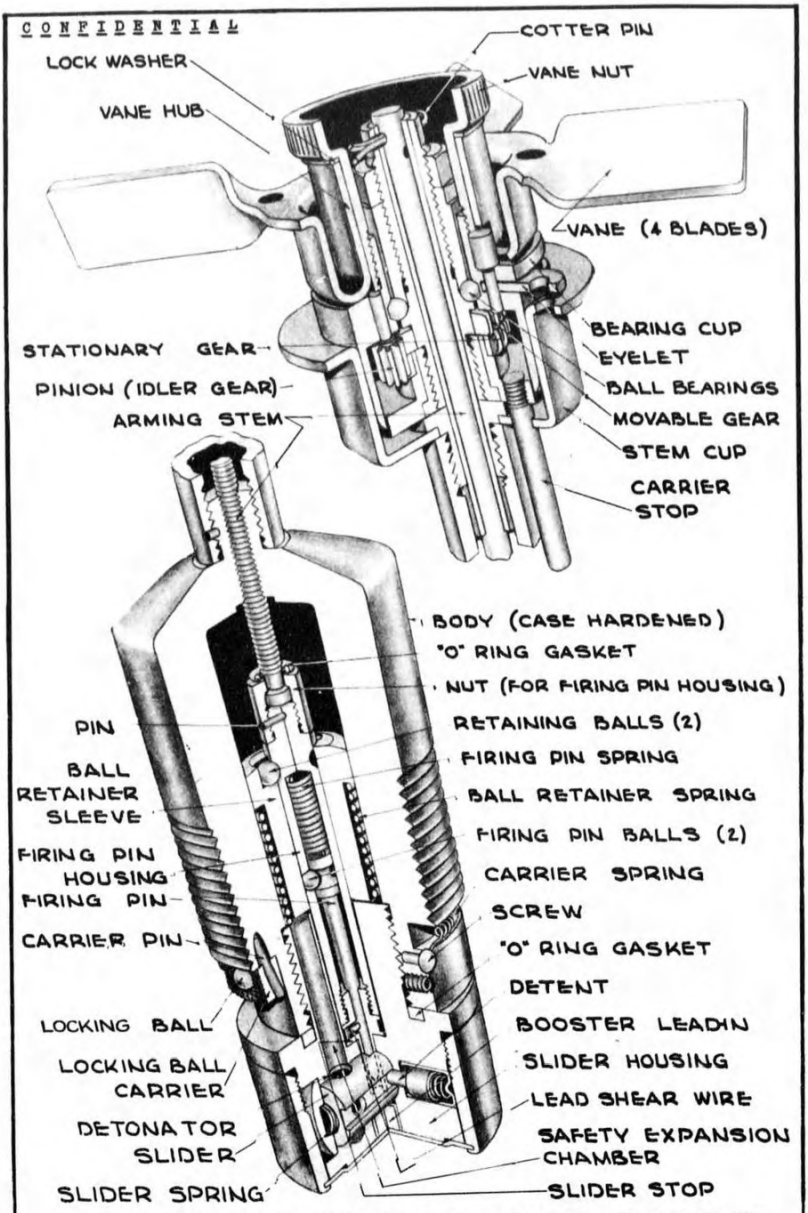


**FIG. 8 BOMB TAIL FUZE MK 237 MOD 0 & MK 238 MOD 0**

**(LEAD SHEAR WIRE - LONG DELAY TIME)**

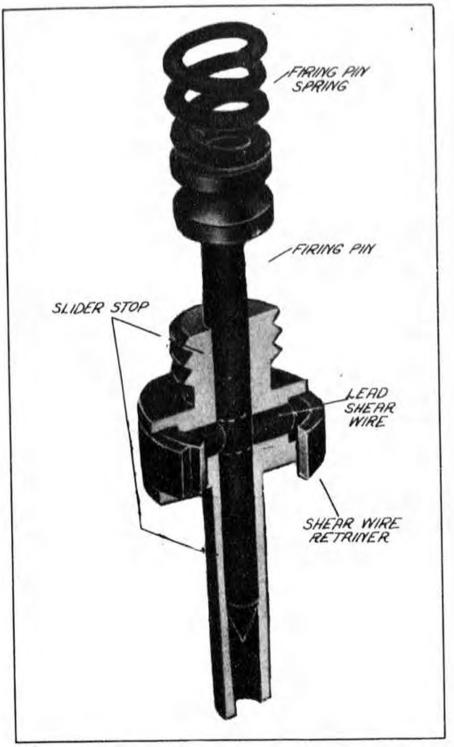


FIG. 9. DETAIL SKETCH SHOWING ARRANGEMENT OF LEAD SHEAR WIRE THROUGH FIRING PIN. WHEN FUZE IS FULLY ARMED FIRING PIN SPRING EXERTS CONSTANT PRESSURE ON FIRING PIN WHICH IN TURN CAUSES DELAYED SHEARING EFFECT ON LEAD SHEAR WIRE.

housing by two balls and the firing pin housing in turn is locked to the ball retainer sleeve by two balls. Thus as the arming stem screws upward the entire firing assembly moves upward under the action of the ball retainer spring. After approximately 150 revolutions of the vanes, (about 600 feet of air travel), the firing assembly has risen sufficiently to withdraw the slider stop and firing pin from the slider slot, allowing the slider to align its detonator below the firing pin and partially arm the fuze (a detent locks the slider in the armed position). Continued rotation of the vanes causes the "O" Ring Gasket on the firing pin housing nut to seat and stop rotation of the vane assembly.

On impact the ball retainer sleeve is forced down by inertia freeing the retaining balls. At the instant deceleration ceases, the ball retainer sleeve is forced upward by its spring, allowing the firing balls to jump out of their recess, so that the only restraining element that remains to prevent the firing pin from being forced into the detonator is the lead shear wire. The fuze is now fully armed. The firing pin under action of its spring exerts pressure on the lead shear wire and causes the wire to shear when the proper length of time has elapsed, depending on temperature conditions. The firing pin strikes the detonator, which in turn sets off the booster lead in.

It is important to note that complete arming of these fuzes is accomplished in two stages, the first one being the requirement of air travel and the other, that of impact.

USE

The AN-Standard bomb and the proper fuze to be used are indicated below:

Mark 237 Mod 0 - 500-lb. G.P. AN-M64A1

Mark 238 Mod 0 - 1000-lb. G. P. AN-M65A1
- 2000-lb. G. P. AN-M66A1

Although the Mark 237 Mod 0 and Mark 238 Mod 0 fit into the 60 series bombs which do not incorporate the "A1" modifications (base plate and adapter booster locked), they should not be used in these bombs unless the A1 modifications are not available. The reason for this is that unless the base plate and adapter booster are locked in position, the locking ball feature of these fuzes can easily be overcome by unscrewing the entire base plate or adapter booster from the bomb in an effort to render the bomb safe.

Standard Army tail fuzes have a 1-1/2 inch thread diameter and thus retain the inner sleeve of the M115A1 adapter booster when fitted in large size GP's; however, the Mark 237 Mod 0 and Mark 238 Mod 0 have a 2 inch thread diameter and therefore require removal of the inner sleeve of the M115A1 adapter booster before installation.

A special short length locking pin will be shipped with these fuzes in order to secure the M115A1 adapter booster to the base plate.

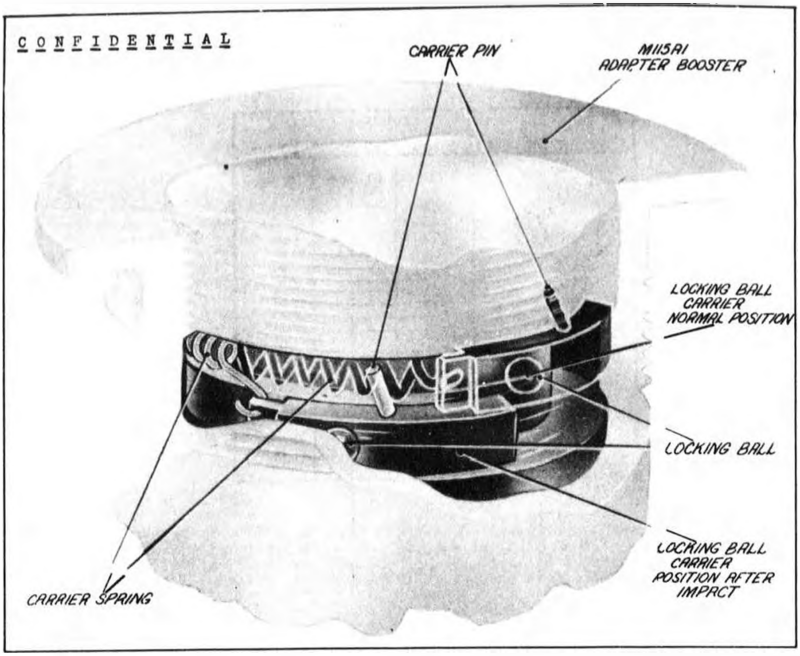


FIG. 10. DETAIL OF BALL LOCKING DEVICE. NOTICE THE LOCKING BALL CARRIER IN NORMAL POSITION IN THE DEEP PORTION OF THE ECCENTRIC. AFTER IMPACT OF BOMB, LOCKING BALL CARRIER HAS DROPPED DOWN AND HAS BEEN PULLED INTO SHALLOW PART OF ECCENTRIC BY CARRIER SPRING THUS LOCKING FUZE IN PLACE IN ADAPTER BOOSTER.

Bombs fuzed with a Mark 237 Mod 0 or Mark 238 Mod 0 should not be released at an altitude lower than that specified by Cominch as the minimum safe altitude of release for instantaneous action fuses (see AFEO Bulletin No. 7, page 16). The reason for this is understandable after studying the operation of this type fuze, since the possibility of instantaneous action exists if the bomb is subjected to double or multiple impact. In such a case, after the first impact the fuze would be fully armed, i.e., the only restraining element to prevent firing being the lead shear wire; hence, on the second impact the fuze could fire if the blow were sufficiently strong to shear the lead shear wire.

Tests on these lead shear wire long delay fuzes have shown favorable results. Depending upon results from further actual service tests, it is believed that the Mark 237 Mod 0 and Mark 238 Mod 0 may replace the M123 series long delay fuzes as far as Naval use is concerned.

TIME PERFORMANCE

The Mark 237 Mod 0 and Mark 238 Mod 0 will have a nominal delay time stencilled on the base of fuze body. The delays incorporated in these fuzes are two, ten, or thirty hours, these nominal delays being based on a temperature of 60° F. The delay time that can be expected depend primarily upon two temperature conditions:

1. Bomb-bay temperature and length of time fuzed bombs remain therein.

2. The cooling or warming effect on fuzed bombs after penetrating the ground at the target.

Preliminary data on expected functioning times at a certain temperature are given in the table below:

| | NOMINAL DELAYS | | |
|---|---|---|---|
| TEMPERATURE (°F) | 2 hr. | 10 hr. | 30 hr. |
| 20° | 10 hrs. | 51 hrs. | 170hrs. |
| 30° | 5.8 | 32 | 110 |
| 40° | 3.6 | 21 | 74 |
| 50° | 2.4 | 14 | 48 |
| 60° | 1.6 | 9.6 | 32 |
| 70° | 1.1 | 6.8 | 23 |
| 80° | .8 | 4.9 | 16 |
| 90° | .58 | 3.5 | 11. |
| 100° | .41 | 2.6 | 8 |
| 110° | .32 | 1.9 | 5.8 |

PRECAUTIONS

1. These fuzes are installed in the normal manner but it is important that they be screwed into the adapter booster securely so that a flush fit exists between the base of the fuze and the inner cup of the adapter booster; otherwise the possibility of a dud exists.

2. Release of bombs with these fuzes should not be at an altitude lower than that specified by Cominch for minimum safe altitude of release for instantaneous action fuzes for reasons explained above.

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C O N F I D E N T I A L

## HYDROSTATIC BOMB FUZE MARK 231

A new simple, single depth setting (25'), hydrostatic tail fuze, designated as the hydrostatic bomb fuze Mark 231, is being developed and tested. This fuze is designed to fit GP bombs AN-M64, 65, and 66, and depth bombs AN-Marks 53 and 54. It can be used wherever the AN-Mark 230 fuze with 25-foot setting is used. Many of the problems which in the past have been associated with hydrostatic fuzes have been eliminated, and it is believed that the new fuze will be safe and reliable for all service uses. Pending further tests, the Mark 231 is not at present being produced for Fleet use.

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REFERENCE: Bulletin of Ordnance Information No. 3-44.

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# MISCELLANEOUS

R E S T R I C T E D

## HEAVY ANTI-TANK MINE M 6

DESCRIPTION AND OPERATION

The M6 mine, Fig. 11, is a flat, round container having a diameter of 13 inches, a height of 3-1/4 inches with a pressure plate on top of the mine 7-1/2 inches in diameter. Filled with 12 lbs. of TNT, the mine weighs 20 lbs.

The pressure plate is supported by a stack of four Belleville Springs and is sealed against moisture by a rubber diaphragm. The diaphragm also acts as a seal to trap air between the pressure plate and the mine body in order to provide resistance against induced detonation when the mine is subjected to a blast. This added resistance, however, does not affect normal functioning.

The fuze well opening is in the center of the pressure plate. Screwed into the fuze well opening is an arming plug. Arming of the mine is accomplished by unscrewing this plug and after turning the plug upside down, screwing it back into the fuze well opening. This arming plug is so constructed that in the unarmed position the center portion is hollow and clearance is provided so that when the pressure plate is depressed, the piston in the fuze is not contacted. However, when the position of the plug is reversed, the center of the plug is solid so that upon application of the required load (300 lbs.) the solid portion forces the piston of the fuze down into the fuze body.

FUZE, CHEMICAL, MINE A.T. M600

The Fuze, Chemical, Mine, M600, is used. (M600 also used in M7 light A.T. mine - See Fig. 12). The fuze is a separate unit and is not an integral part of the mine. In the armed condition when the pressure plate is depressed, the pressure plate plug contacts a small piston at the top of the fuze. Encircling the piston is a small metal cylinder which collapses and allows the piston to be driven downward. This action breaks a tubular glass ampoule (mounted transversely in the fuze body) containing a special acid, and the combination of this acid and the special primer mix which surrounds it causes initiation of the explosive train. This is not to be confused with chemical action type bomb fuzes, i.e., M123 series which have a delay, as the detonation of the primer charge is almost an instantaneous action.

BOOBY TRAP FEATURE

In order to incorporate a "booby-trap" feature in the mine, two activation wells are provided. One well is located in the side of the mine and one in the bottom. The standard M1 activator can be screwed into these wells and then secured so that if the mine is picked up in this condition it will detonate.

DISASSEMBLY

1. Remove pressure plate plug by unscrewing it.
2. Loop a piece of wire under fuze spring and withdraw fuze--it is not threaded into the fuze well.
3. Replace safety fork under spring and plunger.
4. Replace reversible pressure plate arming plug in UNARMED position and screw down hand tight.

PRECAUTIONS

Exercise the same precautions in handling this mine as with other types. Protect the fuze and firing devices from shock, heat and friction. While it will stand normal handling, it must be remembered that it does contain a fuze with a glass ampoule that can be broken. If the M1 activator is used, do not force it into the activator well if the fit is a tight one.

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REFERENCE: OCM Item 24813
New Materiel - October 1944

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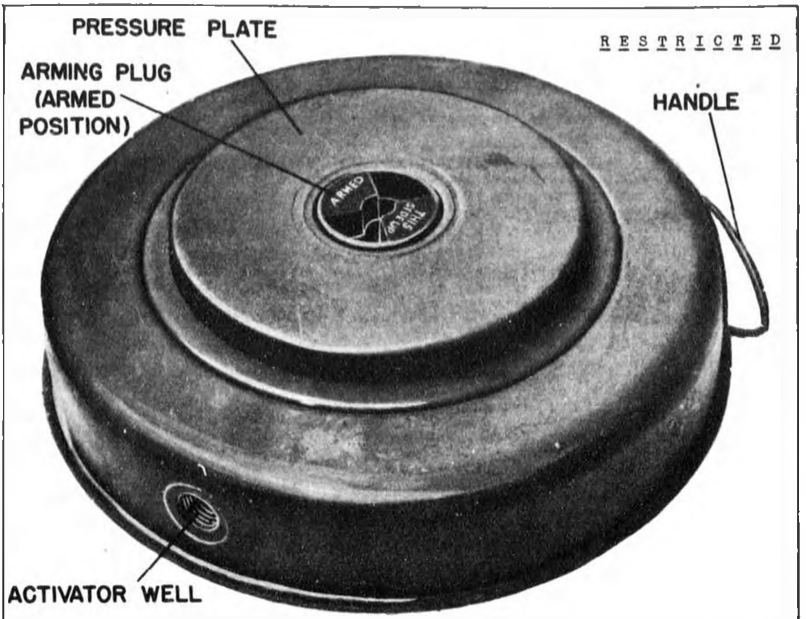


FIG.11 MINE, HEAVY, A.T. M6

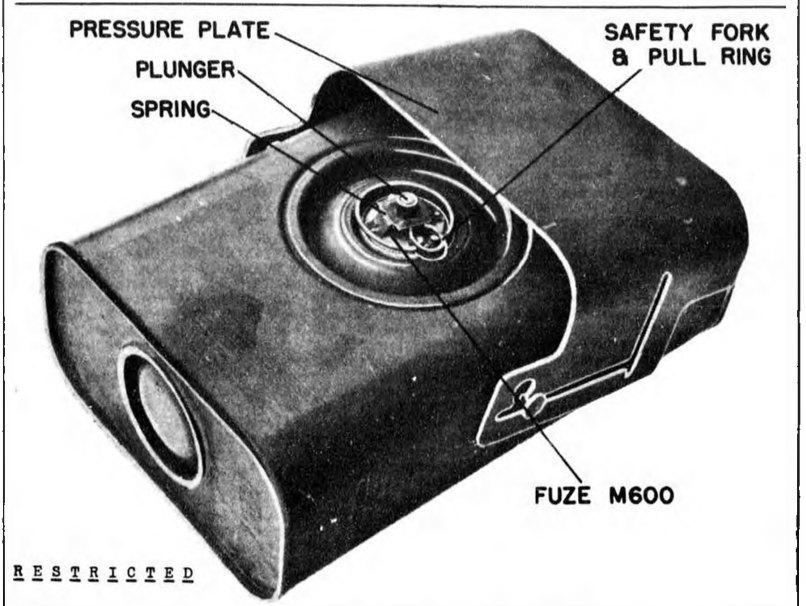


FIG.12 MINE, LIGHT, A.T. M7

## LIGHT ANTI-TANK MINE M 7

The light anti-tank mine M7, Fig. 12, is made from a standard one quart size steel container 7 inches long, 4-1/2 inches wide, and 2-1/2 inches thick. Filled with three lbs. of Tetrytol (about 20% more effective than TNT), the mine weighs about four lbs.

The pressure plate is a "U" shaped steel stamping which fits over the top of the body and is attached by means of two studs with flat heads on the sides of the body. The sides of the pressure plate are provided with cut-out guide slots which mate with the studs to hold the pressure plate in the armed or unarmed position.

The M600 chemical fuze is used in this mine (also for M6 Mine above). It is simply placed in the fuze well when preparing for use and can easily be lifted out if necessary. In order to arm the fuse, the safety fork is removed and the "U" shaped pressure plate bracket is moved along the studs so that it will be directly over the fuze body. 300 lbs. pressure is required to activate the fuze.

There is one activation well provided, located at one end of the mine body, to accommodate the M1 activator.

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REFERENCE: OCM Item 25174
New Materiel - October 1944

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CONFIDENTIAL

## HBX - FILLER FOR DEPTH BOMB AN-MK 54

The Bureau of Ordnance has recently commenced loading AN-Mk 54 depth bombs with HBX (See AFEO Bulletin No. 11, page 26) in place of Torpex. Test results from bullet fire, fragmentation impact and airplane drops have indicated that HBX is less sensitive than Torpex combined with the fact that the loss of underwater power as compared to Torpex is negligible.

In view of these superior qualities of HBX, it is felt that it will play an increasingly more important part and will gradually replace Torpex and TNT in underwater munitions.

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RESTRICTED

## FRAGMENTATION BOMB CLUSTERS AN-M1A1

Accidents to planes loaded with fragmentation bomb clusters AN-M1A1 have been reported to the Bureau of Ordnance. In some of these accidents the bomb or bombs were seen to explode beneath the dropping plane by pilots in the same flight. These explosions apparently occurred at the instant the cluster disintegrated. The under side of the several planes that were able to return to base after such accidents were found to be riddled with fragment holes and recovered fragments were identified as pieces of AN-M41 bombs, thus eliminating the possibility of AA damage. From the information which has been made available to the Bureau of Ordnance, it would appear that these accidents can be definitely attributed to fuze functioning caused by one of the bombs colliding with part of the disintegrating cluster adapter or with another bomb. In the unarmed condition the fuze M110 or AN-M110A1 can function if the impact involves 300 ft. lbs. or more of energy. In the armed condition this type fuze is very sensitive. The most probable cause of functioning is considered to be the presence of an armed fuze in one of the bombs in the cluster. The cluster has been designed to prevent arming of the fuzes until after disintegration of the adapter, but occasionally, if roughly handled, bombs will become loose in the clusters and fuze vanes bent so that the clusters may contain fuses which are free to arm when the bomb bay doors are opened. To prevent the danger of such a hazardous condition strict compliance with the check off list given below is essential. Clusters which have been badly damaged in shipment should be disposed of by dropping in deep water, under the immediate supervision of the Bomb Disposal Officer.

1. Upon receipt of fragmentation bomb clusters AN-M1A1 at Naval Air Stations or on board CV's, CVL's or CVE's, the clusters should be inspected and the following items carefully checked:

(a) Bands around bombs must be tight and the bombs must be held rigidly to the adapter.

(b) Safety cotter pins must be inserted through the proper holes in the release mechanisms. Holes farthest in from the end of the strap clamp are for safety cotter pins.

(c) Arming Wire: Holes in strap clamps must be in line with suspension lugs of cluster adapter.

(d) Fins should be inspected for bends or crimped edges. If fins are bent or damaged, they should be carefully straightened.

(e) Fuzes should be checked to see that arming vanes cannot rotate when the bomb is in the cluster.

(f) Fuzes should be checked to see that safety blocks or "C" shaped safety collar are properly interposed between the striker head and the fuze body.

2. Inspection to be made after loading clusters into aircraft:

(a) Check banding to see that bombs are tight in the adapter.

(b) Check to see that arming wire is installed properly through holes in the end of the strap clamp. At least 2 inches of wire should extend beyond the strap clamp. Install arming wire extension if required of the type described in Bureau of Ordnance Circular Letter AV123-43 dated 23 December 1943.

(c) See that arming wire ends are not kinked or burred.

(d) Check to insure that arming wire (s) goes through suspension lugs of the cluster adapter.

(e) Check to see that all bombs are tight in cluster.

(f) Fuzes should be checked to see that the arming vanes cannot rotate when the bomb is in the cluster and that the fuze vanes will be free to rotate when the bomb is released from the cluster.

(g) Fuzes should be checked to see that the safety blocks or "C" shaped safety collar are properly interposed between the striker head and the fuze body.

(h) Check all fins for bends or crimped edges--straighten if necessary.

The fuze M110 or AN-M110A1 used in the bombs in the clusters M1, M1A1 and AN-M1A1 is not detonator safe. Accordingly, it is recommended that none of these clusters be suspended from external racks for carrier operations due to possibility of fuze functioning on deck in event of a crash or accidental release. For the same reason, all clusters should be jettisoned by the aircraft before making a carrier landing.

Due to the quick opening feature of these clusters, it is not advisable to release them from a dive angle as the disintegration of the cluster and the subsequent rapid arming of the fuze along the flight path or a diving plane makes it extremely hazardous. These fragmentation clusters should be released from level flight only.

To avoid injury to bombs or fuzes, the cluster should be stowed in shipping box until cluster is to be loaded on plane. Sufficient shipping boxes should be retained for the return of clusters not expended.

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R E S T R I C T E D

## STURDIER TAIL FINS FOR BOMBS

In the past, high level bombing has not ordinarily been undertaken at altitudes above 25,000 feet. Under these conditions no difficulties were encountered with the type of tail fins for bombs in current use. However, with the advent of the B-29 Super Fortress, bombings have been carried out at altitudes of 25,000 feet or higher, and it was determined that the standard tail fin had a tendency to deform due to aero-dynamic forces and cause the bomb to take an erratic flight. In some cases this would cause the bomb to have side, rather than nose, impact and cause a U.X.B.

The solution to this problem has been found in the use of a heavier gauge metal in construction of the tail fin. These new, sturdier fins can be identified by a large letter "A" stencilled on the fin in black ink. The tail crate will have its upper corners painted black.

As soon as manufacturing facilities will permit, all production of the tail fins will be of the new type construction.

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R E S T R I C T E D

## MOISTURE - PROOFING OF PROJECTILE FUZES

A new method of moisture-proofing mechanical time fuzes and base detonating fuzes for projectiles, which is expected to increase the life and improve the performance of the fuzes, has recently been adopted. Moisture-proofing of mechanical time fuzes is accomplished as follows: A silica gel desiccating capsule is included in the fuze body, a gasket is placed between the lower cap and body and this joint is sealed by the application of a special Bakelite varnish. A sealing compound (glyptol) is used to seal over the top of tension wire screws and a thread sealing compound is used at the joints between the upper and lower caps and on the bottom closing screw threads. In the future, all 45-second mechanical time fuzes and all 35-second mechanical time fuzes will be moisture-proofed by this method before they are issued to the forces afloat. They will be designated as the Mark 50 (Mods 0, 1, 2, and 3) and as the Mark 51 (Mods 0, 1, and 2), respectively. The clockwork mechanisms are unchanged so that, operationally, the fuzes are the same as the original marks.

Moisture-proofing of base detonating fuzes is accomplished as follows: Nose caps are painted with purple lacquer over and around all sealing plugs. The booster end of the fuze is sealed by a coating of Bakelite varnish. A small quantity of varnish is applied to the threads of the plunger retaining plug inside the fuze body prior to assembly. In addition, a plastic desiccator unit of silica gel is placed in the interior of the fuze to remove all moisture from air entrapped in the fuze at original assembly. Base detonating fuzes, moisture-proofed by this method, have been assigned new mods and designated as follows:

(a) Mark 28 Mods 15 and 16 for 5" AA common, 5"/51 caliber HC, and 6"/47 caliber HC,

(b) Mark 21 Mod 1 for 6" to 16" AP

(c) Mark 19 Mod 1 for 6"/47 caliber common

(d) Mark 20 Mod 1 and Mod 2 for 5" common

(e) Mark 38 Mod 1 for 8" to 16" HC

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REFERENCE: Bulletin of Ordnance Information No. 3-44.

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R E S T R I C T E D

## DISCONTINUANCE OF USE OF GRAPHITE IN CANNELURES OF PROJECTILES

For many years a mixture of graphite and tallow has been spread in the cannelures of projectiles at the time the projectiles are assembled. Recent tests indicate that the ballistics, flight characteristics, initial velocity, etc., of projectiles is in no way affected by the presence or absence of this mixture. Its use on new production has therefore been discontinued. The removal of this mixture from projectiles now on hand or in the Fleet is not considered necessary.

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REFERENCE: Bulletin of Ordnance Information No. 3-44.

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# USE OF M 123 SERIES LONG DELAY FUZES FOR DEMOLITION

BuOrd recently received an inquiry concerning the possibility of using M123 series long delay time fuzes in bombs for emergency demolition work and whether this would be a safe and acceptable procedure. In response, BuOrd stated that:

"Fuzes of this series are the only time fuzes suitable for this purpose but, due to the time tolerances of these fuzes, a two-hour delay fuse should be used to make this a reasonably safe operation. If a large number of bombs are to be fuzed to carry out complete and final destruction of all the ammunition at the activity, some plan should be devised to insure complete evacuation of the area within one hour.

"The supply of these fuzes is critical and they should not be used for demolition work other than that occasioned by dire emergency. All general demolition work should be done using the regular demolition equipment in accordance with accepted demolition procedures."

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## SUPPORT RINGS FOR HYDROSTATIC TAIL FUZES

It will be recalled that the flat type composition gasket used on Hydrostatic Tail Fuzes Mk 229, and Mods and AN-Mk 230 and Mods was replaced some time ago by an "O" Ring Gasket made of live rubber. The purpose of the "O" Ring Rubber Gasket was to execute a better water-tight seal than had been previously accomplished with the flat type composition gasket to prevent entry of water at the base of these fuzes.

It has now been determined that the use of the "O" Ring Gasket prevents metal to metal contacts between the fuze and the fuze seat liner with the consequent possibility of distortion of the fuze on impact.

As a temporary expedient, a support ring (BuOrd Sketch #71509) has been designed to retain the "O" Ring Gasket. These support rings are simple flat steel washers. Ammunition Depots will issue one support ring with each of the Hydrostatic tail fuzes, except those incorporating the new "undercut" design to accommodate the "O" Ring Gasket.

The fuzes incorporating the "Undercut" design and that do NOT require the use of the support rings are:

1. Reo Motors AN-Mk 230 Lots 72, 75, and all lots thereafter.
2. Aldon Products - AN-Mk 230 beginning with carton No. 4999 of Lot 26, and all lots thereafter.

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CONFIDENTIAL

## ROCKET HANDLING

Unofficial reports have been received that aircraft rockets are not being handled properly by Aviation Ordnancemen. Ordinary shock will not detonate the ballistite propellant. Severe shock, however, may fracture the grain, causing excessive pressure upon ignition (because of increased burning surface) and resulting in a possible pressure blow-up of the motor tube. Ordnancemen and other personnel handling aircraft rockets are, therefore, cautioned to observe due care at all times while handling and loading aircraft rockets.

It is believed that much of the mishandling of rockets is caused by the fact that the rear lug band on the 3"5 rocket motor, as well as the mounting tongue on the rear launcher, may be shaped improperly. This makes the loading of this lug band on to the Mk 5 Mod 1 rear launcher (zero length launcher) difficult or impossible. In an effort to get the rockets on these launchers, it has been reported that ordnancemen hammer on the rocket lug bands to increase the clearance. This may cause failure of the lug band upper loop where it is spot-welded to the lug band proper. This, in turn, could cause the rockets to fall off in assisted take-offs, arrested landings, and high speed flight, and also could cause fracturing of the rocket motor with the attendant danger of blow-ups of the rocket upon firing. BuAer has authorized activities using rockets to file the mounting tongue on the rear launcher post according to the following dimensions: 0"515 wide, with 1/32" chamfer on edges, 0.203 thick. BuOrd states that the effective thickness of the upper curve of the rocket lug band loop should be not more than 0.109 inches.

BuOrd has shipped a sufficient quantity of properly manufactured rear lug bands to major commands for redistribution. Defective lug bands should be turned in to the nearest ammunition depot. It is recommended that all ships and activities check dimensions of rear launcher tongues and make test gages in order to check all rocket rear lug bands before use. In the event it is found necessary to alter locally the loop of the rear lug band, it is mandatory that it be first removed from the rocket motor. BuOrd is working on instructions for the local modifications of this loop. However, it appears that the most acceptable method is to request high priority shipment of suitable replacements from ComAirPac.

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REFERENCE: Naval Aviation Confidential Bulletin No. 10-44.

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# SUGGESTED READING

(Confidential)

1. O.P. 1178, "Performance of Bombs and Projectiles Against Shore Installations," dated 9 May 1944.

   This O.P. was issued to furnish the service with information concerning the penetration and cratering of earth by bombs and the penetration of concrete by bombs and projectiles. The information in this O.P. constitutes a summary, in a form convenient for use, of available data on the performance of Naval bombs and projectiles against shore installations.

(Confidential)

2. NavOrd OCL 653-44, "Projectors, Projector Ammunition and Surface Rocket Launchers--Revision of Nomenclature", dated 20 November 1944.

   This OCL will be of particular interest to personnel responsible for handling launchers and 4"5 and 7"2 ammunition, etc.

(Confidential)

3. NavOrd OCL TV6-44, "Summary of Recent Information on Aircraft Torpedoes", dated 14 November 1944.

   This letter is short summary which brings up-to-date recent developments in the aircraft torpedo.

(Restricted)

4. NavOrd OCL A55-44, "U. S. Naval Amphibious Demolition Equipment", dated 24 July 1944.

   The scope of this OCL includes information on demolition charges, demolition outfits, demolition firing devices and certain fuzes and boosters. Army items are not included.

(Restricted)

5. O. P. 1131, "4"5 Rocket Launcher Mk 7 (Experimental)" dated 17 July 1944.

   This O.P. has been issued for the reference and training of all personnel concerned with the use of the Launcher Mk 7 and the 4"5 Rocket ammunition.

(Restricted)

6. O. P. 1318 (Preliminary), "Rocket Launcher Mk 36 Mod 0 - Description and Instruction for Use" dated 14 November 1944.

   This launcher is a four-rail T-slot type for firing fin-stabilized aircraft rockets from shipboard in large numbers to lay intense barrages of high explosives at ranges up to 4,000 yards.

(Restricted)

7. O.P. 1135 (Preliminary), "Rocket Launcher Mark 30 Mod 0 - T-slot Launcher for Fin Stabilized Rockets."

   Briefly, this is a manually loaded, electrically fired stationary launcher with 6 metal T-slot rails. It may be elevated through 360°. This launcher is intended for use in firing Navy type fin stabilized rockets equipped with button-type suspension lugs. It will fire the 3"5 rocket (3"25 motor), 5"0 rocket (3"25 motor) and 5"0 rocket (5"0 motor). The launcher is for shipboard use and may be mounted out-board of the vessel.

3. If a live-loaded bomb is used for testing, extreme care should be exercised, and the bomb raised only a few inches above the deck.

4. Due to the space limitations in the bomb-bay of the SB2C type aircraft, the bomb tails must be rotated so that the fins will clear the bomb-bay door hinges when the bombs are released. A careful check must be made of the tail fin positions to insure a free fall.

5. After the tail adjustments are made, the fin lock nuts must be securely tightened.

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REFERENCE: NavOrd OMI V31-44

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## SUGGESTED READING

(Restricted)

1. O.P. 1125, "Chemical Spraying Equipment", dated 29 September 1944.

   This O.P. contains information on Navy aircraft smoke and chemical tanks and related equipment as well as instructions on handling, etc.

(Restricted)

2. O.P. 1050, First Revision, "Aircraft Smoke Bombs", dated 30 October 1944.

   This Ordnance Pamphlet was recently revised and contains detailed information on the following items:

   50-lb. Aircraft Smoke Bomb Mk 1 Mods 1 and 2
   100-lb. Aircraft Smoke Bomb Mk 3 Mod 0
   100-lb. Quick Opening Cluster M25 of 14 10-lb. HC Smoke Bombs M77

   It also includes details on safety precautions and maintenance.

(Unclassified)

3. Circular Letter V-31, "Stowage In and Removal of Explosives and Pyrotechnics from Aircraft After Flights", (Originally issued on 29 March 1940 and reissued in December 1944).

   This letter has been reissued in order to impress upon all activities concerned the importance of removing explosives and pyrotechnics from aircraft after flights.

(Restricted)

4. NavOrd OCL A2-45, "Non-Explosive 40 mm Tracer Ammunition For Use Against Target Drones - Issue of", dated 5 January 1945.

   About 1 February 1945 it is expected that this new round of non-explosive 40 mm tracer ammunition will be made available to all antiaircraft training centers upon request.

(Restricted)

5. O.P. 1315, "Bombing Table for Use with Droppable Fuel Tanks," dated 27 November 1944.

   This pamphlet contains the necessary sighting data for use when bombing from F6F and F4U type aircraft with droppable fuel tanks equipped with stabilizing fins and sighting by means of a fixed gunsight graduated in mils.

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