

**ADVANCED  
FUZE &  
EXPLOSIVE  
ORDNANCE  
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**CONFIDENTIAL**

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# ROCKETS

R E S T R I C T E D

## SPIN STABILIZED ROCKETS

The Bureau of Ordnance has developed 3 $\frac{1}{2}$ " and 5 $\frac{1}{2}$ " spin stabilized rockets (Fig. 1). These rockets do not have fins located at the aft end of the round to help stabilize them in flight. Instead they take on a spinning motion similar to that of a projectile, the spin being imparted by canting the rocket nozzles.

A complete round consists essentially of a H. E. body, a rocket motor and a nose or a base fuze. In outward appearance the round resembles an elongated projectile (See Fig. 1). Projectile point detonating, base, and auxiliary detonating fuzes, having in some cases minor modifications, are used.

A limited number of these rockets, both 3 $\frac{1}{2}$ " and 5 $\frac{1}{2}$ ", are being manufactured for service tests. Complete data on handling, assembly, safety precautions, etc. are not yet available but for the benefit of Bomb Disposal Officers and other personnel in the field who may encounter this new weapon, general characteristics are summarized below and should prove helpful in recognition and handling.

The following 5 $\frac{1}{2}$ " and 3 $\frac{1}{2}$ " spin stabilized rockets are or will be given service tests soon. These are the combinations that can be expected in the field.

### 5 $\frac{1}{2}$ " Spin Stabilized Rockets

	I**	II	III**
MOTOR	5 $\frac{1}{2}$ " Mk 3 Mod 0	5 $\frac{1}{2}$ " Mk 3 Mod 0	5 $\frac{1}{2}$ " Mk 4 Mod 0
BODY	5 $\frac{1}{2}$ " Mk 8 Mod 0	5 $\frac{1}{2}$ " Mk 7 Mod 0	5 $\frac{1}{2}$ " Mk 10 Mod 0
Wt. of Body	20 lbs	20 lbs	24.6 lbs
Filler	Explosive "D"	TNT	TNT
Wt. of Filler	1.68 lbs	Approx 1.75 lbs	9.6 lbs
NOSE FUZE	None	Mk 100 Mod 0*	Mk 30 Mod 3
BASE FUZE	Mk 36 Base Det (Less tracer)	None	None
AUXILIARY DETONATING FUZE	None	Mk 44 Mod 2	Mk 44 Mod 1
WT. COMPLETE ROUND	50 lbs (approx.)	50 lbs (approx.)	50 lbs (approx.)
OVERALL LENGTH (FUZED)	28 $\frac{1}{2}$ "	31 $\frac{1}{2}$ "	32 $\frac{1}{2}$ "
USE	From PT Boats	From PT Boats	Bombardment

\* Fuze Mk 100 Mod 0 is a combination of the Mk 29 point detonating fuze and the .05 second delay assembly of the Army's M48A2 point detonating fuze.

\*\* Assemblies expected to become "Service".

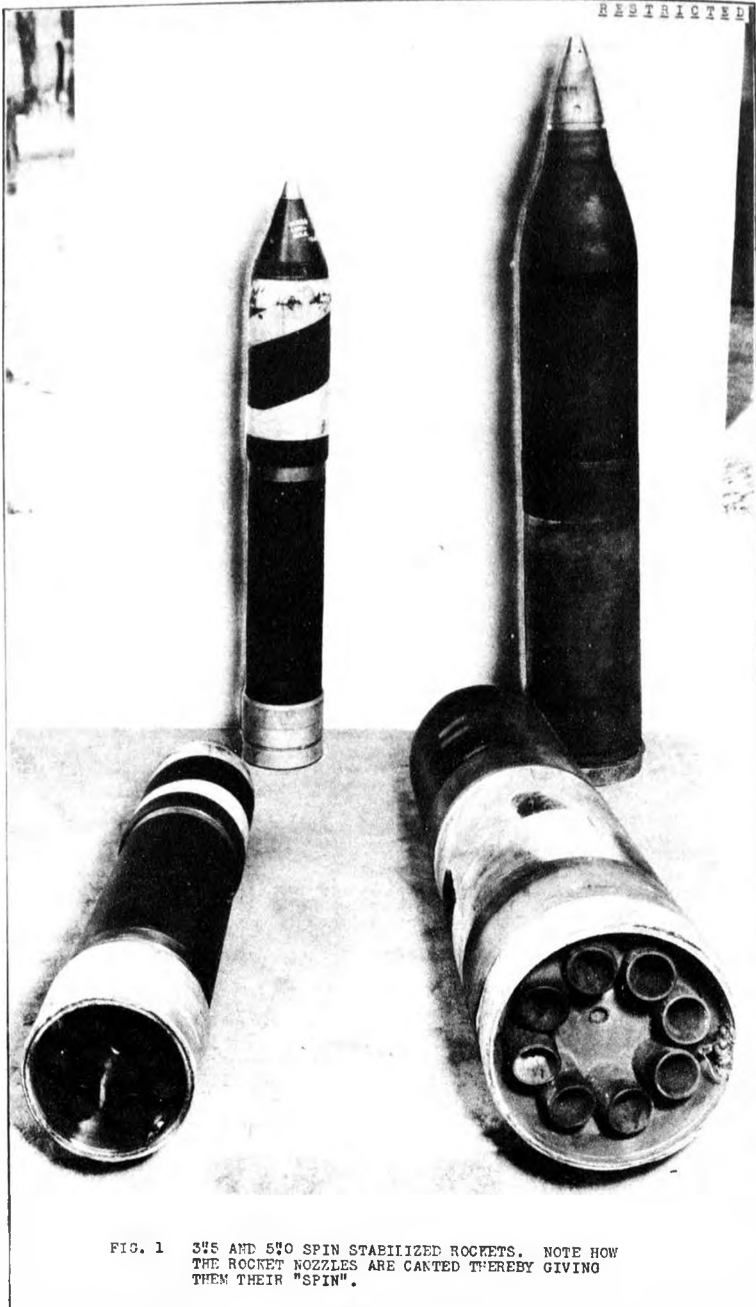


FIG. 1 3½ AND 5½ SPIN STABILIZED ROCKETS. NOTE HOW THE ROCKET NOZZLES ARE CANTED THEREBY GIVING THEM THEIR "SPIN".

### 3 1/2 Spin Stabilized Rocket

MOTOR	3 1/2 Mk 13 Mod 0
BODY	3 1/2 Mk 13 Mod 0
Wt. of Body	14.6 lbs
Filler	TNT
Wt. of Filler	1.5 lbs
NCSE FUZE	Mk 100 Mod 0
BASE FUZE	None
AUXILIARY DETONATING FUZE	Mk 44 Mod 2
WT. COMPLETE ROUND	25 lbs.
OVERALL LENGTH	24 7/8

For details on fuzes used in spin stabilized rockets, reference is invited to "U. S. Navy Projectiles and Fuzes", dated August 1944 and published by the U. S. Navy Bomb Disposal School.

Point Detonating Fuze Mk 29	- Page 157
"    "    "    "    30	- " 159
Base Detonating Fuze Mk 36	- " 197
Aux. Detonating Fuze Mk 44	- " 209

As soon as more complete data becomes available on spin stabilized rockets, it will be published in this Bulletin.

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# BOMBS

R E S T R I C T E D

## ANTI-RICOCHET PARACHUTE BOMBS

### INTRODUCTION

The Army has recently developed and issued a limited number of anti-ricochet bomb parachutes, T3 and T4, to the field. The parachutes are designed to break the rapid descent of G. P. bombs from low flying aircraft and at the same time effect a more vertical impact. These parachutes are issued with bomb tail fuze, T79E1, which differs from the conventional type fuze in that a wind anemometer type vane is used to arm the fuze. An adapter is required which connects the bomb and the parachute unit as seen in Figures 2 and 3. The anti-ricochet bomb parachute T4 is used with 100-lb. and 250-lb. G. P. bombs, and the anti-ricochet bomb parachute T3 is used with 500-lb. G. P. bombs.

### PARACHUTE UNITS T3 and T4

These units consist of a parachute and shroud lines housed in a cylindrical canister with a cover which is held in place by means of two latches diametrically opposite each other. These latches are kept closed by cotter pins when issued and by arming wires when fastened to the bomb. The canisters have a threaded collar at the front end for assembly to the adapter, which in turn is screwed to the rear of the bomb. The T3 and T4 are alike except for size.

### T79E1 TAIL FUZE

When issued, this fuze contains the primer detonator M16A1 (8 to 15 seconds delay). The fuze is threaded to fit in adapter booster M102 in 100 and 250-lb. and the adapter booster M115 in 500-lb. G.P. bombs. The T79E1, as issued, does not contain the conventional type arming vane. Instead, an anemometer type vane, Fig. 2, issued with the parachute adapters is used to arm the fuze. The arming stem of the anemometer vane passes through the fuze transversely; one end containing a hole (free end) and the other end fastened to the fuze body by means of a sealing wire. The fuze body contains a plunger and cocked firing pin assembly similar to the M112 series fuzes. The length of the solid portion of the plunger has been increased and is drilled transversely to accommodate the arming stem. Arming is accomplished by unscrewing the arming stem. This is done during the flight of the bomb by action of the wind on the anemometer vane.

### ADAPTERS FOR ANTI-RICOCHET BOMB PARACHUTES T3 AND T4

This adapter, Fig. 2, contains a large inner threaded opening which fits on the tail fin threads of the bomb. The other end of the adapter contains smaller external threads for assembly to the threaded collar on the front of the parachute canister. A sleeve which projects from one side of the adapter houses the anemometer arming stem and acts as a bearing for the shaft. The anti-ricochet parachutes T3 and T4 require different size adapters, the correct size being issued with each parachute.

### ANEMOMETER ARMING VANE

This anemometer is placed in the adapter sleeve so that the small cups project to the side of the bomb and the coupling on the end of the flexible shaft fits over the free end of the arming stem. The coupling is then locked to the arming stem by means of a spring clip or cotter pin fastened to the coupling. Turning of the anemometer causes the arming stem to unscrew sufficiently to arm the fuze. As was the case with the adapters, the anti-ricochet parachutes T3 and T4 require a different size anemometer assembly, the correct size being issued with each parachute and adapter.

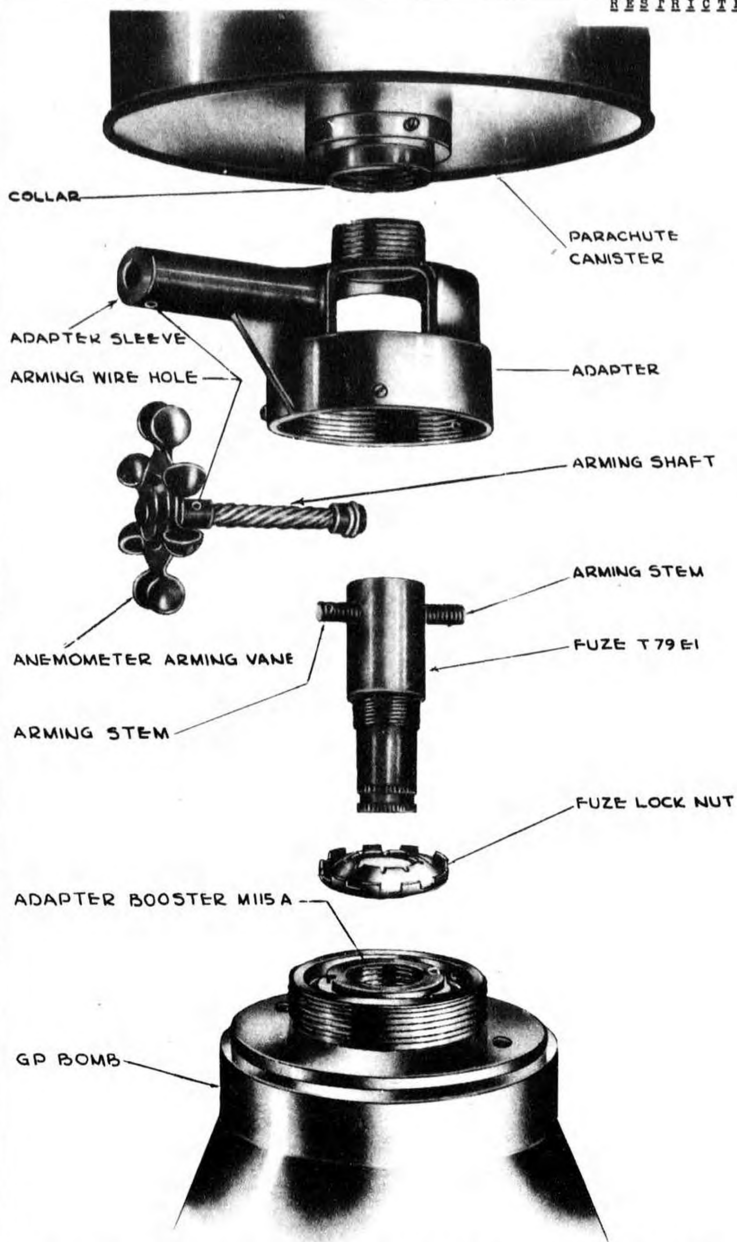


FIG. 2 EXPLODED VIEW SHOWING COMPONENTS OF ANTI-RICOCHET BOMB PARACHUTE ASSEMBLY

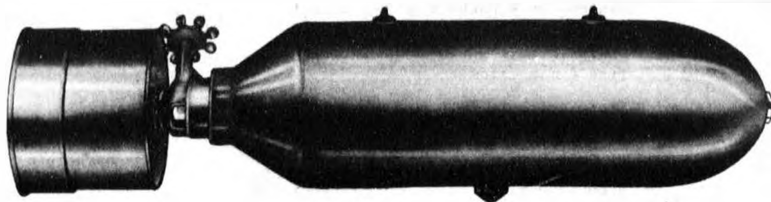


FIG 3 ASSEMBLED VIEW OF ANTI-RICOCHET BOMB PARACHUTE  
ON 500 LB AN-M64 AI GP BOMB

#### ARMING WIRE ASSEMBLY

At the present time no arming wire assembly will be issued but one must be made up for each complete round. The arming wire assembly will require three wires (.046 inches in diameter) assembled to one swivel loop. One of these wires passes through the adapter sleeve and through the anemometer shaft. The other two wires pass through the latches on the parachute canister. It is suggested that arming wire assemblies for 2000-lb. G. P. bombs be used for making up this arming wire assembly.

#### PREPARATION OF BOMB

##### a. To fuze bomb.

- (1) Screw the T79E1 fuze with primer detonator M16A1 (8 to 15 seconds delay) into the tail of the bomb, hand tight, so that the free end of the arming stem is approximately 20 to 30 degrees to either side of the single suspension lug.
- (2) Tighten the fuze lock nut with a wrench.

##### b. To assemble parachute adapter to bomb.

- (1) Screw the adapter to the tail of the bomb. Adjust the final position of the adapter so that the sleeve is in line with the free end of the fuze arming stem.
- (2) Tighten the set screws on the adapter to prevent it from turning on the tail of the bomb.

**CAUTION:** It is very important that the adapter sleeve be in line with fuze arming stem. This is necessary to insure free action of the wind anemometer and fuze arming stem when functioned by slip stream when the bomb is dropped.

##### c. To assemble wind vane anemometer.

- (1) Remove the spring clip or cotter pin from the coupling on the end of the flexible shaft.

- (2) Insert the shaft of the anemometer into the adapter sleeve and slide the coupling over the free end of the fuze arming stem.
- (3) Fasten the 2 parts together with the spring clip or cotter pin which was found on the anemometer coupling.
- (4) Check to make sure the anemometer shaft lines up with the fuze arming stem.

d. To fasten parachute unit to bomb.

- (1) Screw the parachute unit to the back of the adapter as tight as possible. Then adjust the final position of the parachute unit so that the 2 parachute canister latches are located in a horizontal position with respect to the suspension lugs.
- (2) After the parachute unit is adjusted to the proper position as described above, tighten the set screw which is located in the threaded collar on the front of the parachute canister. This will prevent the parachute unit from turning on the adapter threads.

e. To assemble arming wire.

- (1) Pass the 3 strands of the arming wire assembly through the rear suspension lug.
- (2) Pass one strand of the arming wire through the hole in the adapter sleeve and the anemometer shaft. This will prevent the shaft from turning after the fuze sealing wire is removed.
- (3) Pass a Fahnstock clip over end of the wire and move it up to the back side of the adapter sleeve. Trim this wire about 2 inches behind the adapter sleeve.
- (4) Remove the cotter pin from one of the latches on the parachute canister, pass one of the free arming wire strands through this latch and trim the strand about 3 inches behind the latch.
- (5) Remove the cotter pin from the other latch and pass the remaining strand of the arming wire through this latch and trim the wire about 3 inches behind the latch.

f. Fuze sealing wire.

- (1) Cut and remove the sealing wire which passes through the rear end of the fuze arming stem. This should be done after bomb is fastened in the bomb bay, if practicable.

FUNCTIONING

When dropped armed, the arming wire assembly is withdrawn from the bomb, anemometer and parachute canister latches. The anemometer vane is then free to rotate and causes the arming stem to unscrew from the fuze. The parachute canister opens as soon as the arming wires are pulled from the latches. The wind stream may then act to pull the aft cover off the assembly. The parachute then opens and checks the velocity of the bomb.

- - - - -

REFERENCE: TB 9X-90

\* \* \* \* \*

## FIRE BOMBS

(Aircraft Jettisonable Fuel Tanks)

INTRODUCTION

Extensive tests on the use of gasoline gel (gasoline-Napalm mix) filled aircraft jettisonable fuel tanks have been conducted by the Navy and the Army with very gratifying results. In addition, reports from the field indicate that these fuel tanks are an effective weapon. This weapon is popularly known as the "Fire Bomb".

At the present time, standard Navy or Army auxiliary fuel tanks are being used. Despite the poor dropping characteristics of the tanks, accuracy in low level high-speed attack is generally satisfactory. Deflection error is ordinarily not a problem on low altitude releases. Nevertheless, an effort is being made to improve the dropping characteristics of the tanks by modifying available tanks with a tail fin assembly.

Fire Bombs are effective against personnel in slit trenches, and dugouts (have suffocation as well as incendiary effect), wooden piers, docks and waterfront warehouses, wooden surface vessels and concentration of small surface craft, and inflammable stores and structures both on land and water.

The area coverage from one bomb is approximately 100 feet by 300 feet. The longitudinal axis being parallel to the line of flight.

JETTISONABLE FUEL TANKS AND STABILIZERSFuel Tanks

There are available various types of jettisonable fuel tanks which can readily be converted to become a fire bomb. Illustrations of some of these tanks are shown in Figs. 4, 5, and 6. (For further information covering capacities and types of droppable fuel tanks, see BuAer Technical Note 64-44, dated 19 July 1944).

A 150 gallon Universal or Interchangeable tank is now in production, and it is believed will be ready for issue some time this month (December). This tank, shown in Fig. 7, can be mounted on the F6F (C/L), F4U-1D and 4 (Pylon), F4-1D (Pylon) and F7F-2 (wing). It is expected that the first production of this tank will be shipped in a knocked down condition to be assembled in the field; later production to be completely assembled.

Stabilizers

In an effort to give the fire bomb more stable flight characteristics and enable dropping from higher altitudes, stabilizers have been designed. BuAer has published under the date of 23 August 1944, Technical Note 71-44, details on fabricating locally fin stabilizers for droppable fuel tanks. This item includes sketches, photographs, and detailed description of the methods of stabilizing the droppable fuel tanks.

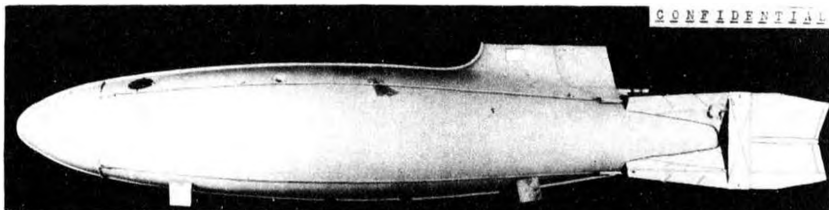


FIG. 4 F6F FUSELAGE FUEL TANK WITH STABILIZER AND HARNESS.  
(NOTE, CLAMP FOR IGNITER)



FIG. 5 F4U-1D, P38, PV WING PYLON FUEL TANK WITH STABILIZER AND HARNESS. (NOTE, CLAMP FOR IGNITER)

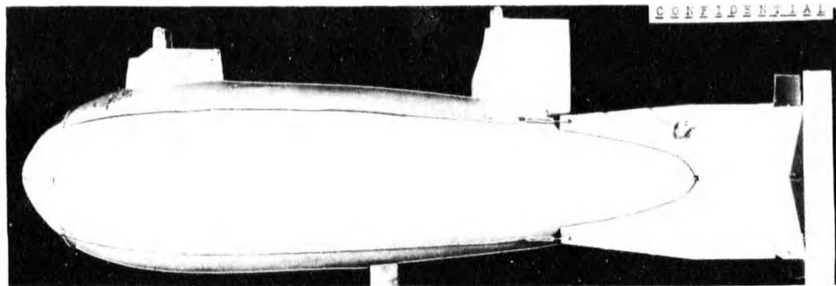


FIG. 6 F4U C/L FUEL TANK WITH STABILIZER AND HARNESS. (NOTE, CLAMP FOR IGNITER)

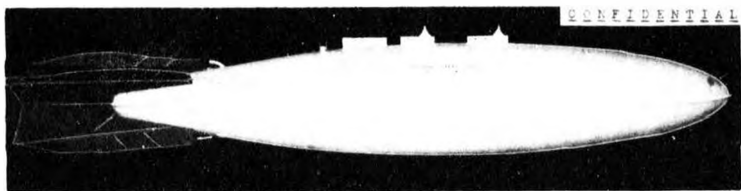


FIG. 7 UNIVERSAL OR INTERCHANGEABLE FUEL TANK WITH STABILIZER ATTACHED.

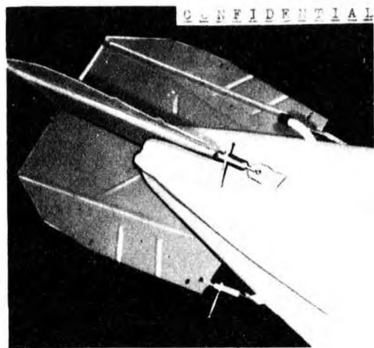


FIG. 8 CLOSE-UP OF STABILIZER ON UNIVERSAL TANK.

Briefly, a typical installation is comprised of the tail surface assembly, four cables (such as 3/32" tow target cable), safety wire for stiffening the tail surface assembly, four pins for tightening the cables after installation, and a nose ring. This assembly might be termed a "harness" since the nose ring fitted to the nose of the tank has attached to it four cables which run along the longitudinal axis of the tank where they are attached to the tail fin assembly. Of the types mentioned, some are made of plywood while others are made of a light sheet steel.

At the present time, pre-fabricated stabilizer kits are being produced and issued for the F4U (C/L), F6F (fuselage) and F4U-1D (Wing-pylon) tanks. (See Figs. 4, 5, and 6). These kits include stabilizers made from sheet steel shipped in the knocked-down state, together with the necessary "harness" for installation on the fuel tank in the field.

When the Universal tank is issued, a stabilizer will also accompany it. This fuel tank has clips welded to the aft end for affixing the stabilizer, obviating the necessity for a "harness". (See Figs. 7 and 8 showing stabilizer and attachments).

In connection with the stabilizers, it is to be noted, that they are provided with a clamp for attaching an igniter. This igniter is in addition to the fuel tank cap igniter, and further assures ignition of the gasoline gel.

#### IGNITION SYSTEM

There have been developed various types of igniters, adaptable to the fuel tank cap or the stabilizer of the jettisonable fuel tank. However, it is believed that the anemometer type of igniter, namely the E4R2, shown in Fig. 10, will be standardized and replace the earlier types, as covered in AFEC Bulletin No. 7, page 12, and the E4R1 igniter shown in Fig. 9. (A tail positioned anemometer type igniter will also be standardized later). At the present time, in order to expedite shipment to the field, the E4R1 and E3R1 igniters are being supplied.

#### E4R1 Igniter

##### Description

The E4R1 igniter, (see Fig. 9), consists essentially of an adapter which houses the E9R17 fuze (modification of the M3 fuze), a tank cap, and a M1F grenade (WP or Na) screwed on the end of the adapter. The E9R17 fuze is retained in the safe (unarmed) condition by an arming wire which is pulled when the tank is dropped, thus arming the fuze instantly. In addition, the fuze is shipped with a retaining pin which is removed after the arming wire is attached to the short arming wire in the fuze. The adapter which carries the E9R17 fuze has a flash channel which transmits the flash from the black powder booster to the "Infallable" (propellant powder, similar to Ballistite) powder burster of the grenade. Two types of filler are used in the grenades depending on the target. If the target is surrounded by water, a sodium (Na) filled grenade is used, because sodium will float and burst into flame when it comes in contact with water, thus igniting the surrounding gasoline gel. Similarly for land targets, white phosphorus (WP) filled grenades were found to be more efficient.

These ignition units will fit any Navy jettisonable gas tank. Upon receipt, the units will be arranged as follows:

- (a) The igniters minus the fuze will be packed 20 to a shipping box.
- (b) In the same box but separate will be 20 E9R17 fuzes.

##### Installation

- (a) Screw the E9R17 fuze firmly into the adapter of the igniter.
- (b) Substitute this entire assembly for the standard tank cap in the gasoline gel filled jettisonable tank.

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\* Trade Name

ARMING WIRE, 90° REMOVED  
(.036 Dia.)

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FAHNESTOCK CLIPS

ADAPTER

SAFETY PIN

STRIKER

STRIKER PIN

SLEEVE

TANK  
CAP

FLASH CHANNEL

GRENADE  
W.P. OR SODIUM

RETAINING PIN  
ARMING PIN  
FUZE HEAD

E9R17 FUZE

STRIKER SPRING  
PRIMER, M2G

BLACK POWDER BOOSTER

ADAPTER NUT

INFALLIBLE  
POWDER  
BURSTER

**FIG.9 E4R1 IGNITER FOR AIRCRAFT  
JETTISONABLE GAS TANK**

- (c) Rig an arming wire from the tank rack or other plane structure to the short arming wire (.036 diameter) already in the fuze. Two Fahnestock clips should be secured to the free end of the short arming wire. The arming wire plug on the fuze should be turned to such a position that the arming wire will pull the short arming wire out, more or less parallel to the small hole in the end of the fuze. Otherwise the short arming wire might break off, and remain in the fuze when the tank is dropped, preventing fuze action on impact. Remove the retaining pin immediately prior to takeoff.

### Operation

When the tank is dropped, the arming wire is automatically pulled, arming the fuze. Upon impact with ground or water, the lightly constructed tank bursts scattering gasoline gel over a wide area. At the same time the E9R17 fuze acts, the striker carrying the striker pin moves down and sets off the M26 primer, and the flash from the M26 primer ignites the black powder booster which flashes through the flash channel, sets off the burster which breaks open the grenade scattering white phosphorus or sodium around in the gasoline gel, resulting in ignition of the gel. (Operation of E9R17 same as M3).

### E4R2 IGNITER

#### Description

The E4R2 igniter, (See Fig. 10), consists essentially of an adapter which houses the E9R22 anemometer type fuze, a tank cap, and a M15 grenade (WP or Na) screwed on the end of the adapter. The tank cap has been modified on this igniter so as to provide stronger construction between the adapter and grenade, thus eliminating the possibility of the adapter shearing from the grenade on impact. The E9R22 anemometer fuze is retained in the safe (unarmed) position by an arming wire (.064 diameter), which is pulled when the tank is dropped, allowing the vanes to rotate and arm the fuze. The fuze is shipped with a safety pin which is removed after the arming wire is installed. The anemometer feature is incorporated to make the fuze safer for carrier usage. The firing train and grenade is similar to that of the E4R1 igniter. (It is believed that some of the E4R2 igniters will be shipped soon equipped with the E9R17 fuzes. E9R22 fuze to be standardized and will replace E9R17 fuze later.)

#### Installation

The installation of the E4R2 igniter is similar to that of the E4R1, except that the E4R2 employs an .064 arming wire only, installed after the igniter is assembled to the fire bomb, and before the safety pin is removed.

#### Operation

When the tank is dropped, the arming wire is automatically pulled, allowing the arming vane (anemometer type) to rotate. After approximately 18 revolutions of the arming vane the arming screw has risen sufficiently to free the retaining balls, freeing the striker from the sleeve, and the fuze is partially armed. After approximately 30 revolutions, the arming screw has risen completely out of the striker and the fuze is fully armed. This arming operation requires approximately 150 feet of air travel. Upon impact with the ground or water, the balance of the operation is similar to the fire bomb using the E9R17 fuze.

### E3R1 IGNITER

#### Description

The E3R1 igniter is similar to the E4R1 igniter, but modified for tail positioning. Consists of an adapter housing an E9R17 fuze, and a M15 grenade screwed on the end of the adapter. This igniter is being produced and issued at present. It is believed the anemometer type of fuze will be standardized and replace the E9R17 later.

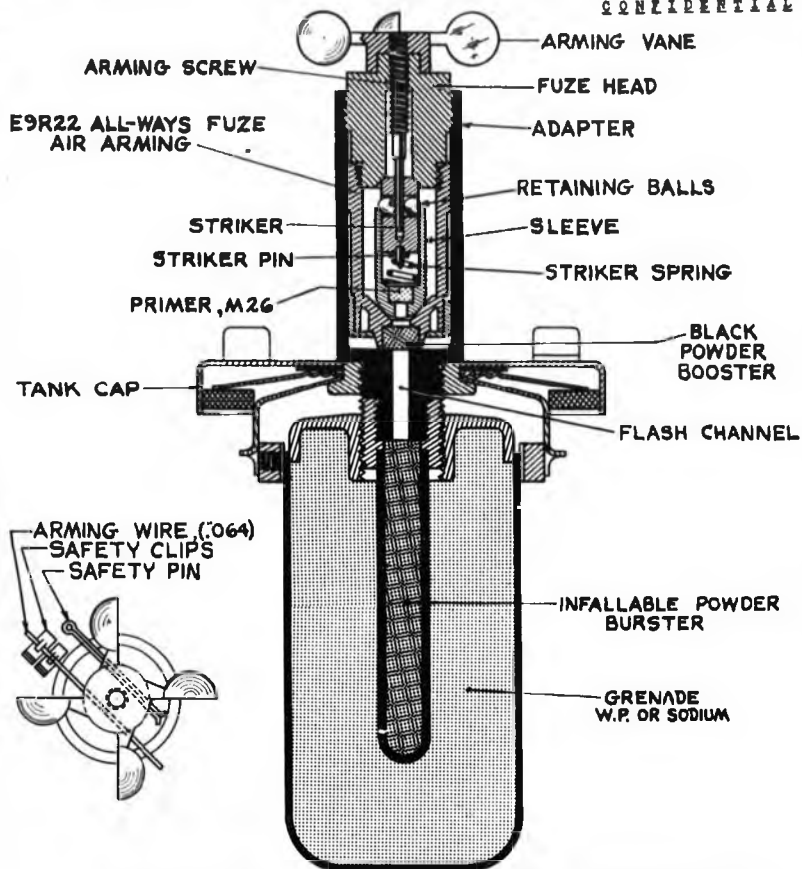
#### Installation

The E3R1 igniter is assembled to the stabilizer by means of a clamp, and is rigged with an arming wire similar to the E4R1 installation.

#### Purpose and Use

The purpose of having a tail igniter in addition to a cap igniter is to give further assurance of igniting the gasoline gel. It is recommended that on missions against land targets that two WP igniters be

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**FIG. 10 E4R2 IGNITER FOR AIRCRAFT  
JETTISONABLE GAS TANK**

used, while on missions against water targets that two Na igniters be used.

On missions where land or water targets may be encountered, it is recommended that the fire bomb be equipped with one WP igniter and one Na igniter, so that it will be equally effective against either type of target.

SPECIAL PRECAUTIONS

1. Do not remove retaining pin and short arming wire from the ESR17 fuze since this would result in automatic arming. If this should happen

inadvertently, such an armed fuze should be disposed of in the most practical manner. (For installation, remove retaining pin after arming wire has been attached to the short arming wire in the fuze, and immediately prior to takeoff.)

2. Do not remove the safety pin from the E9R22 fuze until the arming wire has been installed and secured with two Fahnestock clips, and the plane is ready for takeoff.
3. Do not assemble the fuze to igniters, nor the igniters to the fire bomb until just before use.
4. Gas tanks carrying these igniters should be jettisoned in the open sea or other safe area before returning to base or carrier. They should be dropped with the arming wire remaining in place if the plane is so equipped and it is not desired that the gel ignite. If the tactical situation is such that tanks which are not dropped on an enemy target must be jettisoned so that no conflagration results, then the tank racks must be equipped beforehand with Bomb Arming Control AN-A2 (Fed. Stock No. 3-Q-1806) or, if this is not available, the A1 type (Fed. Stock No. 3-Q-1806) will be satisfactory.

#### FIRE BOMB FILLER

The filler used for these fire bombs is a gasoline-Napalm

mixture.

Napalm, a white powder (sometimes darkened by impurities) is an inert soap substance, which consists of a mixture (coprecipitated) of basic aluminum soaps of fatty acids and naphthenic acid. Napalm itself has no incendiary properties being inert in its characteristics. It serves to set the gasoline to the proper consistency, so that the resulting conflagration has effective area coverage and intensity and duration of burning. Napalm has a tendency to absorb moisture when exposed to the air for an appreciable period of time and is thereby rendered unfit for use. Therefore, unused open containers of Napalm should be disposed of, and if filling operations are conducted in the rain, provision should be made for covering the Napalm. To assure a thorough mix, especially when the Navy Incendiary Vixer is used, cartridge size of the Napalm (Zakins or Pfister type) should be small enough to pass 16 mesh, and the presence of at least 20% fines which pass 40 mesh is very helpful. (BuOrd has taken steps to procure Napalm of uniform quality and texture and to re-grade the Napalm that has been delivered.) 85% & 15% by weight of Napalm in the gasoline-Napalm mix is recommended for most satisfactory results. (It has been found that a thinner mix than this results in "fire balls", which is a large flame in the air and minimum burning on the ground. A heavier mix is equally unsatisfactory, since too thick a mix will result in ineffective coverage and slow burning of low intensity without the essential sheet of flame.)

100 octane or 80 octane gasoline can be used equally well. For rapid mixing, temperature of gasoline should not be under 75° F, the optimum range being 80° F to 90° F.

Another agent which is added is "MARIBON", a white powder, consisting of 50% magnesium carbonate and 50% calcium carbonate. 7% by weight of Napalm of this agent is added to prevent clogging in the outlet hose. At present this agent is being added to the Napalm in the field. In the future it will be added to the Napalm at the manufacturers' plant.

#### TRAINING FOR MIXING AND TRANSFER OF GASOLINE-NAPALM MIX

The Army has developed a system of mixing the gasoline-Napalm mix, which has proven satisfactory for land base use. However, the mixing process presents a serious fire hazard because of gas vapor being drawn off during the mixing process. In addition the Army method has the drawback of requiring 4 hours for curing after the agents are mixed. Because of these factors the Army's method of mixing is not completely suitable for use aboard carriers.

##### 1. Army Method of Mixing and Transferring.

Using any available facilities for dispensing gasoline, measure 40 gallons of gasoline into a 55 gallon drum. 11

mentioned previously, standard 80 octane gasoline or 100 octane gasoline can be used. (Army prefers 80 octane).

Weigh a total of 21 pounds of Napalm into two pails. Place a funnel in the 2" opening of the drum.

Next insert an air agitation tube from the air compressor into the 3/4" opening in the drum and permit a rapid but quiet bubbling of the gasoline. Pour the 21 pounds of Napalm into the funnel as rapidly as possible, shaking the funnel (if Napalm is blown back into the funnel, reduce the quantity of air). (See Fig. 11). When all the Napalm is in the drum, move the air agitation tube back and forth across the bottom for about 4 minutes to whip into the solution any materials which may have settled.



FIG. 11 TWENTY-ONE POUNDS OF NAPALM (EAKINS) ADDED TO 40 GALLONS OF GASOLINE WHILE AIR AGITATION IS TAKING PLACE. (AS SOON AS THE NAPALM BECOMES SUSPENDED IN THE GASOLINE, AN ADDITIONAL 13 GALLONS OF GASOLINE WILL BE ADDED AND AIR AGITATION WILL BE CONTINUED FOR 1 MINUTE.)

When the Napalm starts to dissolve, add 13 gallons of gasoline and agitate gently for about 1 minute, until all the Napalm is completely suspended. (Do not blow air through the mix any longer than necessary, as this promotes evaporation resulting in a loss of gasoline, increase of gas fumes in the air, and chilling of the mix. (Chilling increases mixing time required).

When agitation is complete, replace the bungs and invert the drum. This tends to reduce caking of Napalm on the bottom of the drum. Store in this position for at least four hours to "cure" the mix. This period of curing is necessary to permit the Napalm and gasoline to become a homogeneous mixture. (Once mixed, the fuel may be left in the drums for extended periods without "breaking down" occurring).

Transfer of the gasoline gel from the mixing drum to the droppable fuel tank is accomplished by compressed air. A 2" hose fitted with an adapter is connected to the large size opening of the drum, while a hose from an air compressor is attached to the

small 3/4" hole of the drum. (See Fig. 12). In this way the gasoline gel is transferred from the mixing drum to the droppable fuel tank. A pressure of 15 p.s.i. is sufficient to empty a drum through approximately 14 feet of hose and a quick opening valve into the fire bomb in 6 minutes. (Pressure should not exceed 40 p.s.i.)

Three drums of the gasoline gel must be made up for each 165 gallon droppable fuel tank.



FIG. 12 FILLING TWO FIRE BOMBS, MOUNTED ON A P-47, WITH THICKENED FUEL USING FUEL MIXING AND TRANSFER KIT, E2.

Caution is to be observed that spilled gasoline constitutes a considerable fire hazard, and the thickened gasoline dries to a hard coating, which usually requires scraping to remove. Therefore, upon completion of filling operations, filling equipment should be drained thoroughly and flushed with gasoline.

(The Army is making available to its activities a "Mixing and Transfer Kit, Thickened Fuel, E2").

#### B. Navy Method of Mixing and Transferring.

The Navy has developed for carrier as well as land usage an Incendiary Mixer, for mixing the gasoline and Napalm in the correct proportions. This mixer has the advantages of being safe for carriers, simple, continuous in operation, and eliminates the necessity for a "curing" period. There have been developed several modifications of the Incendiary Mixer, the Mk 1 Mod 0 which is being issued at present to the field, and modifications which will be available later.

##### Mk 1 Mod 0 Incendiary Mixer

##### General Description

Incendiary Mixer, Mark 1 Mod 0, (see Fig. 13), provides a simple and rapid means of mixing Napalm and gasoline in desired proportions, and delivering the mixture to a receiving fuel tank in one continuous operation.

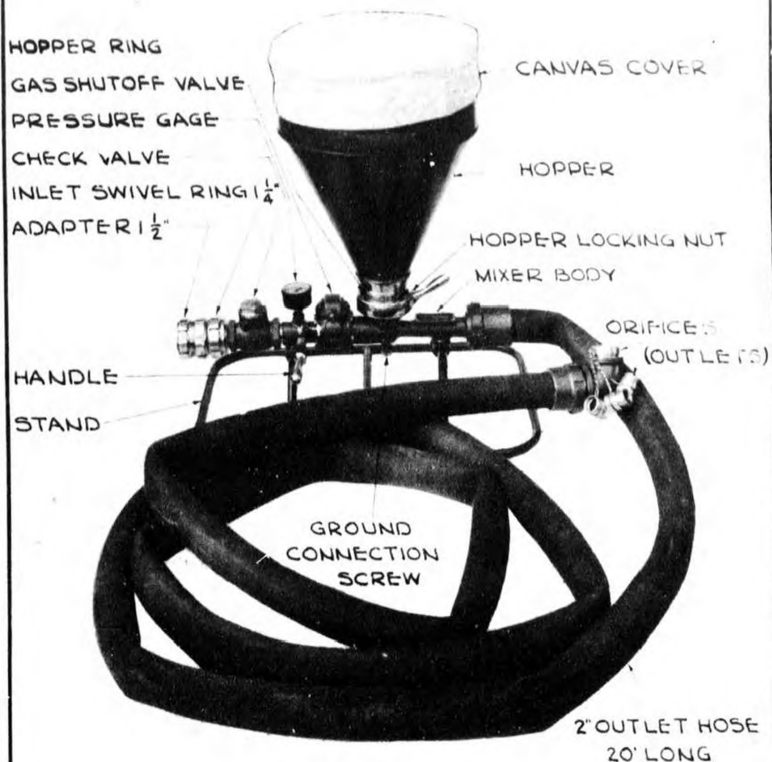


FIGURE 13  
MARK I MOD O INCENDIARY MIXER

The mixer produces the desired results provided certain variables are controlled. The most critical of these variables are the quality and texture of the Napalm and the temperature of the fuel. Within limits, variations of gasoline temperature and Napalm texture can be compensated for by adjustment of the nozzle on the discharge hose of the mixer. It is essential that the quality of the Napalm be such that no settling will occur since the mixer is designed to handle only high quality Napalm.

Preparation of Chemical

The particle size of the Napalm has been found to be very important, large particles being adverse and small particles ideal. The texture of the Napalm, formerly supplied, varies considerably among the different manufacturers, but steps have now been taken to provide only finely ground Napalm to which has been added an inert anti-caking powder. An anti-caking powder, like

"Marinco" facilitates flow and prevents or minimizes coalescence of the Napalm particles. Until such time as this prepared Napalm becomes generally available, it will be necessary to choose a Napalm of minimum average particle size, such as that manufactured by Ekins or Pfister, then screen this chemical through 16 mesh (usually 50% recovery) and thoroughly mix with 7% "Marinco" by weight. Napalm other than that made by the above mentioned manufacturers will not be satisfactory even if passed through a 16 mesh screen because of the lack of enough small particles which will pass very fine meshes. This Napalm is, however, being made satisfactory by thoroughly mixing with 7% "Marinco" by weight and grinding in a standard Comminuting machine. Do not expose the Napalm to the atmosphere longer than is absolutely necessary. It takes up moisture quite rapidly and over-exposure to the atmosphere may defeat the purpose of adding the Napalm to the gasoline.

#### Operating Principle

For a given gasoline temperature and a given inlet pressure on the fuel line, the larger the outlet nozzle the lower the back-pressure will be and, hence, more Napalm will be drawn into the mixer. Conversely, if the percentage of Napalm is found to be too high, it may be reduced by using a smaller outlet which will increase the back-pressure in the jets. Generally speaking, low pressures, high fuel temperatures, and coarse Napalm call for larger outlets. The 2" delivery hose on the discharge side of the mixer is fitted with four outlets (20/32" - 24/32" - 28/32" - 30/32"). It is planned that an adjustable, calibrated nozzle will replace the four outlets on future models. The operation of the mixer has been based on tests using an inlet pressure of 25 lbs. gauge. If it fails to take in the desired amount of Napalm at higher pressure by nozzle adjustment alone, a throttle valve may be inserted on the inlet side.

The flow of gasoline varies directly as the square root of the pressure and indirectly as the square root of the specific gravity of the gasoline. At 25 lbs. gauge inlet pressure at the mixer, the through put of gasoline used is 28 gals. per minute. It is possible to calculate the through put of the gasoline used at other inlet pressures by the fact that the through put varies directly as the square root of the pressure. For example, if the gasoline is delivered to the mixer at 16 lbs. gauge pressure, the through put would be  $\sqrt{16} \times 28$  or  $4 \times 28$  or 22-2/5 gals. per minute.

#### Installation

For Shipboard use, the gasoline supply line is connected directly to the 1-1/4" inlet swivel connection. For land use where the tank truck is equipped with a 1-1/2" hose connection, the adapter furnished with the unit is required.

The 2" discharge hose, furnished with the unit, contains a static wire from the delivery tip to the coupling at the mixer. Hence, it is only necessary to ground the mixer if the container being filled is grounded. A screw connection for the ground wire is located underneath the mixer body.

#### Selection of Discharge Orifice

Using the relationship above, the following table was computed for use in "trial and error" selection of the correct discharge orifice to give the desired mixture of 94% gasoline to 6% Napalm. The table makes allowances for the addition of 7% Marinco by weight to the Napalm.

Inlet Gauge Pressure in lbs./sq. in.	Time in Seconds to Consume 5 lbs. of Prepared Napalm when using Correct Discharge Orifice
15	34
16	33
17	32
18	31
19	30
20	29

Inlet Gauge Pressure  
in lbs./sq. in.  
(cont)

Time in Seconds to  
Consume 5 lbs. of Prepared  
Chemical when using Correct  
Discharge Orifice (cont)

21-22	28
23-24	27
25	26
26-28	25
29-30	24
31-33	23
34-35	22

Selection of the correct discharge orifice is accomplished by using a stop watch and measuring the time required for the mixer to consume 5 lbs. of prepared Napalm, and changing orifices, if indicated, until the time agrees with that shown in the table above. For example, if the inlet operating pressure is 25 lbs./sq. in. the correct consumption time as shown in the table should be 26 seconds. If the measured time is more than 26 seconds, repeat the operation using the next larger orifice and, conversely, if the measured time is less, try the next smaller orifice, etc.

During the above tests, the small amount of straight gasoline flowing into a receiving fuel tank, while no Napalm is consumed, is not considered too serious. This is true since it involves only one tank, which is still usable, although it does not contain the desired proportion of gasoline to Napalm.

#### Use and Care in Handling

Operation of the Mark 1 Mod O mixer should be such that the correct amount of Napalm ( $6 \pm 1/2\%$ ) is entirely consumed before the receiving fuel tank is full. A few seconds run after exhaustion of Napalm serves to clean the unit, and when the gasoline shutoff valve is closed only clean gasoline rises in the hopper. By this procedure it is possible to avoid formation of rubbery mass in the mixer.

In closing the quick operating gasoline shutoff valve, back splash of the gasoline up the empty hopper may be reduced by closing the valve slowly.

In the event the Napalm is not exhausted at time of shut down, the gasoline will rise in the hopper with the attendant formation of the rubbery mass which must be removed manually. This is accomplished by turning the hopper locking ring handle to right and lifting off the hopper. The loose dry particles of Napalm can be emptied back into the supply, while the reacted mass in the hopper and that in the suction chamber of the mixer can be disposed of by dropping the mass into a receiving fuel tank.

Gasoline should flow through the mixer under a suitable pressure and any gasoline from a previous run remaining in the hopper should be drawn in the gasoline stream before starting to feed Napalm to the mixer. This requirement may be eliminated in future models by installation of a shut-off valve in the throat of the hopper.

It is preferable to keep the hopper about 1/2 full and observe continuity of feed so that any stoppage may be detected quickly. If Napalm does not flow, check gasoline supply pressure, stoppages in mixer and hose.

In replacing the hopper see that the gasket is in place and is clean. The hopper is installed by turning the locking ring handle to right as far as it will go and then inserting hopper in openings in the locking ring and turning handle to left. The hopper must be locked securely in place to prevent air leakage which seriously reduces chemical input.

After service, the mixer should be thoroughly cleaned and inspected. By turning mixer body upside down (opens flap check valve) and holding one end toward light, a clear passage should be observed through the jets. If the check valve moves sluggishly, the top plug should be removed and the mechanism cleaned. It is important to inspect all valves.

Mk 1 Mod 1 Incendiary Mixer

The Mk 1 Mod 1 Incendiary Mixer, which will replace the Mk 1 Mod 0 Mixer, is similar to the Mk 1 Mod 0, except that a Napalm shutoff valve in the throat of the hopper is incorporated, and an adjustable calibrated nozzle replaces the four orifices or outlets. (A kit will be provided later to change over the Mk 1 Mod 0 Mixers in the field to the Mk 1 Mod 1 type.)



FIG. 14 FIRE BOMB, EQUIPPED WITH WP IGNITER, FUNCTIONING ON LAND. (THIS PICTURE TAKEN IMMEDIATELY AFTER IMPACT, SUBSEQUENT AREA COVERAGE WILL BE APPROXIMATELY 100 BY 300 FEET)



FIG. 15 FIRE BOMB, EQUIPPED WITH SODIUM IGNITER, FUNCTIONING ON WATER. SODIUM PARTICLES HAVE SURFACED AND BROKEN INTO FLAME SETTING FUEL AFIRE. (THIS PICTURE TAKEN AFTER SHEET OF FLAME HAD DIMINISHED.)

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REFERENCES: Preparation and Employment of the Fire Bomb-(CWS), Emlin Field Report-(Army); Preliminary Instructional Notes for Use of Incendiary Mixer, Mk 1 Mod 0; BuAer Technical Notes 71-44, and 64-44.

\* \* \* \* \*

# FUZES

R E S T R I C T E D

## NEW ARMY FUZES

At the present time several new Army fuzes are being issued to the field in limited quantities. While drawings on several of these fuzes are not yet available, a brief description follows in the event that they are encountered by personnel in the field.

1. T53E1

Expected Standardization: M152

The T53E1 is a mechanical time tail fuze similar in construction and appearance to a T55 mechanical time nose fuze. Briefly, it is a T55E1 type fuze with the vanes reversed so that it will properly arm as a tail fuze. Like the T55E1, it has only a one-half tetryl booster, the balance of the space in the booster cup being taken up by an inert clay pellet. This fuze will be used in the tail of aimable incendiary clusters of the M18 type.

2. T71

Expected standardization: M155

The T71 is a mechanical time nose fuze designed for use in the M26 cluster holding twenty 20-lb. M41 fragmentation bombs. Heretofore the M26 cluster used in the M11A2 mechanical time nose fuze for delayed opening. However, the M11A2 did not prove completely satisfactory and as a result the T71 was developed. The T71 has the appearance of an M11A2 but differs from it in that it has no gear reduction system.

The omission of the gear reduction system affords a quick arming feature which is a desirable characteristic of a fuze for the M26 cluster. While the M11A2 may still be used in the M26 cluster, the T71 is the preferred fuze and should be used in place of the M11A2 if available.

3. T73

Expected standardization: M153

The T73 is a mechanical time tail fuze of which only a limited quantity was issued until such time as the T53E1 (M152) could be placed in manufacture. The T73 is made by taking a T55E1 mechanical time nose fuze and simply reversing the vanes so that it might be used as a tail fuze. This type fuze is no longer being issued since the T53E1 (M152) has replaced it. The limited number of fuzes which have been issued were sent out to the field as a tail fuze in aimable incendiary clusters. The T73 can be distinguished from the T53E1 in that the vane is painted red.

4. T79E1

Expected standardization: Not yet known.

For details on this fuze, consult page 4 .

# MISCELLANEOUS

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

## EXPLOSIVES

The Research and Development Departments of the services are constantly striving to improve the explosives we are now using. They are making efforts to discover new ones or new combinations that will do the job better. This article should bring up to date the status of explosives, including information on those now in the field as well as those which will probably reach the field in the near future.

The major developments have been made in high explosives, comparatively little having been done on propellants and initiators. Each of the high explosives will be discussed in turn. The use, the reason for its specific use, and a few figures which will serve to compare it with others, will be given for each explosive.

### NOTES

Two scales are employed to compare sensitivity of explosives. These have been obtained for the most part from "Explosives Research Memorandum No. 10"<sup>\*</sup>. The first of these is the "Laboratory Impact Sensitivity" in which the ratio of the drop of a given weight necessary to detonate the explosive under discussion to the drop necessary to detonate TNT is expressed on a percentage basis. TNT will be given as 100. The second is a scale of "Bullet Impact Sensitivity" with RDX rated at 0 and TNT at 100. The other explosives are expressed in relation to these two. A few of the figures used were not obtained from this publication but are estimates based on other sources. These will be labeled as, "estimated". In some cases, sufficient tests have not been made to determine a value and none is given. Velocity of detonation varies directly with the density to which the explosive is cast or pressed, (all other factors being constant). The velocity of detonation will, therefore, be given for a definite density of loading.

### TNT

#### Trinitrotoluol

TNT combines so many of the characteristics of an ideal military high explosive that for many years it has been the standard main charge for almost every type of ordnance. It is powerful, brisant, easy to load by casting since its melting point (Grade A) is 80.2° C, stable under all storage conditions, insensitive enough to stand all normal handling, and should stand even bullet impact when cast. The Navy uses it as a booster in a pressed granular form in which it is more sensitive to detonator action.

In the last war, production was inhibited on wartime scale since toluol, which is a coaltar product, was limited in quantity. This is no longer a problem as it can be synthesized from petroleum. Early in this war, while synthetic plants were being built there was, nevertheless, a shortage of toluol and substitutes for TNT had to be used. The supply of TNT is now adequate and the explosives which are replacing it to some extent are new explosives or mixtures which have some particularly desirable characteristic, usually more brisance and power.

The velocity of detonation of TNT is 22,300 ft/sec at a density of 1.55. Its Laboratory Impact Value is 100. Its Bullet Impact Value is 100. Its color is yellow to buff.

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<sup>\*</sup> Prepared by BuOrd, dated 1 August 1944

## TETRYL

### Trinitrophenylmethylnitramine

Tetryl, because of its combination of high power, brisance, and sensitivity, is the standard U. S. booster charge although the Navy still uses an appreciable amount of granular TNT. Its sensitivity is such that it can be set off by a detonator, and it is powerful enough to detonate the main charge. It has been tried for main charge loads in small caliber projectiles but has proven too sensitive to withstand the set-back in all but 20 mm. It is used as a base charge in compound detonators which in effect makes it a small booster in intimate contact with the initiating explosive. The melting point of Tetryl (180° C) is too high to allow it to be melted and cast. It is loaded by being mixed with small quantities of graphite or stearic acid which serve to lubricate it while it is being pressed into pellets. In some cases the pellets are further consolidated into the container.

Tetryl is quite safe to handle and extremely stable in stowage. Exposed or loose tetryl should not be handled as it may cause severe dermatitis.

The velocity of detonation is 24,400 ft/sec. at a density of 1.55. Its color is light yellow but it is usually gray because of the graphite. It is appreciably more powerful than TNT. Its Laboratory Impact Value is 45. Its Bullet Impact Value is 61.

## EXPLOSIVE D

### Ammonium Picrate

Explosive D is the standard main charge for armor piercing bombs and projectiles and all other Navy projectiles over 3". While its power and brisance are slightly inferior to TNT it is much more insensitive to shock and will stand impact on armor plate without being deflagrated. It has two other disadvantages besides its inferior power:

1. Its melting point is too high for it to be melted and cast and it is therefore loaded by being pressed into cases by a hydraulic ram.
2. It reacts with metals to form extremely sensitive compounds. This is counteracted by carefully covering the interior of the bombs or projectiles with acid-proof lacquer.

Its rate of detonation is 21,300 ft/sec. at a density of 1.48. Its power and brisance are about 95% that of TNT. Its Laboratory Impact Value is 99. Its Bullet Impact Value is over 100. Its color is yellow or yellow-orange.

## RDX

### Cyclonite Cyclotrimethylenetrinitramine

RDX is the most powerful and brisant of the military high explosives. It is considered much too sensitive to use alone although the Italians have been known to use it as a booster. It seems to be about half way between Tetryl and PETN in sensitivity. RDX is being used extensively in mixtures of other explosives and inerts which reduce the sensitivity to a safe range, while the mixtures have a very high brisance and power due to the RDX. It has excellent stowage qualities but because of its sensitivity it is shipped immersed in water like an initiating explosive. The velocity of detonation is 28,000 ft/sec. at a density of 1.70. Its Laboratory Impact Value is 34. Its Bullet Impact Value is 0. Its color is white.

## PETN

### Pentaerythritetetranitrate

PETN resembles RDX in its characteristics. It is somewhat more sensitive but almost equal in power and brisance. It is appre-

ciably more sensitive to percussion and impact than Tetryl and is, therefore, not used alone as a booster, though it is being used as the base charge in some compound detonators in the way Tetryl is. PETN does have, however, much less tendency to burn than similar explosives. Though its main use alone in the service is in primacord, it is becoming increasingly important in mixtures of explosives. When used alone, PETN is combined with a small quantity of wax to desensitize and lubricate it and is loaded by pressing.

The value of PETN in primacord is due to the extreme violence of its detonation which makes it useful as a demolition charge, as a means of setting off several demolition charges simultaneously by carrying the detonation wave of a single cap to each of them, and as a means of bursting open aimable clusters of incendiary bombs such as the M17A1 or M18. It is important to know that PETN in primacord is very insensitive to flame, shock, and friction, and therefore must be detonated by a cap.

The velocity of detonation of PETN is 26,000 ft/sec. Velocity of detonation of primacord is 20,500 ft/sec. Its Laboratory Impact Value is 22. Its Bullet Impact Value, though not given, would be about equal to RDX (0). Its color is white.

#### HALEITE

##### EDNA, Ethylenedinitramine

Haloite is a new explosive that probably will not be used alone, but will be used in combination with other explosives. It is somewhat more powerful than TNT. Its sensitivity is about the same as Tetryl. It melts at 180° C but one report states that it may detonate in the manner of an initiating explosive at that temperature or a little lower. If loaded alone it would, therefore, be pressed. Its rate of detonation is 25,000 ft/sec at a density of 1.50. Its Laboratory Impact Value is 46. Its Bullet Impact Value is not available.

#### NITROGUANIDINE

Nitroguanidine is the explosive incorporated in the Navy's new double based propellant power, SPCG, (covered in AFEG Bulletin No. 10, page 18.) It is unusual in being a high explosive that is so cool in its reaction that it explodes without flash. It is a good high explosive and was used in the last war by the Germans. It is comparable in strength to TNT and its sensitivity is of the same order. Its rate of detonation is 24,400 ft/sec. at a density of 1.50.

#### AMATOL

Amatol is a substitute for TNT developed by the British during the last war when TNT was scarce. It is a mixture of ammonium nitrate and TNT; the percentage of ammonium nitrate, depending upon the availability of TNT, has varied from 40% to 80%. Its power and brisance decrease with increasing percentages of nitrate, and its sensitivity decreases at the same time. However, it is still a fairly good high explosive even when the TNT is reduced to 20%. 80/20 cannot be cast since it is not fluid enough to pour even when the TNT is molten and it must therefore be loaded by extrusion. Amatol has one big disadvantage, namely, it is very hygroscopic, and therefore is usually protected by a sealing pour of pure T. T.

Recently TNT production has reached the stage where it is available in sufficient quantities that the use of amatol is very limited. An appreciable quantity of it, however, is still in the field.

The velocity of detonation of 50/50 is 19,700 ft/sec. at a density of 1.54. Its Laboratory Impact Value is 93. Its Bullet Impact Value is about 100. Its color is buff.

#### COMPOSITION B

Composition B is intended to be used as a more powerful replacement for TNT in the loading of some of the large size G. P. bombs, and in frag. bombs. It will be used where an explosive with more power

and brisance than TNT is of tactical advantage and there is no objection to a slight increase in sensitivity.

Composition B1 is a mixture of 59% RDX, 40% TNT, 1% wax. Composition B2 is a mixture of 80% RDX, 40% TNT. The TNT cuts down the sensitivity of the RDX to a safe range and lowers the melting point to 81° C, allowing the material to be cast loaded. According to tests, the wax does have a slight effect on the sensitivity.

Composition B might be detonated low order by bullet impact but it is almost as insensitive as TNT in this respect. It has an extremely high shaped charge efficiency. Its velocity of detonation is 24,500 ft/sec. at a density of 1.60. Its total energy of blast in air is about 116% of that of TNT. Its Laboratory Impact Value is 79. Its Bullet Impact Value is 79. Its color is yellow to brown.

#### TORPEX

Torpex is one of the explosives developed during this war to be used mainly in underwater ordnance. The original Torpex (Torpex 1) was a mixture of 45% RDX, 37% TNT, 18% Aluminum powder (1% wax added). Torpex 2, which is now being used, is 42% RDX, 40% TNT, 18% Aluminum powder, (1% wax added). It is used in mines, torpedo warheads, and depth bombs. Torpex is appreciably more sensitive than TNT. Its bullet impact and drop test sensitivities are of the same order as those of Tetryl. It is quite stable in stowage though it does produce gas with pressure in the case as a result of the gas. It is insensitive enough to stand all normal handling. Its melting point is low enough for it to be cast loaded. Its velocity of detonation is 24,000 ft/sec. at a density of 1.72. It is 141% as powerful as TNT. Its Laboratory Impact Value is 53. Its Bullet Impact Value is 48. Its color is slate gray.

#### DBX

##### Depth Bomb Explosive

DBX is another Aluminized RDX mixture and its name suggests its intended use. It is 21% RDX, 21% Ammonium nitrate, 40% TNT, 18% Aluminum. It was designed to replace Torpex which it closely resembles in sensitivity, strength, brisance, and energy of shock in water, but half of the strategic RDX in Torpex is replaced by Ammonium nitrate in DBX. It will probably not be used since present supplies of RDX seem adequate to meet the demand. DBX can be cast though its melting range of 98° - 105° C is about the upper limit. Its velocity of detonation is 22,300 ft/sec. at a density of 1.68. It is 143% as powerful as TNT under water. Its Laboratory Impact Value is not given. Its Bullet Impact Value is 51. Its color is gray.

#### HBX

HBX is a new mixture designed to replace Torpex in depth bombs. It has been recommended that it be loaded in the AN-Mk 54 Mod 1 flat nose depth bomb but it is not known when these will be available. HBX is 40% RDX, 38% TNT, 17% Aluminum Powder, 5% desensitizer (desensitizer is 24% high melting wax, 14% nitrocellulose, 2% lecithin).

All tests are not complete on this explosive but those which are completed indicate that it will be about 98% to 100% as powerful as Torpex, that it will be definitely less sensitive than Torpex in both laboratory impact and bullet impact, that it will be slightly more sensitive in these respects than TNT, and that it will be about the same order as Composition B. Therefore, an explosion from bullet impact or improper handling will be much less likely than it is in Torpex loaded bombs, though of course it will not be impossible.

A definite difficulty with Torpex, and HBX, is that they produce gas and build up pressure in the case during stowage. It has been discovered that .5% by weight of calcium chloride added to the mixture will absorb all the moisture and eliminate the production of gas. It has been recommended that this percentage be added and that the resulting mixtures be designated Torpex 3 and HEX 1.

#### COMPOSITION A

Composition A is a mixture of 91% RDX and 9% plasticizing oil. The oil content is sufficient to desensitize the mixture and lubricate it enough to allow it to be pressed into cases. Composition A is not, however, a plastic explosive in the sense that it can be molded to shape by hand, but is fluid enough to be consolidated into AA shells which will probably be its principal use. It is less sensitive than TNT in both drop and bullet impact tests. It is appreciably more brisant and powerful, as is indicated by its velocity of detonation of 27,000 ft/sec. at a density of 1.62. Its Laboratory Impact Value is 105. Its Bullet Impact Value is over 100. Its color may be white or buff depending upon the color of the oil.

#### TETRYTOL

Tetrytol is a mixture of Tetryl and TNT (70% Tetryl, 30% TNT is a frequently used ratio). It is designed to obtain a Tetryl booster that may be cast. This mixture is slightly less powerful and less sensitive than Tetryl. Its particular use is in burster tubes for chemical bombs, in demolition blocks, and in cast shaped charges. It cannot be used where the loaded item is immersed in hot explosive as are the auxiliary boosters in the loading of Army bombs because it will be remelted by the heat and separation will result. It is approved for use in all other boosters.

Its velocity of detonation is 24,000 ft/sec. at a density of 1.60. Its Laboratory Impact Value is 45. Its Bullet Impact Value is 65. Its color is yellow.

#### PENTOLITE

Pentolite is a mixture of TNT and PETN, usually 50/50. Its chief uses thus far have been small shell loading, grenades and in cast shaped charges. It has a very high shaped charge efficiency. It is not as stable as TNT in storage, and separation of PETN may occur. Efforts should be made to keep it cool. Its sensitivity is such that it cannot be drilled and the fuze cavities in shells that must be drilled are poured with 80/10. It is about the same sensitivity as Tetryl in drop tests, and more sensitive than Torpex to bullet impact. Its brisance and power are equivalent to Composition B. At a density of 1.65 its rate of detonation is 24,600 ft/sec. Its Laboratory Impact Value is 47. Its Bullet Impact Value is 46.

#### EDNATOL

Ednatol is a mixture of 57% EDNA and 43% TNT. It is another of the explosive mixtures designed to ease the shortage of REX. When it goes into production in the near future, it will be loaded as a substitute for Composition B in large G. P. bombs and in frag. bombs. It is somewhat more powerful than TNT and comparable in sensitivity. It becomes soft enough to pour at 80° C, and it is, therefore, cast. It is entirely stable in storage. At a density of 1.60, it has a velocity of detonation of 24,300 ft/sec. Its Laboratory Impact Value is not given. Its Bullet Impact Value is 83. Its color is yellow.

#### PTX-1

PTX-1 is a new ternary explosive that is undergoing tests and may be adopted for loading in shells, bombs, grenades, mines, demolition blocks, and shaped charges. It is a mixture of 30% RDX, 50% Tetryl, and 20% TNT. This mixture gives a very brisant high explosive equal to Composition B and Pentolite, and superior to Tetrytol and Ednatol. It is less sensitive than Tetrytol and appreciably more stable. Its velocity of detonation is 24,200 ft/sec. at a density of 1.66. Its Laboratory Impact Value is 40 (estimated). Its Bullet Impact Value is not given. Its color is yellow.

#### PTX-2

PTX-2 is another ternary explosive mixture undergoing study and possible future use. It consists of 43.2% RDX, 28% PETN, 28.8% TNT. It is slightly more sensitive in drop and bullet impact tests than Composition B, but a little less sensitive than Pentolite. It is more

brisant than any of the binary mixtures now used, which would include Composition B, and it is about 10% more effective than Tetryl as a booster. It may be used as a booster, as main charge for fragmentation ammunition, and as a shaped charge. Its melting point is such that it will be cast. Its velocity of detonation is 26,200 ft/sec at a density of 1.69. Its Laboratory Impact Value is 50 (estimated). Its Bullet Impact Value is not given. Its color is yellow.

#### COMPOSITION C

Composition C-3 is the only one of the Composition C series now in production though quantities of the others may be found in the field. It is 77% RDX, 3% Tetryl, 4% TNT, 1% Nitrocellulose, 5% MNT (Mononitrotoluol), 10% DNT (Dinitrotoluol). The last two, while they are explosives, are oily liquids and plasticize the mixture. The essential difference between Composition C-3 and Composition C-2 is the substitution of 3% Tetryl for 3% of RDX, which improves the plastic qualities. Composition C-1 was 88.3% RDX and 11.7% plasticizing oil. The changes have been made in order to obtain a plastic composition that would meet the requirements of an ideal explosive for molded and shaped charges. The major difficulties were to obtain a mixture that would maintain its plasticity over a wide range of temperature and not exude oil.

Composition C-3 is about 1.35 times as powerful as TNT. Its velocity of detonation is 26,000 ft/sec. at a density of 1.58. The Laboratory Impact Value is 98. Its Bullet Impact Value is over 100. Its color is brown.

#### PEP-3

This is a new plastic explosive that is now being tested for possible future use. It was the result of an attempt to find a suitable plastic explosive that does not contain RDX. Pep-3 is a mixture of 86% PETN and 14% plasticizing oil. Pep-2 was 85% PETN and 15% oil, but it was a little too soft. Pep-3 is about 90% as powerful and brisant as Composition C but its stowage stability and plastic range are much better. Its sensitivity is about the same as Composition C though it has much less tendency to burn.

#### MERCURY FULMINATE

Mercury fulminate is an initiating explosive that may be used either as a primer or detonator. It may be detonated by flame, friction, or percussion and in turn detonate a booster, or it may be mixed with other materials to form a primer composition and used to ignite a propellant charge. Its melting point is much too high for it to be cast and it is loaded by being pressed into caps. It has one disadvantage for military use in that it will decompose in stowage at tropical temperatures and at the end of about three years may be rendered useless. Compared to high explosives, it has low power and brisance which is indicated by its velocity of detonation of 16,500 ft/sec. at a density of 4.00. Its Laboratory Impact Value is 8. Its color is light yellow.

#### LEAD AZIDE

Lead Azide is a relatively new initiator that has been manufactured in the U. S. only since 1931. It may be used where a detonation is caused from flame but Mercury Fulminate is generally preferred where the cap is to be set off by a firing pin. It does have the distinct advantage over Fulminate in being completely stable in stowage at elevated temperatures. Its rate of detonation is of the same order as fulminate, 17,500 ft/sec. at a density of 4.00. Its Laboratory Impact Value is 19. Its color is white.

#### DDNP

##### Diazodinitrophenol

DDNP is an initiating explosive which has been used for some time in commercial detonating caps and is now being used to some extent

in military types. It is likewise undergoing investigation for use in Navy detonators. It is more insensitive to shock than Mercury Fulminate and Lead Azide though it may be detonated by a sharp blow. It will, therefore, probably be used only where it will be set off electrically or by miner's safety fuse. It has an advantage in being more powerful than other initiating explosives and being comparable in strength to Tetryl. If unconfined, flame will cause it to flash but will not detonate it. This, combined with its insensitivity to shock, makes it much more safe to handle.

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

## DETONATION OF BOMBS EXPOSED TO FIRE

When a bomb loaded airplane crashes and catches fire, the lives of both rescuers and the crew of the crashed plane depend in most cases upon some knowledge of the amount of time which is available before the bombs may be expected to detonate. A report entitled, "Regulations for the Fire Protection of Advanced Bases", prepared by BuDocks, BuShips, BuAer, and BuOrd; issued by the Chief of Naval Operations, August 1944, gave the following information on Burning Aircraft Carrying Explosives:

"Fire fighting personnel may be called upon to extinguish a fire in burning aircraft and it is entirely possible such craft may contain explosives. The following is offered for the information and guidance of such personnel.

Research has proven that bombs, when exposed to intense and sustained heat, will explode in from 2-1/4 to 5-1/3 minutes, depending upon the type of bomb and the intensity of the heat. Personnel cannot survive a fire for nearly this period. Efforts should be directed in rescuing personnel and fighting the fire to keep it from enveloping cockpits, escape doors, etc.

A detonating wave incident to one bomb exploding will detonate all explosives in the immediate vicinity practically instantaneously. The danger area of a high explosive detonation is shaped similar to an inverted sombrero, therefore the safest position in the vicinity is the prone position."

Based on this report experiments have been conducted by the Bureau of Ordnance to determine the time interval necessary for detonation of 100 lb. G. P. bombs when exposed to fire. Tests were made at Explosives Investigation Laboratory, Naval Powder Factory, Indian Head, Maryland, by exposing loaded and fuzed bombs to an open gasoline-aluminum fire. The procedure and results of these tests at Indian Head are given below.

### PROCEDURE

Two bomb-fuze combinations were used. The first combination was a 100 lb. G. P. bomb, Mark 4 Mod 4, fuzed with the Nose Fuze AN-Mark 219. The other combination chosen was a 100 lb. G. P. bomb, AN-M30, with the Nose Fuze AN-M103. Three trials were made with each combination and attempts made to hold all other factors as constant as possible. Smaller bombs were used because of the obvious fire hazard and damaging blast effect from larger type.

Preliminary tests were made with various materials in an attempted simulation of a crashed aircraft fire. The combination of materials decided upon was powdered asbestos, sheet aluminum obtained from aircraft scrap, and 100 octane gasoline, the asbestos serving as an agent to retard the soaking of the gasoline into the ground. While the aluminum did not burn with a flame, it was found in the oxide form after firing and probably contributed some heat to the gasoline flame.

For the actual tests a pit 6 x 6 x 2 feet was dug and a suitable stand erected for the support of the bombs. The powdered

asbestos was spread uniformly about the bottom of the pit to an approximate depth of two inches. Scrap aluminum was placed in the pit at random but with some attempt at getting some about the entire area of the pits. The bombs were suspended horizontally over the center of the pit at a height of about 19 inches from the bottom of the pit by means of wire rope and a chain strap. The strap arrangement, however, was later replaced by the wire rope extending through the suspension lugs to eliminate any changes in position of the bomb during the tests. A Mark 1 electric thermit ignition squib was placed near the center of the pit on top of the scrap and connected to the firing leads. Ten gallons of 100 octane gasoline were poured on the scrap and also over the bomb and fuze just prior to ignition in order to keep vaporization losses to a minimum.

#### TEST ONE

The first bomb fuze combination tested to represent the minimum time necessary for detonation was a Mark 4 Mod 4 100-lb. G. P. bomb with the Nose Fuze AN-Mark 219. This bomb is filled with 55 lbs. of TNT and has no fuze pocket for a tail fuze. In this test the fin assembly was omitted from the bomb, otherwise its fuzed condition was that of a bomb being carried in an aircraft.

#### RESULTS OF TEST ONE

Trial One: An explosion resembling a high order occurred seven minutes after the ignition of the gasoline. Upon examination of the pit after the explosion some fragments of the bomb were found. The Nose Fuze, AN-Mark 219, did not detonate as the nose fragment of the bomb was found in the pit with part of the fuze intact and parts of the cup and vanes close by.

Trial Two: In trial two, the same bomb-fuze combination was used with conditions similar to that in trial one; however, an explosion occurred in 6-1/4 minutes after the 100 octane gas had been ignited. Also, twenty seconds later a small report was heard and an object noted bounding across the field. The cause of the second report or the identity of the object was never learned. In this trial indications were that the Nose Fuze did not detonate. Parts of the fuze were found intact in the pit (See Figures 3 and 4).

Trial Three: In this trial, employing the same bomb-fuze combination of trials one and two, the louder of two explosions occurred after 5-1/4 minutes. A second report, very similar to that in trial two was heard 1-1/6 minutes later. Fragments in the pit in trial three also indicated that the nose fuze AN-Mark 219 did not detonate from the 5-1/4 minutes exposure to the extreme heat conditions.

In all of the trials of Test One, the explosion extinguished the gasoline flame.

#### TEST TWO

The bomb-fuze combination used in test two was the AN-M30 100-lb. G. P. bomb filled with 54 lbs. of TNT and fuzed with the Nose Fuze AN-M103, assembled without the fuze vanes. In this test the fin assembly was attached to the bomb. As in test one the bomb was suspended 19 inches above the bottom of a pit. The same combination of powdered asbestos spread to a depth of two inches over the bottom of the pit, and sheet aluminum spread about the 6 x 6 x 2 feet area of the pit was used.

Trial One: After the 100 octane gasoline had been ignited, an explosion occurred in 6-1/4 minutes, which was the same time interval as the explosion for Trial two of the Mark 4 Mod 4 bomb and fuze AN-Mark 219, but not as intense. The detonation affected the fire very little.

Trial Two: The time interval to detonate in this trial was 4-1/3 minutes, the lowest time interval of all the tests. It was noted that the detonation in test two, trials one and two, did not seem as intense as those in the three trials in test one.

Trial Three: The first detonation, quite low as compared with all previous initial detonations, occurred in 6-1/3 minutes. Another detonation much larger than any of the previous "second reports" was heard at eight minutes after zero time, putting the fire completely out. It is to be noted in this connection that all the main detonations in Test One trials scattered or put out the fire almost completely. The first detonation in this last trial affected the fire little if any. (Of particular interest in this last trial was the finding of the fuze booster in the pit, unexploded.)

The following table is a compilation of the results of the tests:

<u>TEST</u>	<u>TRIAL</u>	<u>COMBINATION</u>	<u>TIME FOR DETONATION</u>	<u>REMARKS</u>
1	1	Mk 4 Mod 4 bomb AN-Mk 219 fuze	7 minutes	--
1	2	" " "	6' 15"	Small report heard 6' 35"
1	3	" " "	5' 15"	Small report heard 6' 25"
2	1	AN-M30 bomb AN-M103 fuze	6' 15"	--
2	2	"	4' 20"	--
2	3	"	6' 20"	Second explosion in 8 min.

#### CONCLUSIONS

Results of these tests made by exposing loaded and fuzed 100 lb. G. P. bombs to an open gasoline-aluminum fire, indicate that NO definite time interval can be predicted before detonation of this bomb-fuze combination. However, the minimum detonation time in these tests does come outside the safety time interval of 2-1/4 minutes mentioned in the report issued by Chief Naval Operations.

Separate tests conducted on the fuzes used in the bomb-fuze combination (which were tested in empty 100 lb. G. P. bombs) indicated that approximately fifteen minutes was required for detonation of the fuze when exposed to fire. From these tests it is evident that the time necessary for detonation of the bomb is independent of the fuze used.

It might also be presumed that a larger bomb would not detonate as quickly as a small bomb, under similar conditions, since the larger bomb will require more heat to raise its temperature to the point where it will detonate. Similar tests are to be conducted on some larger type bombs as well as a thin case bomb, such as a depth bomb. While the above tests were made on G. P. bombs, it is considered that A.P. and S.A.P. bombs would require a longer time interval to detonate because of their thicker case; however, until so proven, the time interval for G. P. bombs should apply.

The intensity of the fire and its proximity to the bomb are two extremely important elements capable of changing the figures given above. Rescue work should, therefore, be governed not only by these figures, but by a common-sense analysis of the circumstances surrounding any particular crash.

It is vitally important to remember that any time limit should include the time for both rescued and rescuing personnel to get a safe distance from the airplane by the time of the detonation. The heavier the total bomb load the farther away personnel must get to be safe. The best rule is to keep on going--unless it is possible to get below surface of the ground after proceeding from the immediate area of the burning airplane. In case of a carrier crash, water should be streamed on the bomb in the plane, if possible, to keep its temperature as low as possible during rescue and disposal activities.

Personnel handling burning aircraft carrying explosives should be governed by the following DO's and DON'Ts carried in the

report issued by Chief of Naval Operations (see reference in first paragraph of this article):

- (A) DO leave the rescue and fire fighting to PERSONNEL QUALIFIED TO DO SO. Do not restrict them.
- (B) DO know your airplane, the location of the gas tanks, the bomb compartment, escape hatches and access doors.
- (C) DO be calm, be conscious of the time element and move with precision. Leave the scene after one and a half minutes which gives you forty-five seconds to get clear.
- (D) DO assume the prone position in the immediate vicinity to avoid blast injuries.
- (E) DON'T be a sightseer. Don't invite the epitaph, "He was just an innocent by-stander."
- (F) DON'T fight the fire too long or make a futile effort to be a hero. Leave after one and a half minutes.
- (G) DON'T expend further lives on a lost cause. You know when occupants are hopelessly trapped."

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REFERENCE: Naval Aviation Confidential Bulletin

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R E S T R I C T E D

## EXUDATION FROM T.N.T. LOADED MUNITIONS

In an attempt to obtain actual evidence of exudation in bombs, depth charges, and other munitions loaded with TNT and explosive mixtures containing TNT, NAVORD OCL A121-43 was issued. In response, Bu Ord received reports of such exudation, but either no samples were submitted for analysis, or the sample submitted did not prove to be exudate from the explosive but merely the luting compound used in sealing the munition.

The type of luting now used resembles exudate in most of its physical characteristics. Unfortunately, even extremely minute traces of TNT in the luting are enough to give a red color. For this reason conclusive field tests for actual exudation are not now considered feasible in operating areas.

In the future, the following procedure shall be followed whenever suspected exudate is encountered:

1. Collect a sample of the material and put it into a glass container.
2. Forward the sample as an enclosure to a letter to the Commanding Officer, Naval Powder Factory, Indian Head, Maryland, and forward a copy of the letter to the Bureau of Ordnance.
3. Describe the munition thoroughly, including name, mark, manufacturer, lot number, loading depot and all pertinent information.
4. Segregate or turn in to an ammunition activity the suspected munition, after first tagging the item to indicate that this circular letter\* has been complied with, and show on the tag the file number and date of letter to the Naval Powder Factory.

It is hoped that this procedure will do much to clarify the situation as regards exudate. The results of the tests at the Naval

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\* NAVORD OCL A75-44, 19 October 1944.

Powder Factory will be communicated to the activity sending in the sample in every case.

The provisions of Articles 1215, 1216, and 1217 of the Bureau of Ordnance Manual should be complied with in regard to exuding munitions.

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REFERENCE: NAVORD OCL A75-44, 19 October 1944

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R E S T R I C T E D

## H. C. SMOKE EFFECT ON PERSONNEL

An investigation to determine the toxicity of the smoke from HC smoke munitions in closed spaces has been conducted recently at Edgewood Arsenal, Maryland. This investigation has shown that the breathing of HC smoke in high concentrations can cause serious injury or death. Dangerous concentrations of HC smoke can readily occur in enclosed spaces in which one or more HC smoke munitions of any type or size are burned, including the HC Smoke Pot M2 (Navy Training Candle), the HC Smoke Grenade AN-M8, and the HC Smoke Pot M1.

The standard Navy gas masks and rescue breathing equipment provide adequate protection against the toxic effects of HC smoke.

In view of the above information the following safety instructions regarding the use of HC smoke munitions in closed spaces for training are hereby promulgated:

PERSONNEL SHOULD NOT ENTER OR REMAIN IN ENCLOSED SPACES CONTAINING HC SMOKE WITHOUT WEARING A GAS MASK OR RESCUE BREATHING EQUIPMENT. IF THE LIKELIHOOD OF A LACK OF OXYGEN IN THE ATMOSPHERE EXISTS DUE TO CAUSES OTHER THAN THE BURNING OF THE HC SMOKE MUNITIONS, RESCUE BREATHING EQUIPMENT ONLY SHOULD BE WORN.

Pending the completion of an investigation of the toxicity of HC smoke screens generated in the open, it is recommended that personnel who must remain near an HC munition generating smoke in the open should wear gas masks.

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REFERENCE: NAVORD OCL A71-44, 14 October 1944

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R E S T R I C T E D

## 4"5 BARRAGE ROCKET MISFIRES

BuOrd has received several reports of misfires of 4"5 Barrage Rocket ammunition when used in the 4"5 Rocket Launcher Mark 7 (automatic). These misfires are attributed to the following:

1. The coating of paint on the after motor shroud of the 2"25 Rocket Motor, Mark 9 Mod O, prevents electrical contact with the knife edge (ground) contactor of the Launcher.
2. Molten glyptal from the sealing plug of the Rocket Motor nozzle may cover the knife edges and effectively insulate them from the motor shrouds.
3. BuOrd is initiating changes in the specifications for the shrouds for the 2"25 Rocket Motor, Mark 9 Mod O, so that they will be plated instead of painted. Until

the plated shroud makes its appearance in service, it is suggested that misfires on Mark 7 Launchers may be minimized by:

1. Removing the paint from the after shroud of the 2125 Rocket Motor, Mark 9 Mod O, and coating it with petrolatum or grease to prevent rusting. This coating is to be wiped off just prior to loading in the Launcher.
2. Cleaning the knife edge contacts with sandpaper or file as frequently as necessary to insure good electrical contact.

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REFERENCE: NAVORD OCL A68-44, 28 September 1944.

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### SUGGESTED READING

(Restricted)

1. Ordnance Pamphlet 1133, "Rocket Launchers Mark 17 and Mark 17 Mod 1", dated 30 August 1944.

The launchers were formerly designated Rocket Launcher Mark 1 (Target) and Mark 1 Mod 1 (Target). This O. P. contains a complete description and instructions for use and also a brief description of the rocket ammunition launched as targets from these launchers.

(Restricted)

2. Navord OCL A69-44, dated 11 October 1944. "Grades of Lots of Small Arms Ammunition and Classification of Aircraft Cannon Ammunition".

The purpose of this letter is, (1) to inform Naval personnel of the various grades and classifications of small arms and aircraft cannon ammunition and the authorized uses of each grade and classifications; (2) to inform Naval personnel of the procedure established to insure that all Naval and Coast Guard activities and Marine Corps Aviation Units will have information as to the correct grade or classification of each lot on hand; and (3) to list those lots of the subject ammunition currently on hand in the Navy which have been re-graded, reclassified, or suspended from use.

(Restricted)

3. Bureau of Ordnance Circular Letter AV27-44, "Introduction into Navy Stock of a Series of Ballistically Matched NEW rounds of 20 mm AIRCRAFT (Army) Ammunition for Use in Hispano-Suiza Aircraft Cannon; information concerning."

The purpose of this letter is (1) to inform all appropriate Naval Ships and Shore Activities of the adoption for use by the Navy of a series of new rounds of 20 mm AIRCRAFT ammunition which, when available, will be distributed to replace completely the older series of rounds currently in use; (2) to provide necessary technical data concerning these new rounds; and (3) to furnish information as to availability and instructions covering their issue and use.

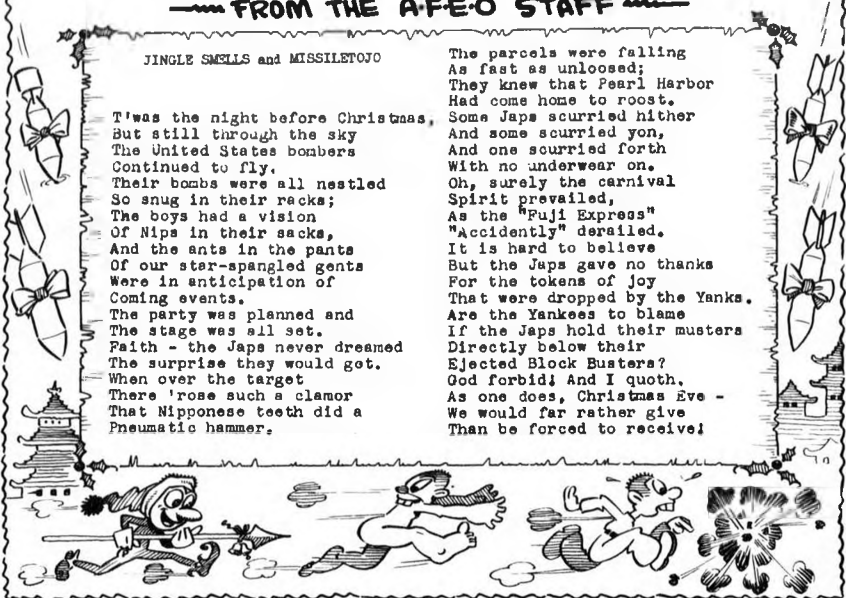
# MERRY CHRISTMAS

FROM THE AFEO STAFF

JINGLE SMELLS and MISSILETOJO

T'was the night before Christmas,  
But still through the sky  
The United States bombers  
Continued to fly.  
Their bombs were all nestled  
So snug in their racks;  
The boys had a vision  
Of Nips in their sacks,  
And the ants in the pants  
Of our star-spangled gents  
Were in anticipation of  
Coming events.  
The party was planned and  
The stage was all set.  
Faith - the Japs never dreamed  
The surprise they would get.  
When over the target  
There 'rose such a clamor  
That Nipponese teeth did a  
Pneumatic hammer.

The parcels were falling  
As fast as unloaded;  
They knew that Pearl Harbor  
Had come home to roost.  
Some Japs scurried hither  
And some scurried yon,  
And one scurried forth  
With no underwear on.  
Oh, surely the carnival  
Spirit prevailed,  
As the "Fuji Express"  
"Accidentally" derailed.  
It is hard to believe  
But the Japs gave no thanks  
For the tokens of joy  
That were dropped by the Yanks.  
Are the Yankees to blame  
If the Japs hold their musters  
Directly below their  
Ejected Block Busters?  
God forbid! And I quoth,  
As one does, Christmas Eve -  
We would far rather give  
Than be forced to receive!





(Restricted)

8. O.P. 1001 (First Revision), "Projectors Mk 10, Mk 10 Mod 1, and Mk 11 and Ammunition", dated 25 July 1944.

This O.P. presents data on instructions and use of the projector and is well illustrated. It also gives good coverage of 7 1/2 projector ammunition (formerly "Hedgehog") and fuses.

(Unclassified)

9. O.P. 5605, "Complete Round Chart for Aircraft Bombs", dated 24 July 1944.

This O.P. provides a catalogue type of reference for bomb type ammunition in complete round or sub-assembly form. It is the latest O.P. available on the subject.

(Restricted)

10. O.P. 878, "General Data on Navy, AN-Standard, Army and British Bombs", dated 21 September 1944.

The data in this publication are a comprehensive listing of the most frequently required information concerning bombs and related equipment. This O.P. supersedes O.P. 878 (First Revision) which should be destroyed.

(Unclassified)

11. NavOrd OCL AV28-44, "Aircraft Bomb Fuses, Navy Type - Surveillance and Disposal of", dated 13 November 1944.

This OCL establishes a definite policy for the segregation and disposal, when required, of present stocks of Navy type fuses returned from combat areas and combatant vessels.

(Unclassified)

12. NavOrd OCL AV25-44, "Description and Use of Standard Navy Aircraft Bomb Arming Wire Assemblies", dated 30 October 1944.

This letter indicates among other things that new arming wire assemblies will be supplied in cylindrical, moisture-proof, sealed containers, packed straight.

(Confidential)

13. NavOrd OCL A77-44, "Instructions for the Issue of Service Ammunition When the Supply is Critical", dated 2 November 1944.

(Confidential)

14. NavOrd OCL A75-44, "Landing Force and Artillery Ammunition - Defective Lots", dated 14 October 1944.

This letter will be highly significant to personnel at NAD's responsible for issuing ammunition to Naval and Marine activities including 37 mm Gun, 60 mm Mortar, 106 mm Howitzer, P.D. fuses M51A1 for 155 mm Guns or Howitzer, etc. Lots indicated in this letter are defective and have been responsible for prematures causing fatalities.

## CORRECTION

In AFEO Bulletin No. 10, page 28, November 1944, it was stated that BuOrd would manufacture Army M115 series tail fuses and that this production would be known as the "Mk 215", "Mk 216", and "Mk 217" to distinguish from Army production. While this was the original plan, it has now been decided to retain the original Army nomenclature on BuOrd production as M115 series.

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