9 278C V-4

UNITED STATES

BOMBS AND FUZES

PYROTECHNICS

U.S.N.B.D.

1 SEPTEMBER, 1945

DECLASSIFIED

CONFIDENTIAL

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RECORD SHEET

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U. S. NAVY BOMB DISPOSAL SCHOOL
Washington 16, D. C.

1 September 1945

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J. P. David

J. P. DAVID
Lieutenant Commander, USNR
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INTRODUCTION

This publication has been compiled to present complete and accurate information on the subjects of bombs, bomb fuzes, and pyrotechnics employed by the armed services of the United States. In addition to information on currently used ordnance, such obsolete or obsolescent ordnance as might be encountered in bomb disposal activities has been included.

The plan of this publication is as follows:

SECTION I: High Explosive Bombs

Part I: U.S. Army "Modified Mark" Series
II: U.S. Army "M" Series
III: U.S. Navy "Mk" Series
IV: U.S. Army-Navy "AN" Series

SECTION II: Incendiary & Chemical Bombs

SECTION III: Bomb Fuzes

SECTION IV: Pyrotechnics

Part I: Aircraft Pyrotechnics
II: Ground Pyrotechnics
III: Ship and Submarine Pyrotechnics

Deviation from this plan has been made in the case of the more recently developed bombs which bear the "M" or "Mk" designation, but which possibly will be standardized for both Army and Navy use in the future. When such material is standardized, and as further information concerning the subjects covered in this publication is received, that information will be forwarded to the possessors of the publication in the form of Correction and Addition sheets.

The section on Land Mines and firing devices has been deleted and will be found in a book covering the entire subject to be inserted in the Hand Grenade book binder at a later date.

SECTION I

HIGH EXPLOSIVE BOMBS

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INTRODUCTION

Prior to 1941, the Army and the Navy had their own individual designs for and manufacture of all types of bombs, and each service had its own distinctive nomenclature to indicate a particular piece of ordnance. The Navy nomenclature was prefixed by the word "Mark" (abbreviated Mk), the number of the design was indicated by a Roman Numeral, and the subsequent modifications to the original design were indicated by the abbreviation "Mod" followed by the number of the particular modification; i.e., Mk XII-Mod 2 500 lb. G.P. bomb. The Army nomenclature prior to July 1, 1925 was similar to the above, differing only in the method of designating the subsequent modifications of a particular design. A modification of an Army bomb was indicated by the abbreviation "M" followed by a Roman Numeral; i.e., Mk I-MII 100 lb. G.P. bomb.

In 1925, the Army changed its method of designation to avoid confusion with Naval ordnance: and since that time, the designation of all items has been prefixed by the abbreviation "M" (for Model) followed by an Arabic Numeral. Subsequent modifications are indicated by adding the letter "A" followed by the number of the particular modification; i.e., M 38A2 indicates the second modification of the bomb originally adopted as the M 38.

Early in 1941, a joint committee for standardization of ordnance, known as the Army-Navy Standardization Board, was created and since its inception, bomb production, with very few exceptions, has been of the types approved by this Board for joint issue to the Army, the Navy, and the British forces. The responsibility of designing bombs for land targets was given to the Army, and bombs for Naval objectives or for carrier use were to be developed by the Navy. Designs accepted by this committee are indicated by the prefix "AN" followed by the Army or the Navy designation for the particular item. Thus, an Army bomb approved for joint production would be designated AN-M 64A1, and a Navy bomb which was accepted would be designated AN-Mk 33.

In this publication, the bombs have been categorized according to the particular series in which they were developed; hence, the section on bombs consists of four parts, each of which has an introduction listing the common characteristics of the bombs within that series. In brief, the four parts and the fundamental characteristics of each are as follows:

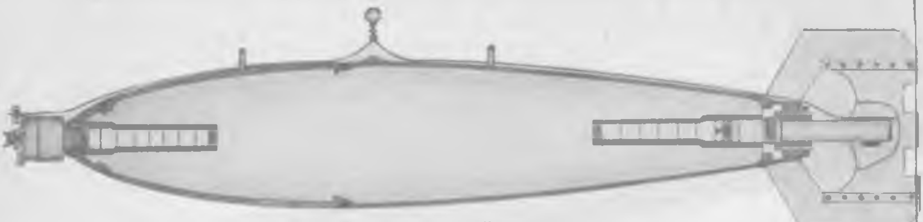
PART I:	U.S. ARMY "MODIFIED MARK" SERIES	Streamlined and filled with 100% TNT.
PART II:	U.S. ARMY "M" SERIES	Parallel sides, ogival nose, and boat tail; box type tail assembly construction; and filled with 50/50 Amatol sealed at both ends with TNT surrounds
PART III:	U.S. NAVY "MK" SERIES	Similar to design of Army bombs and filled with 100% TNT; discontinued with some exceptions under the standardization program.
PART IV:	U.S. ARMY-NAVY "AN" SERIES	Similar to the "M" Series, except (a) third suspension lug added at center of gravity and 180° removed from other two lugs, and (b) base plate changed to the male type.

Since the development of the "AN" series there have been two further modifications of the general purpose (G.P.) bombs within that series, successively the "AN-G.P." and the "AN-G.P.A1" modifications. The changes characteristic of these two modifications are dealt with in the introduction to Part IV.

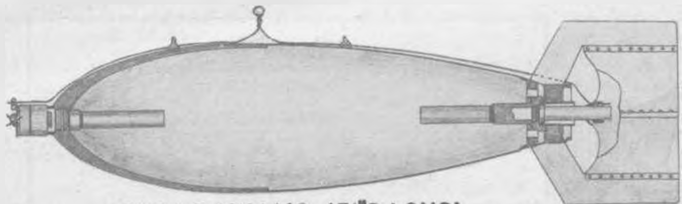
PART I

U.S. ARMY "MODIFIED MARK" SERIES BOMBS

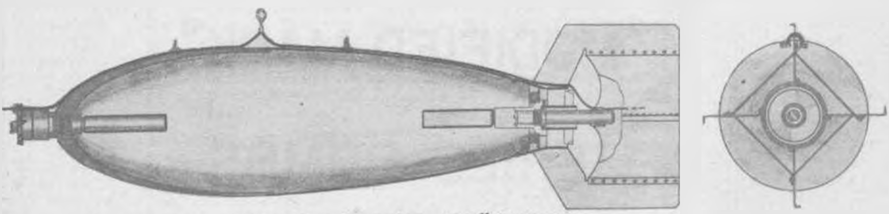
U.S. ARMY "MODIFIED MARK" SERIES (OBSOLETE)



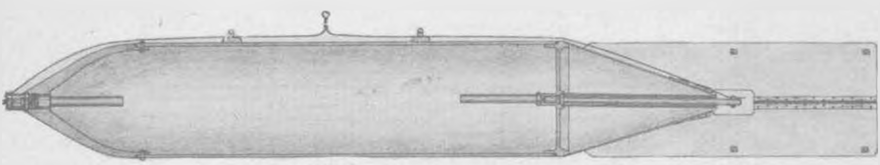
100 LB. MK.I M4 (47".2 LONG)



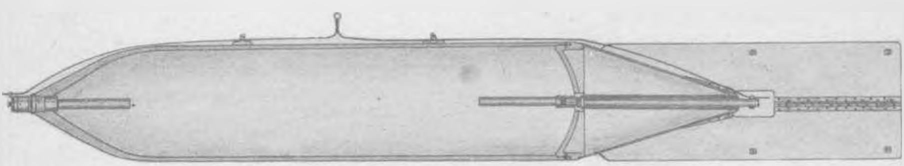
300 LB. MK.I M2 (51".2 LONG)



600 LB. MK.I M2 (63".0 LONG)



2000 LB. MK.I M3 (135".8 LONG)



2000 LB. MK.I M4 & 5 (135".8 LONG)

RESTRICTED

This particular series of bombs was not satisfactory for war use and has been abandoned, except for a few of these bombs which are being used at the present for target practice and training purposes. They are all of the same type and are intended for the same target use: Army Demolition H.E. bombs for General Bombardment. The following chart contains the essential data concerning the bombs of this series

U. S. ARMY BOMBS

"MODIFIED MARK" SERIES BOMBS

(Obsolete)

U. S. ARMY "MODIFIED MARK" SERIES BOMBS

BOMBS	100 lb. Mk I MIV	300 lb. Mk I MII	600 lb. Mk I MIII	1100 lb. Mk III MI	2000 lb. Mk I M III & M IV	2000 lb. Mk I MV
FUZES	Nose: M105			Tail: M106		
OVERALL LENGTH	47.2"	51.2"	63.0"	68.5"	135.8"	
LENGTH OF BODY	39.5"	40.6"	52.2"	61.6"	97.0"	
BODY DIAMETER	7.9"	12.2"	16.5"	20.8"	18.5"	
WALL THICKNESS	0.16"	0.12"	0.2"	0.15"	0.50"	
WALL MATERIAL	Steel.					
BODY CONSTRUCTION	Streamlined body formed by welding three cast steel sections together.				Cast steel. nose riveted to seamless steel tubing; rear not tapered.	Seamless steel tubing.
TYPE OF SUSPENSION	Horizontal.					
CONSTRUCTION OF SUSPENSION	Two U-shaped bar steel eyebolts welded to body along longitudinal axis.				Two U-shaped eyebolts on plates secured to body by cap screws.	
COLOR & MARKINGS	Prior to March 11, 1942, these bombs would have been yellow all over with black manufacturers markings, but since that date will be olive-drab with one inch yellow bands around nose and base and a 1/4 inch band around center of gravity.					
LENGTH OF TAIL	8.5"	12.0"	14.0"	33.5"	49.2"	
WIDTH OF TAIL	11.0"	15.0"	20.5"	28.5"	26.1"	
MATERIAL OF TAIL	Sheet Steel				Sheet steel with cast steel tail cone.	
TAIL CONSTRUCTION	A cast steel sleeve secured to body by a fin locking nut four fins or vanes; internal box-type struts.			Four vanes with bar struts, attached to body by screws.	Four vanes riveted to tail cone; two sets external bar struts to reinforce vanes. Cone secured to flange on base plate.	
WEIGHT OF TAIL	2.6#	6.1#	5.0#	55.0#	140.0#	
TYPE OF FILLING	Cast TNT					
WEIGHT OF FILLING	65.0#	148.0#	355.0#	650.0#	960.0#	
TOTAL WEIGHT	119.4#	285.9#	611.0#	1175.0#	1920.0#	1830.0#
CHARGE/WEIGHT RATIO	54.5%	52.0%	58.0%	55.3%	50.0%	52.4%

PART II

U.S. ARMY "M" SERIES BOMBS

RESTRICTED

INTRODUCTION

BOMBS INCLUDED IN THIS "M" SERIES ARE:

M-30	100 lb.	Demolition H.E.
M-31	300 lb.	Demolition H.E.
M-32	600 lb.	Demolition H.E.
M-33	1100 lb.	Demolition H.E.
M-34	2000 lb.	Demolition H.E.
M-57	250 lb.	Demolition H.E.
M-43	500 lb.	Demolition H.E.
M-44	1000 lb.	Demolition H.E.

Prior to the organization of the AN Standardization Board in 1941, these bombs were designated as "Demolition H.E." bombs; under the standardization policy they were retitled as "General Purpose High Explosive (G.P.H.E.)" bombs.

COMMON CHARACTERISTICS OF THE "M" SERIES BOMBS:

Targets: Ammunition dumps, railway engines, and cars, all types of construction, and aircraft on the ground.

Fuzing: Refer to page 11.

Body Construction: These bombs may be made by any one of the following methods: (a) From seamless steel tubing in which the nose of the bomb is formed by swaging and the tail by drawing to the necessary diameter; (b) or the case may be forged in one piece; (c) or the bomb may be formed from cast sections welded together. These bombs have female base filling plates.

Type of Suspension: Always suspended horizontally by dual lugs.

Construction of Suspension Lug: Two eyebolts welded to body along longitudinal axis of the bomb. The eyebolts are formed from bar steel, shaped in the form of a U and then welded to the body.

Color and Markings: Prior to March 11, 1942, these bombs would have been painted yellow all over with black manufacturer's markings; since that date they have been painted olive-drab with a one-inch yellow band around the nose and base and a 1/4 inch band around the center of gravity.

Material of Tail: Sheet steel.

Tail Construction: This type of tail consists of the following parts: (a) a cast steel sleeve secured to the body of the bomb by a fin locking nut; (b) four fins or vanes; (c) internal box-type struts. One vane and one strut are pressed from one piece of metal and the four pieces are welded together and to the sleeve.

Type of Filling: (a) 50/50 Amatol. Since Amatol is hygroscopic, TNT surrounds are placed around the nose and tail booster sleeves to seal the Amatol from moisture; (b) 100% TNT, which will be stencilled on the bomb. All of this series except the 100 lb. M-30 contain two built-in M104 auxiliary boosters, one in the nose and one in the tail, which contain tetryl. The 100 lb. M-30 has the auxiliary booster in the nose only. The M102 adapter booster (tetryl) is threaded to the base plate of all bombs in the series and receives the tail fuse.

Other bombs that carry an "M" designation, although not actually classified in the "M" series, are included in this section because they are obsolescent:

M-62	600 lb.	A.P.-H.E.
M-61	800 lb.	A.P.-H.E.
M-60	900 lb.	A.P.-H.E.
M-52	1000 lb.	A.P.-H.E.
M-63	1400 lb.	A.P.-H.E.
M-5	30 lb.	Frag.

DATA:

OVERALL LENGTH	25.5 in.
BODY LENGTH	13.05 in.
BODY DIAMETER	4.2 in.
WALL THICKNESS	0.6 in.
TAIL LENGTH	
TAIL WIDTH	6.5 in.
TAIL WEIGHT	

U. S. ARMY BOMB

30 LB. FRAG

M 5

(Obsolete)

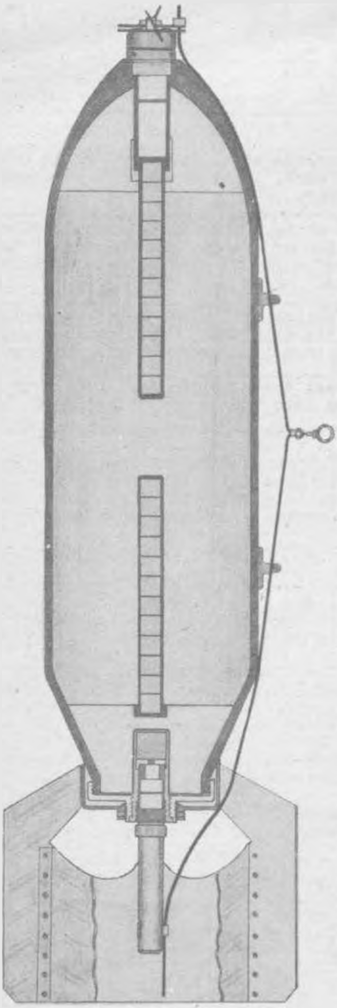
WEIGHTS:

Type of Filling	T.N.T.
Weight of Filling	4.66 lbs.
Total Weight	29.8 lbs.
Chg / Wt. Ratio	16.3%

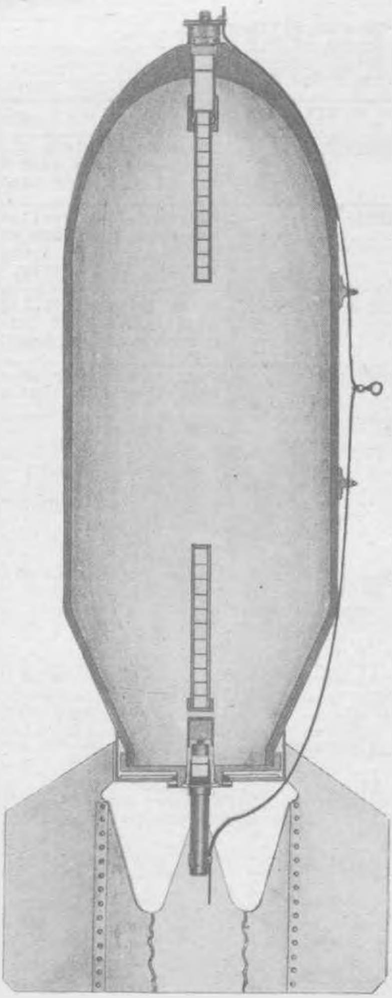
FUZING: Mk XIV

BODY CONSTRUCTION:	The body consists of a seamless steel tube over which are fitted rings cut from cast steel pipe. Cast steel nose and base pieces thread onto this center tube.
SUSPENSION:	Horizontally, vertically, or in a cluster. U-shaped eyebolts are welded to bomb at center of gravity and to rear of tail. Later issues of bombs were in the M3 cluster which contained six M5 30 lb. frag. bombs.
COLOR AND MARKINGS:	Prior to March 11, 1942: yellow with black manufacturer's markings; since that date: olive drab with 1 inch yellow bands around nose and base, 1/4 inch band around center of gravity.
TAIL CONSTRUCTION:	Four rectangular sheet steel vanes welded to a length of 1 inch cast iron pipe that screws into the base filling plug.
REMARKS:	Obsolete bomb.

"M" SERIES DEMOLITION BOMBS



M32 600 LB.



M33 1100 LB.

DATA ON "M" SERIES BOMBS

BOMBS	100 lb. M-30		300 lb. M-31		600 lb. M-32		1100 lb. M-33		2000 lb. M-34	
OVERALL LENGTH	36.0 in.		48.6 in		59.5 in.		68.7 in.		90.4 in.	
LENGTH OF BODY	30.0 in.		40.2 in.		49.5 in.		54.7 in.		70.0 in.	
DIAMETER OF BODY	8.2 in.		10.9 in.		15.2 in.		19.8 in.		23.3 in.	
THICKNESS OF WALL	0.16 in.		0.27 in.		0.35 in.		0.43 in.		0.5 in.	
LENGTH OF TAIL	9.75 in.		12.1 in.		13.9 in.		18.5 in.		25.7 in.	
WIDTH OF TAIL	11.0 in.		14.9 in.		20.4 in.		27.0 in.		31.6 in.	
WEIGHT OF TAIL	3.5 lbs.		6.0 lbs.		12.6 lbs.		22.5 lbs.		38.6 lbs.	
TYPE OF FILLING	Amatol 50/50	TNT	Amatol 50/50	TNT	Amatol 50/50	TNT	Amatol 50/50	TNT	Amatol 50/50	TNT
WEIGHT OF FILLING	53.3 lbs.	54.0 lbs.	135.5 lbs.	137.0 lbs.	319.3 lbs.	336.0 lbs.	588 lbs.	618 lbs.	1061 lbs.	1077 lbs
TOTAL WEIGHT	106.3 lbs.	107.0 lbs.	272.5 lbs.	274.0 lbs	586.5 lbs	621.0 lbs.	1111 lbs.	1141 lbs.	1971 lbs.	1987 lbs
CHARGE/WEIGHT RATIO	50.1%	50.6%	49.4%	50.0%	54.4%	54.1%	52.9%	54.1%	53.8%	54.7%

These bombs take the M103 in the nose and the M106 in the tail.
These bombs are Obsolescent
For data on Targets, Construction of Body, Suspension, Color and Markings, Type of Filling, and Tail Construction, Refer to Introduction to "M" Series Bombs, Page 9.

"M" SERIES DEMOLITION BOMBS

(Obsolescent)

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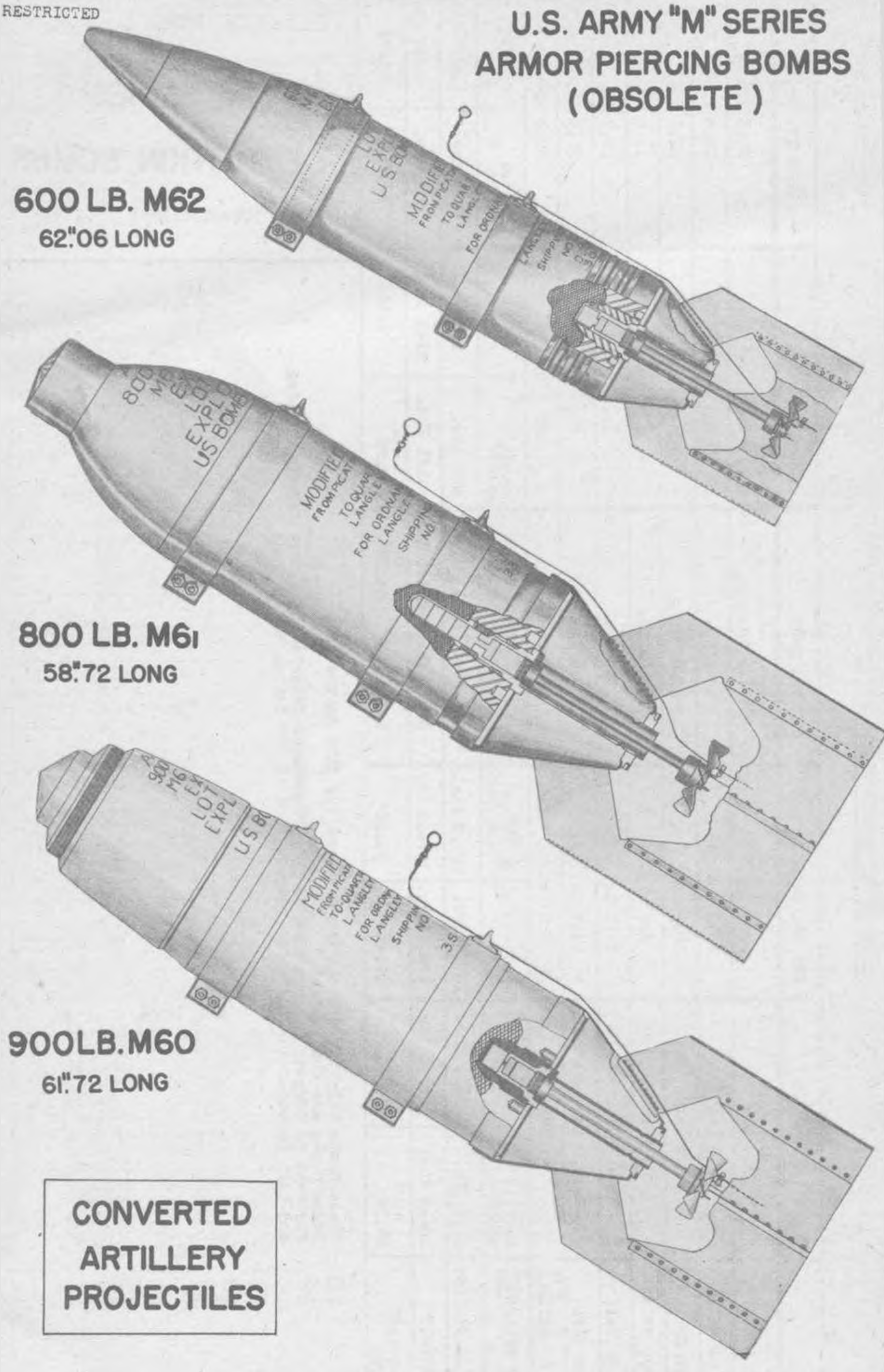

U.S. ARMY "M" SERIES
ARMOR PIERCING BOMBS
(OBSOLETE)
600 LB. M62
62".06 LONG
800 LB. M61
58".72 LONG
900LB.M60
61".72 LONG
CONVERTED
ARTILLERY
PROJECTILES

RESTRICTED

U. S. ARMY BOMBS

"M" A. P.-H. E. BOMBS

(Armor Piercing)

DATA ON "M" DESIGNATED A.P.-H.E. BOMBS

BOMBS	M-62	M-61	M-60	M-52	M-63
	600 lbs.	800 lbs.	900 lbs.	1000 lbs.	1400 lbs.
OVERALL LENGTH	62.1 in.	58.7 in.	61.7 in.	70.9 in.	69.1 in.
LENGTH OF BODY	46.9 in.	38.6 in.	41.3 in.	50.0 in.	45.7 in.
DIAMETER OF BODY	10.1 in.	12.4 in.	12.2 in.	12.3 in.	14.3 in.
WALL THICKNESS				2.3 in.	
LENGTH OF TAIL	17.5 in.	22.7 in.	22.76 in.	22.76 in.	24.0 in.
WIDTH OF TAIL	13.8 in.	16.6 in.	16.6 in.	16.6 in.	19.6 in.
WEIGHT OF TAIL	15.12 lbs.	22.4 lbs.	22.4 lbs.	21.0 lbs.	
TYPE OF FILLING	Explosive D	Explosive D	Explosive D	Explosive D	Explosive D
WEIGHT OF FILLING	33.61 lbs.	32.68 lbs.	43.34 lbs.	58.35 lbs.	35 lbs.
TOTAL BOMB WEIGHT	634.0 lbs.	853.0 lbs.	889.0 lbs.	1077.0 lbs.	1412.0 lbs.
CHARGE/WEIGHT RATIO	5.5%	3.8%	4.8%	5.4%	2.5 %

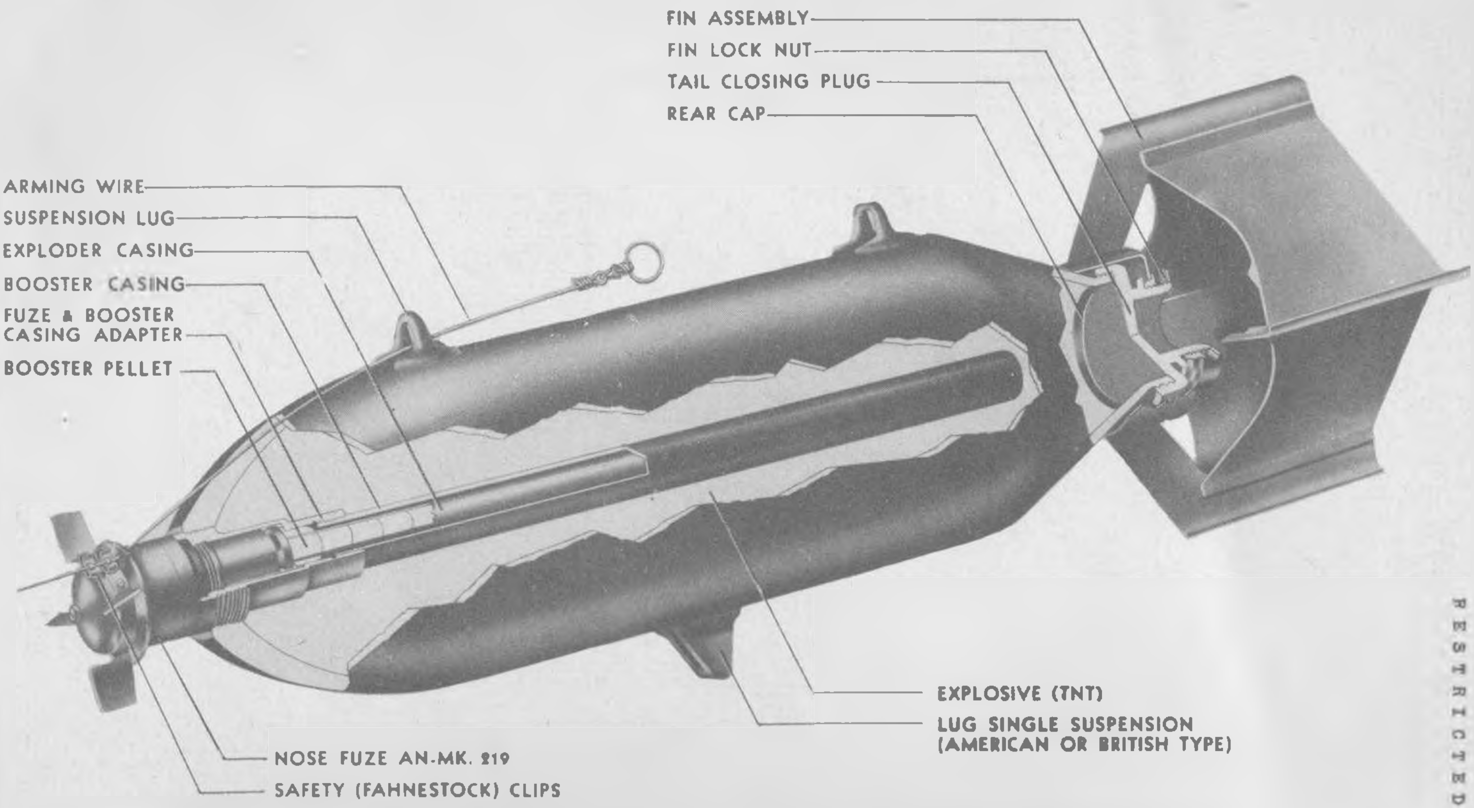
COMMON CHARACTERISTICS "M" DESIGNATED A.P. BOMBS

TARGET:	Armored naval seacraft, reinforced concrete, heavy steel construction.
FUZES:	M-102 or AN-M 102, including A1 & A2 modifications
MATERIAL OF WALL:	Steel
BODY CONSTRUCTION:	These bombs are converted seacoast artillery shells from which the rotating bands may have been removed. The cases are single-piece steel forgings. The modifications of the M52 and M62 differ only slightly in external dimensions and are all equipped with a nose cap for streamlining.
TYPE OF SUSPENSION:	Horizontal
CONSTRUCTION OF SUSPENSION LUG:	Two U-shaped eyebolts welded to plates that are welded or riveted to suspension bands. The bands are secured to the case by tightening bolts on under side of bomb.
COLOR & MARKINGS:	Prior to March 11, 1942, these bombs would have been painted yellow all over with black manufacturer's markings; since that date they have been painted olive-drab with a one inch yellow band around the nose and base and a 1/4 inch band around the center of gravity.
CONSTRUCTION OF TAIL:	Truncated tail cone is secured to bomb base by a locking nut at top of fuze body; four fins or vanes are supported by internal box-type struts.

PART III

U.S. NAVY
"MK." SERIES
BOMBS

100 LB. GENERAL PURPOSE BOMB MK. 4 MOD 4



U. S. NAVY BOMBS

100 LB. G. P.

Mk 1 and Mods
Mk 4 and Mods

(Obsolescent)

DATA:

	Mk I Mods 2-3	Mk IV Mods 1-4
OVERALL LENGTH	48.8 in.	38.2 in.
BODY LENGTH		28.0 in.
BODY DIAMETER	7.9 in.	8.0 in.
WALL THICKNESS		0.175 in.
TAIL LENGTH	21.0 in.	9.1 in.
TAIL WIDTH	9.8 in.	11.0 in.
TAIL WEIGHT		

WEIGHTS:

Type of Filling	Mk I, T.N.T.	Mk 4, T.N.T.
Weight of Filling	Mk I: 65 lbs.	Mk 4: 55 lbs.
Total Weight	Mk I: 116 lbs.	Mk 4: 120 lbs. Mod 1; 105 lbs.Mod 4
Chg / Wt. Ratio	Mk I: 56%	Mk 4: 45.8%; 52.8%

FUZING: AN-Mk 219 Mk233

BODY CONSTRUCTION: Mk I, Mods 2-3: Two sheet steel castings welded together, the bomb having a "tear drop" shape.

Mk IV, Mods 1-4: Single piece steel forging: cylindrical with ogival nose.

SUSPENSION: Mk I, Mods 2-3: Horizontal suspension by two lugs welded on body; may have single lug or trunnions on band.

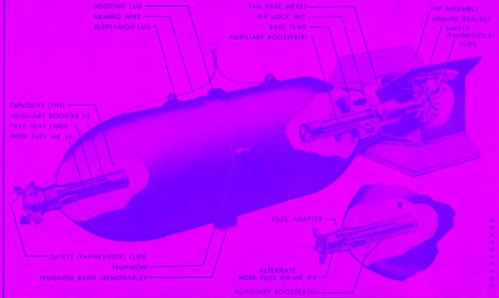
Mk IV,Mods 1-4: Two lugs welded on body 14 inches apart: single lug welded on opposite side.

COLOR & MARKINGS: Grey overall with 4 inch yellow disc between two lugs, indicating H.E. May be yellow overall.

TAIL CONSTRUCTION: Mk I, Mods 2-3: Four vanes which pass down over the body are welded to a tail cone. Vanes fastened to body of bomb by screws and are braced by two sets of bar struts riveted to vanes.

Mk IV,Mods 1-4: Four vanes welded to a sleeve which is secured to bomb body with a locking nut. Box type internal struts are welded to the vanes.

500 LB. G.P. BOMB MK. 12 MOD. 2



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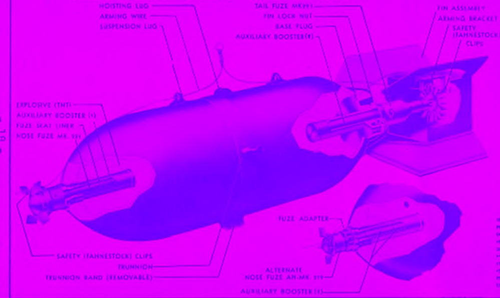
500 LB. G.P. BOMB MK. 12 MOD. 2



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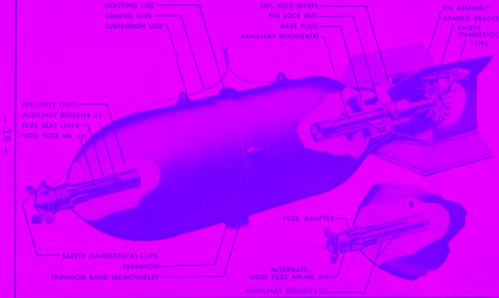
500 LB. G.P. BOMB MK. 12 MOD. 2



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DATA:

	Mk 12 Mod 2
OVERALL LENGTH	59.5 in.
BODY LENGTH	42.6 in.
BODY DIAMETER	14.0 in.
WALL THICKNESS	0.36 in.
TAIL LENGTH	20 in.
TAIL WIDTH	19.4 in.
TAIL WEIGHT	

U. S. NAVY BOMB

500 LB. G.P.

Mk 12
Mk 12 Mod 1
Mk 12 Mod 2

(Obsolescent)

WEIGHTS:

Type of Filling	T.N.T.
Weight of Filling	256 lbs.
Total Weight	504 lbs.
Chg / Wt. Ratio	50 %

FUZING: Nose: AN-Mk 219 (Instantaneous)(Requires Mk 219 adapter ring and one additional Mk I auxiliary booster).
Mk 221 (.01 second delay),Mk 243-0,Mk 244-0-1,Mk239
Tail: Mk 223 (.01 second delay), Mk 229; Mk 229 Mod 3

BODY CONSTRUCTION: One piece steel, forged or drawn; cylindrical with ogival nose.

SUSPENSION: Horizontal suspension by two lugs or trunnions on band for dive bombing.

COLOR & MARKINGS: Grey overall with yellow disc between lugs indicating H.E.

TAIL CONSTRUCTION: Four sheet metal vanes welded to cone which is attached to body by a nut which surrounds the fuze. Box type struts.

REMARKS: Three other 500 lb. G.P. bombs, now obsolete, are:

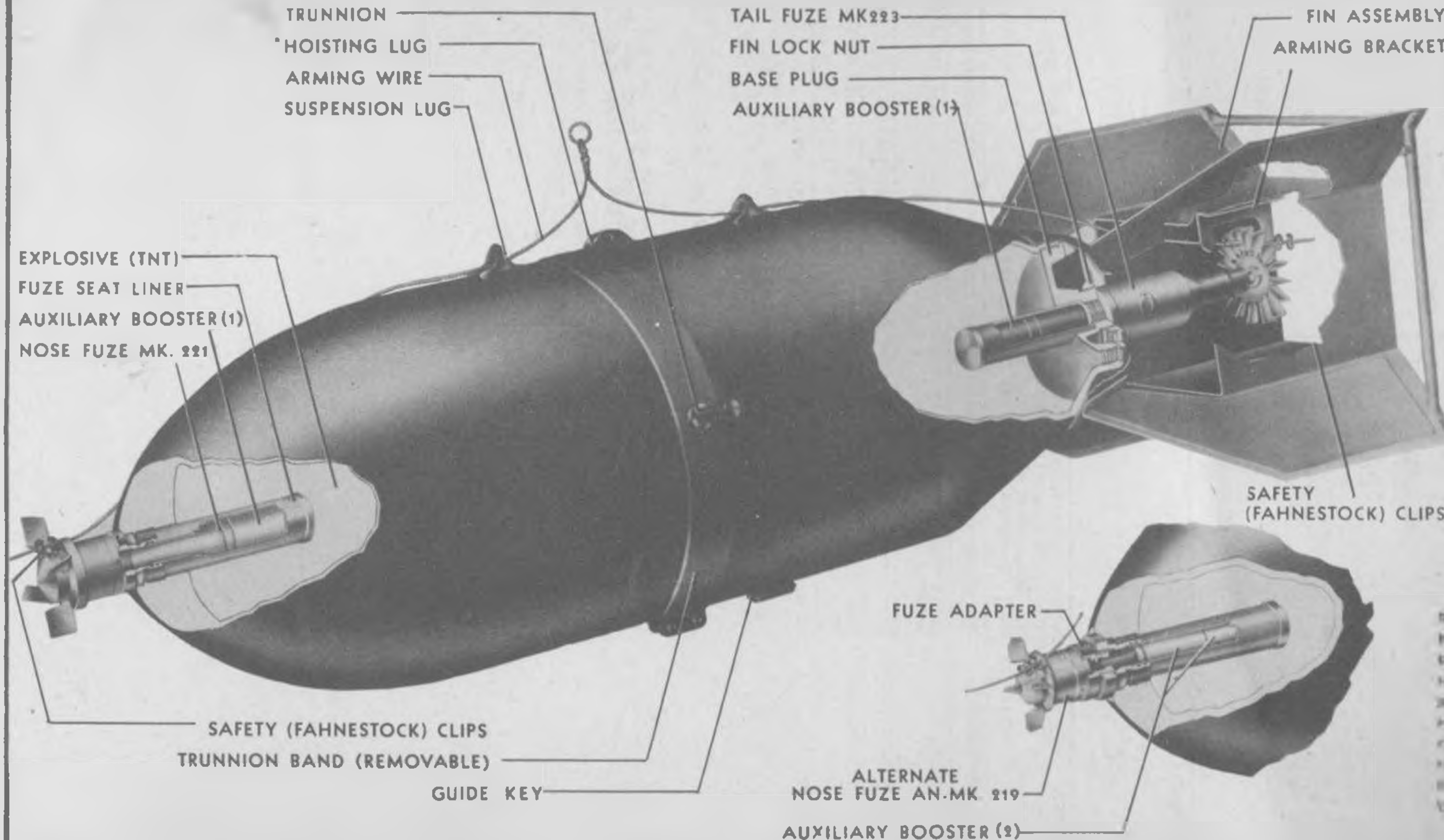
500 lb. Mk III, Mod 1
500 lb. Mk XII, Mod 1
500 lb. Mk IX

The 500 lb. Mk 12 Mod 2 is still to be found in the field, but is no longer being manufactured.

In order to get a wider selection of possible tail fuzings, use an M 102 adapter booster with a .47 inch spacer ring, and install any of the following fuzes: AN-M101A2, M 113A1 or M 116.

The Mk 12 and Mk 12 Mod 1, also declared obsolete, differ from the Mk 12 Mod 2 in that the trunnions are welded to the body. in the former types.

1000 LB. G.P. BOMB MK. 13 MOD. 2



DATA:

	Mk 13 Mod 2
OVERALL LENGTH	72.5 in.
BODY LENGTH	53.0 in.
BODY DIAMETER	17.7 in.
WALL THICKNESS	0.45 in.
TAIL LENGTH	22.3 in.
TAIL WIDTH	23.5 in.
TAIL WEIGHT	

U. S. NAVY BOMB

1000 LB. G.P.

Mk 13
Mk 13 Mod 1
Mk 13 Mod 2

(Obsolescent)

WEIGHTS:

Type of Filling	T.N.T.
Weight of Filling	511 lbs.
Total Weight	1008 lbs.
Chg / Wt. Ratio	51 %

FUZING: Nose: AN-Mk 219 (Instantaneous). Requires Mk 219 adapter ring and one additional Mk 1 auxiliary booster.
Mk 221 (.01 second delay), Mk 243-0, Mk244-0-1, Mk239
Tail: Mk 223 (.01 second delay); Mk 229; Mk 229 Mod 3; Mk230 and Mods.

BODY CONSTRUCTION: One piece drawn or forged steel; cylindrical with ogival nose.

SUSPENSION: Horizontal by two suspension lugs, or suspended by trunnions on band around body for dive bombing. Torpedo sling guide key welded to bomb for suspension in torpedo slings.

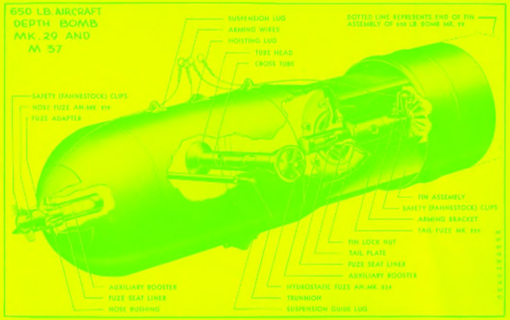
COLOR & MARKINGS: Grey overall with 11 inch yellow disc between suspension lugs to indicate H.E.

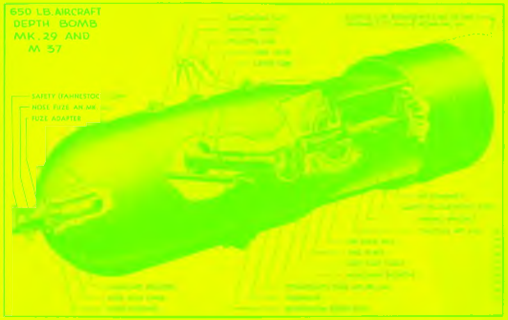
TAIL CONSTRUCTION: Four vanes welded to tail cone which is secured to body by a locking nut which screws onto threaded collar of the base plate.

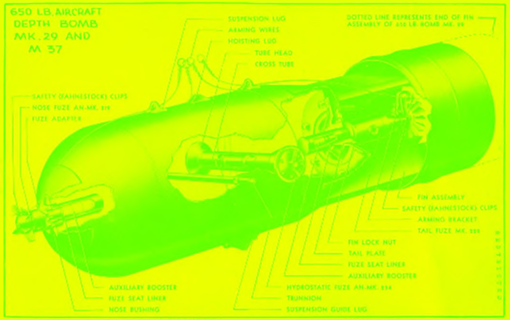
REMARKS: Though this bomb may be found in the field, it is no longer being manufactured.

In order to get a wider selection of possible tail fuzings, use an M102 adapter booster with a .47 inch spacer ring, and install any of the following fuzes: AN-M102A2, M114A1 or M117.

The Mk 3, Mk 5, and Mk 9 bombs are declared obsolete and will be expended in practice. The Mk 13 and Mk 13 Mod 1, also obsolete, differ from the Mk 13 Mod 2 in that the trunnions and two hoisting lugs are welded onto the body.


650 LB. AIRCRAFT
DEPTH BOMB
MK. 29 AND
M 37
SUSPENSION LUG
ARMING WIRES
HOISTING LUG
TUBE HEAD
CROSS TUBE
DOTTED LINE REPRESENTS END OF FIN
ASSEMBLY OF 650 LB. BOMB MK. 29
SAFETY (FAHNESTOCK) CLIPS
NOSE FUZE AN-MK. 219
FUZE ADAPTER
FIN ASSEMBLY
SAFETY (FAHNESTOCK) CLIPS
ARMING BRACKET
TAIL FUZE MK. 229
FIN LOCK NUT
TAIL PLATE
FUZE SEAT LINER
AUXILIARY BOOSTER
AUXILIARY BOOSTER
FUZE SEAT LINER
NOSE BUSHING
HYDROSTATIC FUZE AN-MK. 234
TRUNNION
SUSPENSION GUIDE LUG




650 LB. AIRCRAFT
DEPTH BOMB
MK. 29 AND
M 37
SUSPENSION LUG
ARMING WIRES
HOISTING LUG
TUBE HEAD
CROSS TUBE
DOTTED LINE REPRESENTS END OF FIN
ASSEMBLY OF 650 LB. BOMB MK. 29
SAFETY (FAHNESTOCK) CLIPS
NOSE FUZE AN-MK. 219
FUZE ADAPTER
FIN ASSEMBLY
SAFETY (FAHNESTOCK) CLIPS
ARMING BRACKET
TAIL FUZE MK. 229
FIN LOCK NUT
TAIL PLATE
FUZE SEAT LINER
AUXILIARY BOOSTER
AUXILIARY BOOSTER
FUZE SEAT LINER
NOSE BUSHING
HYDROSTATIC FUZE AN-MK. 234
TRUNNION
SUSPENSION GUIDE LUG

U. S. NAVY BOMBS

650 LB. DEPTH

Mk 29 (Obsolete)
Mk 37 (Obsolete)

DATA:

	Mk 29	Mk 37
OVERALL LENGTH	70.0	63.0 in.
BODY LENGTH	41.0 in.	41.0 in.
BODY DIAMETER	17.7 in.	17.7 in.
WALL THICKNESS	.12 in.	.12 in.
TAIL LENGTH	36 in.	29 in.
TAIL WIDTH	17.7 in.	17.7 in.
TAIL WEIGHT		

WEIGHTS:

Type of Filling	T.N.T.
Weight of Filling	Mk 29: 464 lbs.; Mk 37: 464 lbs.
Total Weight	Mk 29: 657 lbs.; Mk 37: 659 lbs.
Chg / Wt. Ratio	Mk 29: 70%; Mk 37: 70%.

FUZING: Nose: AN-M 103 (Instantaneous); AN-M103A1
AN-Mk 219 (Instantaneous); Mk221; Mk 239

Athwartship: AN-Mk 224 or AN-Mk 234

Tail: Mk 229; Mk 229 Mod 3; AN-Mk230, Mods.

BODY CONSTRUCTION: Bombs are manufactured with a hemispherical nose reinforced with steel disc. The suspension lugs are reinforced with a steel strip. Flat nose attachment in the shape of a bucket and fitting down under the nose of the bomb, can be used to improve underwater trajectory. The vacant spaces are then filled with plaster of paris. These attachments increase the weight by 72 lbs.

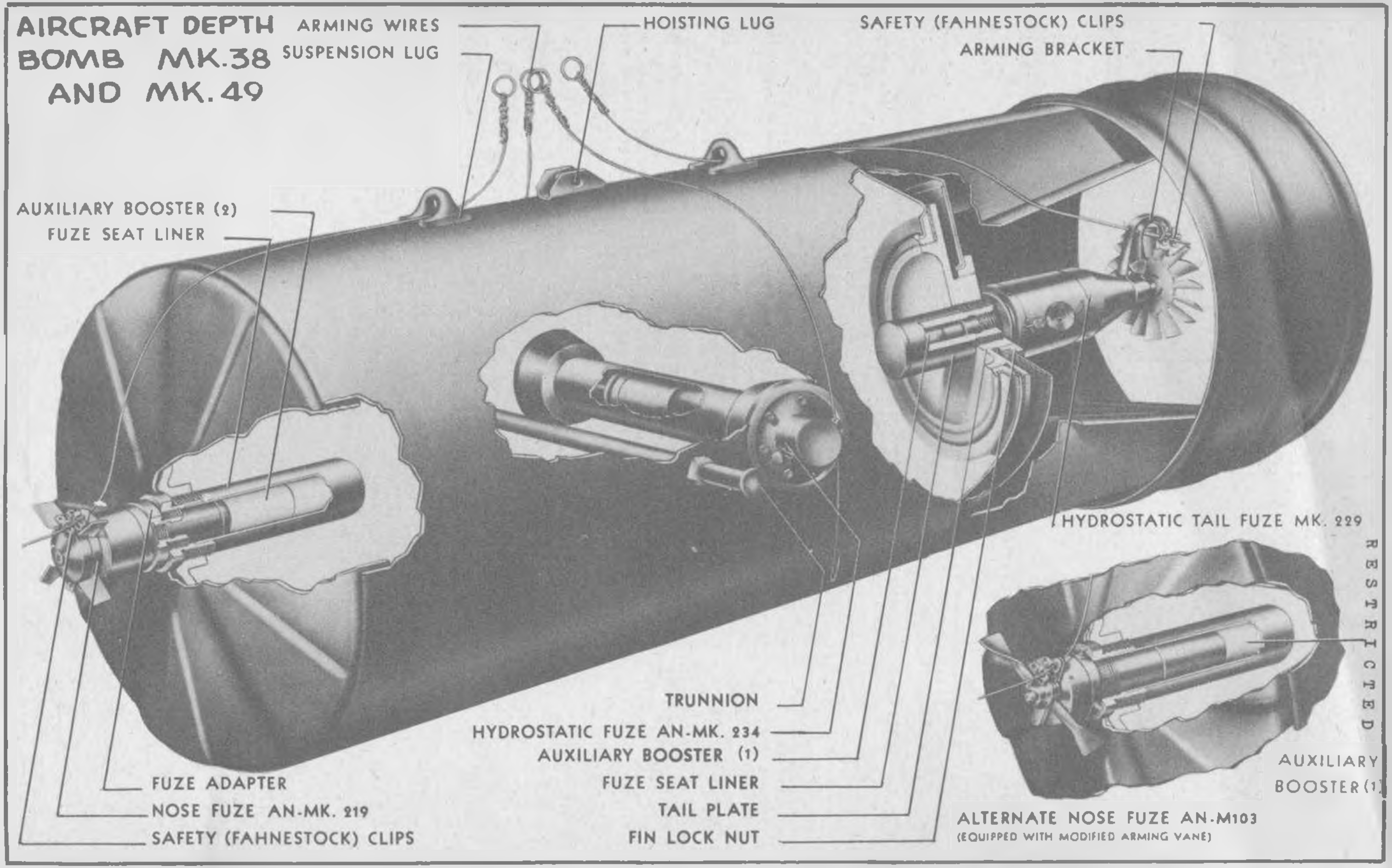
SUSPENSION: Horizontal suspension by the usual two suspension lugs, with threaded holes on each side 90° removed to receive trunnion lugs for displacement gear of dive-bombers.

COLOR & MARKINGS: Painted olive drab or grey overall with an 11 inch yellow disc between the two suspension lugs. May be light grey overall.

TAIL CONSTRUCTION: Four sheet steel vanes welded to tail cone which is secured to the body by locking nut screwing onto the rear of the body. Annular strut is used around rear of vanes. The tail of the Mk 37 was shortened by 7 inches so that the Mk 229 tail fuze could arm more readily. Otherwise the tail is similar to that of the Mk 29.

REMARKS:

(1) AN-Mk 219 will not arm under 2500 feet altitude if flat-nose attachment is used.
(2) Use Mk 219 adapter ring and insert additional auxiliary booster when using AN-Mk 219.
(3) AN-M103 or AN-M103A1 will not arm with flat-nose attachment, unless special arming vanes are used.
(4) An extender is supplied with each bomb to permit installation of the AN-Mk 224 or AN-Mk 234 hydrostatic fuze in the longer athwartship tube.
(5) The Mk 29 converted to the Mk 37 by replacing the tail.
(6) Because of numerous instances in water crash landings where depth bombs fuzed with the AN-Mk 224 or AN-Mk 234 exploded, these two fuzes have been suspended from use. As a consequence, the Mk 29 and Mk 37 may be used only if a nose impact fuze is installed.


AIRCRAFT DEPTH BOMB MK.38 AND MK.49
ARMING WIRES
SUSPENSION LUG
HOISTING LUG
SAFETY (FAHNESTOCK) CLIPS
ARMING BRACKET
AUXILIARY BOOSTER (2)
FUZE SEAT LINER
HYDROSTATIC TAIL FUZE MK. 229
TRUNNION
HYDROSTATIC FUZE AN-MK. 234
AUXILIARY BOOSTER (1)
FUZE SEAT LINER
TAIL PLATE
FIN LOCK NUT
FUZE ADAPTER
NOSE FUZE AN-MK. 219
SAFETY (FAHNESTOCK) CLIPS
AUXILIARY BOOSTER (1)
ALTERNATE NOSE FUZE AN-M103
(EQUIPPED WITH MODIFIED ARMING VANE)

RESTRICTED

DATA:	U. S. NAVY BOMB
OVERALL LENGTH . . . . 58.5 in. BODY LENGTH . . . . 36.4 in. BODY DIAMETER . . . . 17.7 in. WALL THICKNESS . . . . .12 in. TAIL LENGTH . . . . 29.0 in. TAIL WIDTH . . . . 17.7 in. TAIL WEIGHT	**650 LB. DEPTH** Mk 38 (T.N.T.) Mk 49 (Torpex) (Obsolete)

WEIGHTS:

Type of Filling	Mk 38: TNT; Mk 49: Torpex
Weight of Filling	Mk 38: 425 lbs.; Mk 49: 472 lbs.
Total Weight	Mk 38: 634 lbs.; Mk 49: 681 lbs.
Chg / Wt. Ratio	Mk 38: 67 %; Mk 49: 69 %.

FUZING:
- Nose: AN-M103; AN-M103A1 (Instantaneous setting only) with modified arming vane. AN-Mk 219 (Instantaneous)
- Athwartship: AN-Mk 224 or AN-Mk 234
- Tail: Mk 229; Mk 229 Mod 3 (See Remarks); AN-Mk230 and Mods.

BODY CONSTRUCTION:	The body is constructed in three pieces, the flat nose and tail piece being welded onto the sheet steel center tube. The suspension lugs are reinforced with a strip of sheet steel.
SUSPENSION:	Horizontal suspension by the usual two suspension lugs, with threaded holes on each side 90° removed to receive the trunnion lugs for suspension from dive bombers.
COLOR & MARKINGS:	T.N.T. loaded bombs have Mark numbers and weight stencilled in yellow; Torpex loaded bombs have markings in blue.
TAIL CONSTRUCTION:	Four vanes supported by a circular strut.

REMARKS:

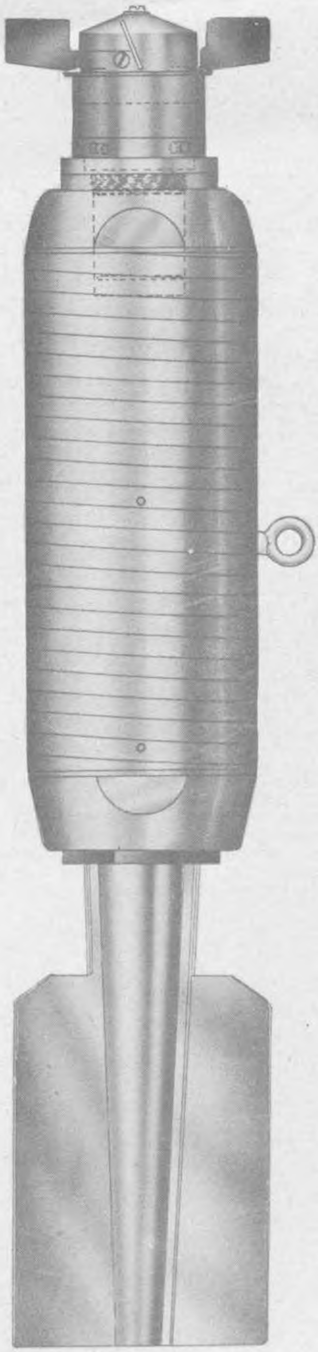
(1) AN-Mk 219 will not arm if dropped from under 2500 feet. A Mk 219 adapter and an additional Mk 1 auxiliary booster must be used with this fuze.
(2) Mk 221 arms with difficulty, and should not be used because of delay.
(3) An extender is supplied with each bomb to permit installation of the AN-Mk 224 or AN-Mk 234 hydrostatic fuze in the longer athwartship tube.
(4) AN-M103 and AN-M103A1 must have special flat nose depth bomb vane.
(5) Because of numerous instances in water crash landings where depth bombs fuzed with the AN-Mk 224 or AN-Mk 234 exploded, these two fuzes have been suspended from use. As a consequence, the Mk 38 and Mk 49 may be used only if a nose impact fuze is installed.

SECTION IV

PYROTECHNICS

CONFIDENTIAL

U.S. NAVY 30LB. FRAGMENTATION BOMB



DATA:	U. S. NAVY BOMB
OVERALL LENGTH . . . . 22.2 in. BODY LENGTH . . . . 12.8 in. BODY DIAMETER . . . . 4.2 in. WALL THICKNESS . . . . 0.57 in. TAIL LENGTH . . . . 7.0 in. TAIL WIDTH . . . . 6.5 in. TAIL WEIGHT . . . . 2.5 lbs.	**30 LB. FRAG** Mk 5, Mods 0, 1, 2, and 3 (Obsolete)

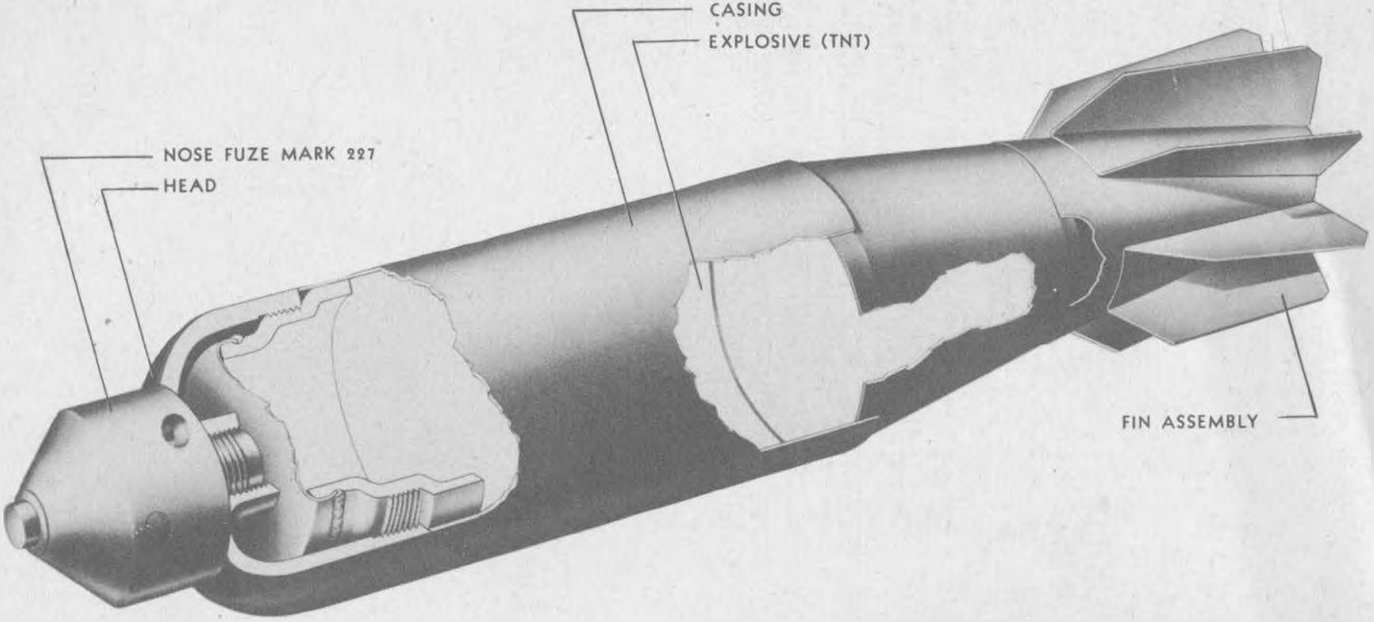
WEIGHTS:

Type of Filling . . . . Cast T.N.T.
Weight of Filling . . . . 4.5 lbs.
Total Weight . . . . 33.4 lbs.
Chg / Wt. Ratio 13.0%

FUZING: Nose:
Mk 5 Mod 2 and Mod 3: AN-Mk 219
Mk 5 Mod 0 and Mod 1: Mk XIV (Army Fuzes)

BODY CONSTRUCTION:	Cast steel nose and tail piece threaded onto tubular steel body. The only difference in construction is that in the Mk V Mod 1 and 2, 23 rings cut from seamless tubing are fitted around the tubular body, while on the Mk 5 Mov 3, a steel wire is helically wound left handed, the adjacent surfaces of wire being parallel.
SUSPENSION:	Horizontal suspension by a single eyebolt which is screwed into a ring at the center of the body.
COLOR & MARKINGS:	Yellow overall or grey with yellow disc on body.
TAIL CONSTRUCTION:	Four sheet steel vanes welded to tail cone, which is secured to base plug by a single bolt.

5 LB. ANTI-AIRCRAFT BOMB MARK 34



DATA:	U. S. NAVY BOMB
OVERALL LENGTH . . . . 15.0 in. BODY LENGTH . . . . 12.0 in. BODY DIAMETER . . . . 3.0 in. WALL THICKNESS . . . . .05 in. TAIL LENGTH . . . . 3.0 in. TAIL WIDTH . . . . 3.0 in. TAIL WEIGHT	**5 LB. A.A.** Mk 34 (Obsolete)

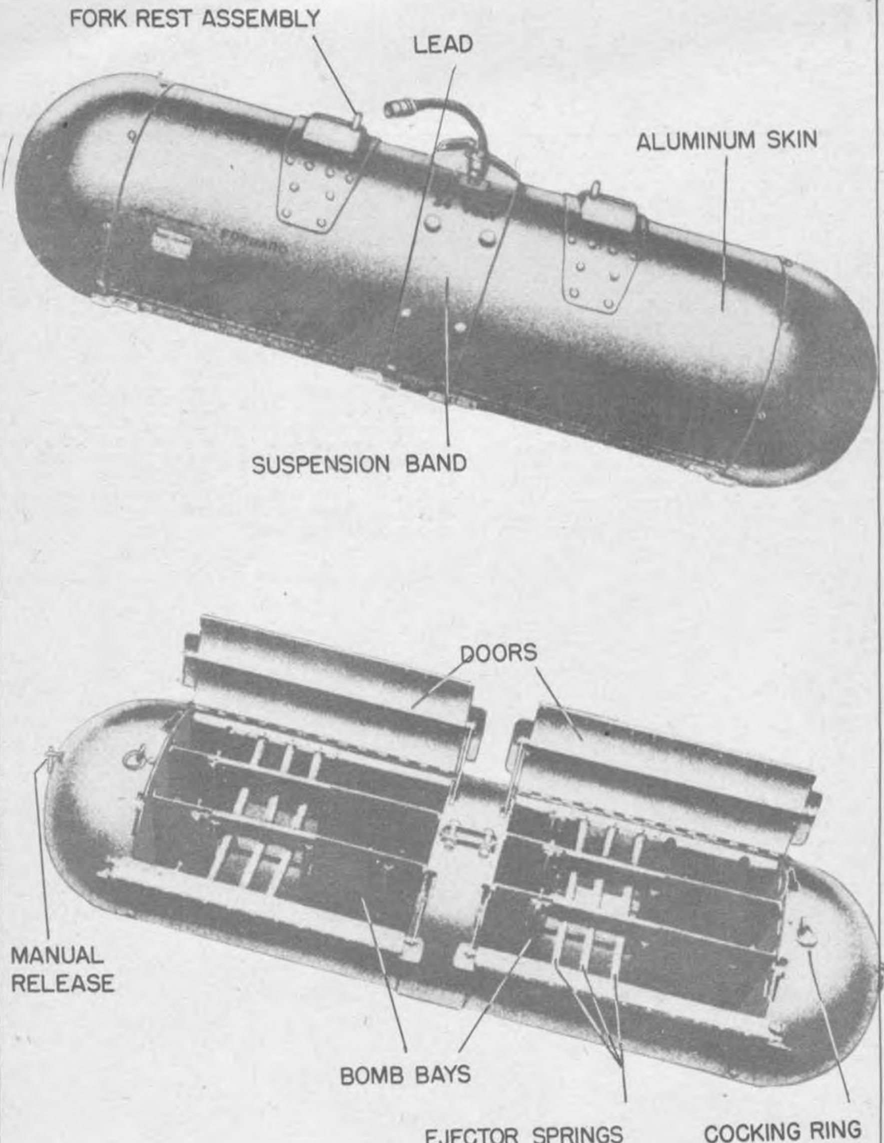
WEIGHTS:

Type of Filling . . . . T.N.T.
Weight of Filling . . . . 1.9 lbs.
Total Weight . . . . 5.5 lbs.
Chg / Wt. Ratio . . . . 34.5 %

FUZING: Mk 227 (Nose)

BODY CONSTRUCTION:	Reinforced steel nose and conical tail section welded to cylindrical steel body.
SUSPENSION:	Mk 3 or Mk 3 Mod 1 container (capacity 20 Mk 34 bombs).
COLOR & MARKINGS:	Grey or olive-drab overall. If grey, will have yellow disc on body; if olive-drab may have yellow nose band.
TAIL CONSTRUCTION:	Eight sheet steel vanes welded to tail cone which, in turn, is welded to body. Vanes are welded on cone at ten degree angle from the longitudinal axis.
REMARKS:	3 lb. Type C (Mk XXXII) A.A. bomb is a smaller copy of the 5 lb. bomb. It is no longer being used.

BOMB CONTAINER MK.3. MOD.I.



BOMB CONTAINER

Mk 3 Mod 1

Data

OVERALL LENGTH		51.1 in.
DIAMETER		13.2 in.
WEIGHT UNLOADED	Mk 3:	65 lbs.
	Mk 3-1:	67 lbs.
WEIGHT LOADED	Mk 3:	175 lbs.
	Mk 3-1:	177 lbs.
CAPACITY		20 Mk 34 A.A.bombs

GENERAL:

The containers are designed to carry 20 Mk 34 A.A. bombs, ten being held in the front compartment and ten in the rear compartment.

DESCRIPTION:

Each housing assembly contains three bomb bays running lengthwise, the outside holding three bombs in each, and the center holding four bombs to make a total of ten for each assembly. The bombs are loaded onto three ejector springs that run crosswise of the housing and are anchored on the flange on each side of the housing. These springs eject the bombs after the door opening mechanism unlatches the doors. After the last bomb has left each compartment, the door closing mechanism shuts and holds the doors closed under spring tension until the container is re-loaded.

The outside skin of the container is of sheet aluminum.

OPERATION:

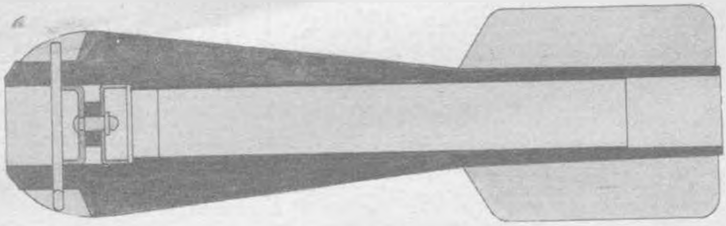
When the operating switch is closed, the solenoid, Mk 24 or Mk 24 Mod 1, mounted on each of the door opening assemblies, is energized. The solenoid imparts the power derived from the electrical source to unlatch the doors. The ten bombs in the front compartment are expelled on the first closing of the operating switch and the ten in the rear are expelled on the second closing of the switch.

The container can also be operated manually.

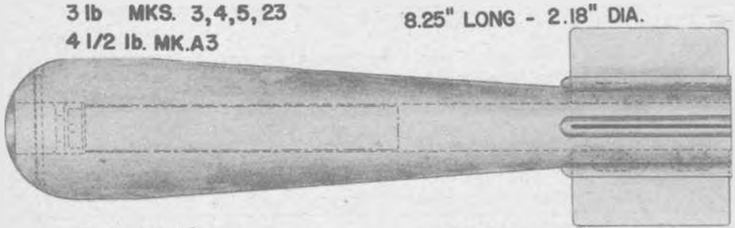
REMARKS:

The Mk 3 and Mk 3 Mod 1 bomb containers are identical with the exception of the suspension band, fork rests, and outside skin.

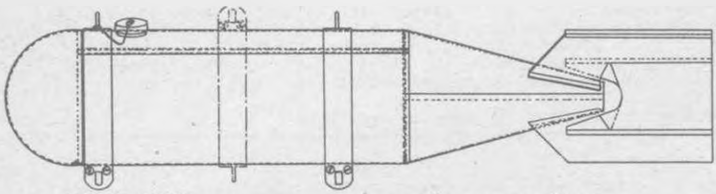
U.S.NAVY PRACTICE BOMBS



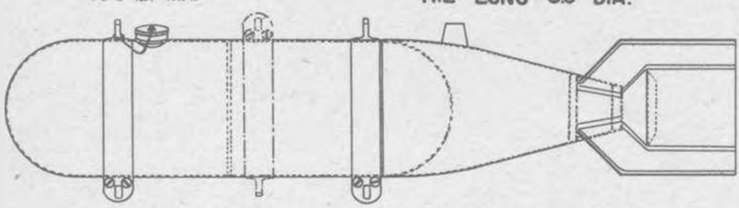
3 lb MKS. 3,4,5,23
4 1/2 lb. MK.A3
8.25" LONG - 2.18" DIA.



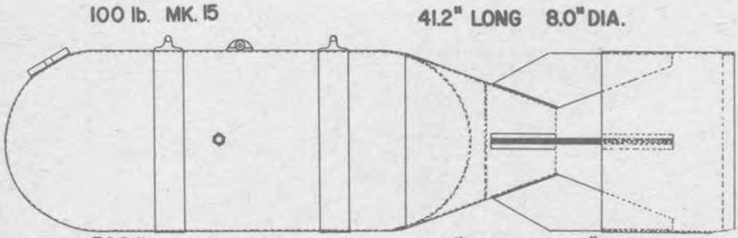
13 lb. MK.19
13.0" LONG - 2.6" DIA.



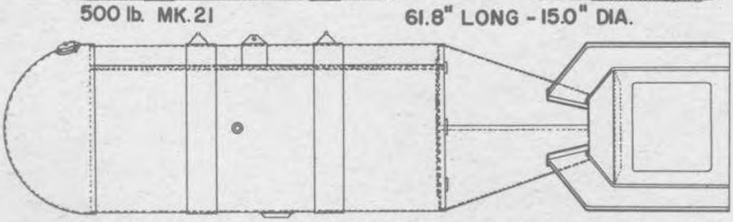
100 lb. MK.7
41.2" LONG - 8.0" DIA.



100 lb. MK.15
41.2" LONG 8.0" DIA.



500 lb. MK.21
61.8" LONG - 15.0" DIA.



1 1000 lb. MK.22
79.0" LONG - 19.0" DIA.

U. S. NAVY

PRACTICE BOMBS

The United States Navy uses two types of practice bombs: (a) Miniature practice bombs and (b) regular-sized practice bombs. Since the miniature practice bombs contain only a practice signal cartridge as a spotting charge and the regular-sized practice bombs contain neither a fuze nor a spotting charge, the information on these bombs has been condensed into the tables below.

MINIATURE PRACTICE BOMBS:

	3 lb. Mks. 3, 4; AN Mk 5 and AN-Mk 23, 43	13 lb. Mk 19
OVERALL LENGTH	8.25 in.	13.0 in.
BODY DIAMETER	2.18 in.	2.6 in.
COLOR & MARKINGS	Unpainted	Unpainted or black
BODY CONSTRUCTION	Alloy Casting	
FILLING	These bombs use either the AN-Mk 4 or Mk 5 Signal Cartridge.	
REMARKS	The AN-Mk 4 practice signal cartridge is an extra long 10-gauge shot gun shell which is inserted in the nose of the bomb. On impact the cartridge is fired, expelling a large puff of black smoke from tail of bomb. The firing device consists of two shallow cups separated by a spacer, the firing pin extending through the bottom of one cup. The firing mechanism in the Mk 5 Mod. 1 is more sensitive than in other marks. The Mk 5 signal cartridge is the same size but filled with fluorescein, which stains the water, giving a spot of longer duration than the AN-Mk 4. Difference between bombs is primarily a difference in alloy of casting.	

REGULAR-SIZED PRACTICE BOMBS:

	LENGTH	DIAMETER	COLOR	TOTAL WEIGHT WATER FILLED	TOTAL WEIGHT WET SAND FILLED
100 lb. Mk. 7	41.2 in.	8.0 in.	Black	48.5 lbs.	83.0 lbs.
100 lb. Mk. 15	41.2 in.	8.0 in.	Black	57.0 lbs.	100.0 lbs.
500 lb. Mk. 5	67.3 in.	16.0 in.	Black	360.0 lbs.	500.0 lbs.
500 lb. Mk. 11	61.8 in.	15.0 in.	Black	268.0 lbs.	448.0 lbs.
500 lb. Mk 21	61.8 in.	15.0 in.	Black		489.0 lbs.
1000 lb. Mk. 7	80.0 in.	19.0 in.	Black	580.0 lbs.	1000.0 lbs.
1000 lb. Mk. 22	79.0 in.	19.0 in.	Black		1013.7 lbs.

No fuzes are used in these bombs and they contain no spotting charge, being filled either with water or wet sand. The filling is usually stencilled on the body of the bomb. To prevent freezing and splitting of cases at high altitude, anti-freeze is added. To improve spotting of hits, a spotting dye is also used.

REMARKS:

Mk 15 100# and Mk 21 500# are the only ones being issued now; the others are obsolete.

PART IV

U. S. ARMY-NAVY "AN" SERIES BOMBS

CONFIDENTIAL

INTRODUCTION

INTRODUCTION

The creation of the Army-Navy Standardization Committee resulted in the standardization of the bombs of these two services into the A N series. This series was very similar to the "M" series except for these modifications:

(a) A third suspension lug was added at the center of gravity and diametrically opposite the dual suspension lugs to fit British release devices.
(b) The base plate was changed to a male plug to increase the strength on low angle penetration of targets.
(c) The bombs were painted an overall olive-drab with 1" yellow bands around the nose and base and a 1/4 inch yellow band around the center of gravity.

The bombs in this series included the following weights: 100#, 250#, 500#, 1000#, and 2000#. These bombs are all general purpose high-explosive bombs. Though other types of bombs (i.e. armor-piercing, semi-armor piercing, fragmentation, incendiary, depth, etc.) have been subsequently standardized and given AN designations, it is with the AN general purpose bombs and their modifications that this introduction shall be concerned.

AN G.P. Series:

The AN series was subsequently replaced by the AN G.P. series to make it possible for these bombs to be used in anti-submarine work as well as for general bombardment. This modification was incorporated into the 500#, 1000#, and 2000# bombs only, their new designations becoming AN-M 64, AN-M 65, and AN-M 66, and consisted of a change from the M102 adapter booster to the M115 adapter booster. With the M115 adapter booster, it became possible to use either standard Army tail fuzes or the AN-Mk 230 tail hydrostatic fuze. The standard filling of these bombs was 50/50 Amatol until the supply of T.N.T. became ample in 1943, at which time T.N.T. became the standard filler. At the present time, 25% of the production of these bombs is filled with Composition "B".

AN G.P. Al Series:

The Al modification consists of two steel pins in the base plate which lock the base plate to the main filling, thus preventing removal of the base plate once the bomb is filled. In this series the adapter boosters have also been modified to the M102 Al and the M115 Al. This modification consists of a hole through the adapter booster and a groove in the threads of the base plate to receive a locking pin which is shipped with all anti-withdrawal tail fuzes. Insertion of the pin which is held in by the fuze body prevents withdrawal of the adapter booster. This series is the current production G.P. bomb series and is used jointly by the Army, Navy, and British.

General Purpose Bomb Designations:

The following table will assist in understanding the development of the designations that have been successively applied to general purpose bombs used by the Army and Navy:

Weight (lb)	M Series	Navy	AN Series	AN-GP Series	AN-GP Al Series
100	M30	Mk 4-4	AN-M30	AN-M30	AN-M30 Al
250	M57		AN-M57	AN-M57	AN-M57 Al
300	M31				
500	M43	Mk 12-2	AN-M43	AN-M64	AN-M64 Al
600	M32				
1000	M44	Mk 13-2	AN-M44	AN-M65	AN-M65 Al
1100	M33				
2000	M34		AN-M34	AN-M66	AN-M66 Al

COMMON CHARACTERISTICS OF "AN" DESIGNATED GENERAL PURPOSE BOMBS:

Body Construction

The body construction of American G.P. bombs may be in one, two, or three pieces. Methods of manufacture include (a) one piece cast or spun, (b) two piece cast and welded or (c) three piece cast and welded. The ogival nose tapers to join the thin parallel side walls which terminate in a boat tailed shape at the after end. The threaded nose opening is closed by the fuze seat liner and the threaded base opening is closed by a male plug, the tail fuze pocket being made by the adapter booster.

Suspension

Dual suspension lugs for horizontal suspension are welded directly to the bomb case, being spaced 14 inches apart on bombs up to 2000 pounds, and 30 inches apart on bombs 2000 pounds and over. A single horizontal suspension lug is also welded to the bomb case at the center of gravity and diametrically opposite the dual lugs. The lugs are eyebolts, shaped from bar steel and formed in the shape of a U. M series bombs could be carried on single suspension racks by using an additional single suspension lug welded on a band fitting around the bomb body at the center of gravity.

For suspension in dive bomb displacement gear, trunnions are provided on a separate band which may be one of two types. The first type provides the trunnion only, and the second, a more common type, provides a single hoisting lug in addition to the trunnions. On some of the newer designs of AN bombs of Navy manufacture, the suspension and hoisting fittings are not attached to the bomb case by welding, but are held to the case by threaded bolts fitting into holes tapped and threaded into the body. For suspension in torpedo slings, the torpedo sling guide key found on Navy bombs can be made on AN bombs by using the base of the single suspension lug with the lug removed by gentle hacksawing.

To hoist bombs into Navy planes, the AN bombs not equipped with hoisting lugs must have a hoisting lug furnished by either an expendable band with single or dual lugs, or by a removable hoisting band. The removable band is preferred, since it does not affect the terminal velocity of the bomb. The newest and best of these bands is the Mark 8 universal hoisting band. For Army planes, bombs are usually hoisted by canvas slings, which also have the advantage of not affecting air trajectory.

Tail Fin Construction

The tail construction is known as the box type tail and consists of the following parts: A cast steel sleeve secured to the body of the bomb by a fin locking nut, four sheet steel fins supported by 4 sheet steel struts in the shape of a box. One fin and one strut are pressed from the single piece of metal and the four pieces are then welded to the sleeve. 'A' indicates heavier construction for high altitude bombing.

Color and Markings

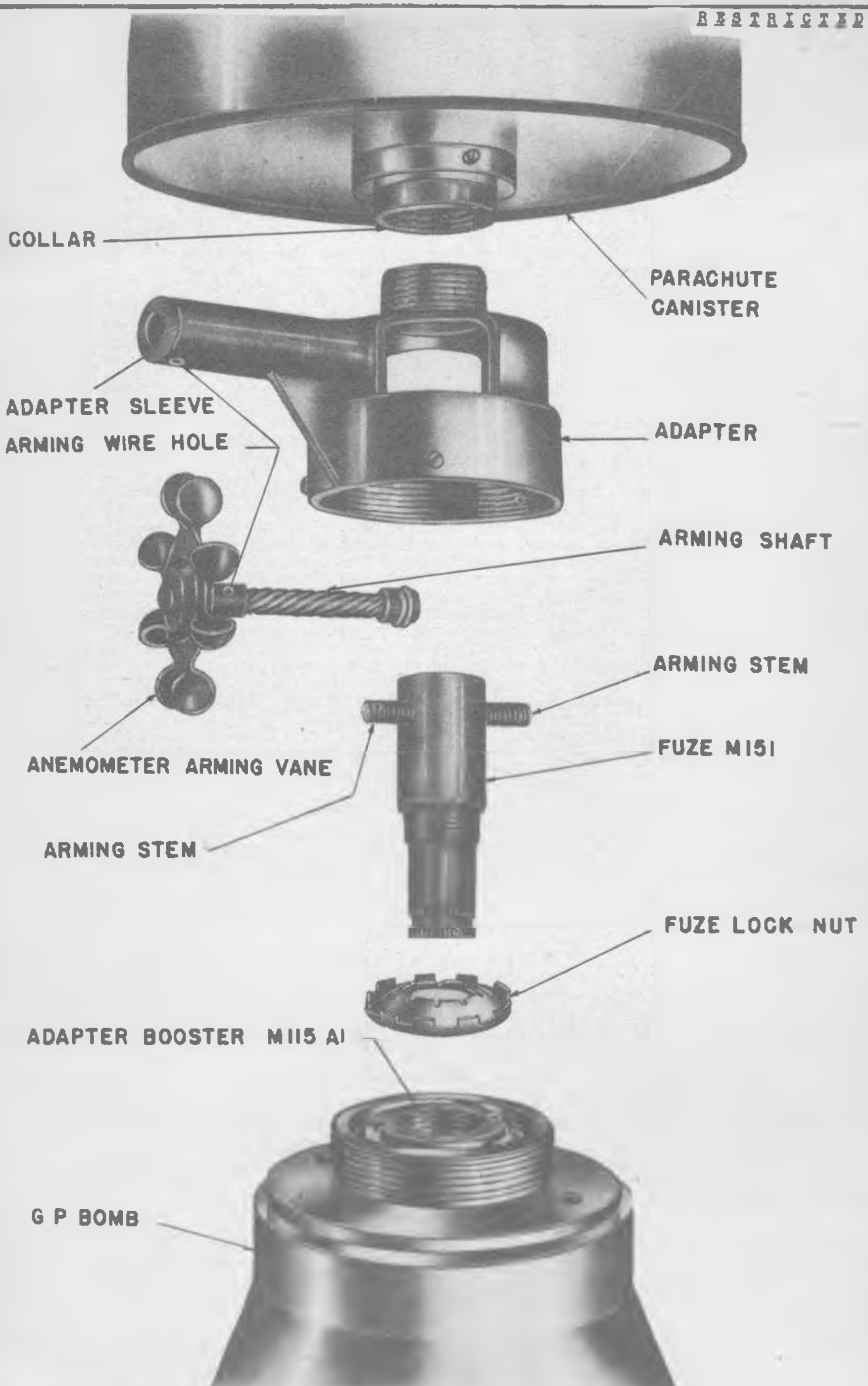
The standard color scheme employed on these bombs since March 11, 1942, has been an olive drab body with yellow bands to indicate the H.E. filler. The banding system for Amatol and TNT fillers is a 1" yellow band at the nose, a 1" yellow band at the tail of the bomb body, and a 1/4" dotted band at the center of gravity. Because Composition "B" is more sensitive and requires more careful handling, it is given an additional marking of a second 1" yellow band at the nose and at the tail. On these bands "Comp. B" is stencilled in black paint. Recent production eliminates the 1/4" band, since the center of gravity is located accurately enough by the single suspension lug.

The following standard markings are painted on the bomb body in black paint; type, weight and name of bomb, type of filling, lot number, place of filling and date of filling and inspector's initials.

Additional indestructable marking is stamped into the metal of the bomb case on the rear conical surface of the bomb body; type, size, name, maker's initials, lot number and date (i.e., G.P. 500 lb. AN-M64 CSCO Lot 57 4/42).

Explosive Filling

The filling of these bombs is accomplished in the following manner. With



EXPLODED VIEW SHOWING COMPONENTS OF ANTI-RICOCHET PARACHUTE ASSEMBLY

Explosive Filling (cont'd)

the nose fuze seat liner in place, the bomb is placed on end nose down and an M104 auxiliary booster is positioned behind it. The M104 is a bakelite tube containing tetryl pellets. The initial pour of the explosive is sufficient to secure the auxiliary booster when it cools, then the remainder of the filling, 50/50 Amatol, TNT, or Composition "B" is added until approximately 6 inches remains to be filled. A second M104 auxiliary booster is then inserted in all bombs except the 100 lb. and the tail surround is added to complete the filling. A wooden former is inserted in the tail fuze cavity as the filling cools. After cooling, the former is removed and the appropriate adapter booster is inserted. The adapter booster consists of the fuze seat liner with an additional steel cup containing a tetryl pellet. The M102 (and M102A1) adapter booster has an internal thread diameter of 1.50 inches. The M115 adapter booster has an internal thread diameter of 2.0 inches, and an adapter ring to further reduce the diameter to 1.50 inches when smaller fuzes are used. For reference to adapter boosters, see page 145.

In recent production the auxiliary booster has been eliminated in Composition "B" loaded AN-M64 500 lb., AN-M65 1000 lb., and AN-M66 2000 lb. G.P. bombs. It has been found that the auxiliary booster has little connection with the effectiveness of the bomb, considering the fact that Comp. "B"'s rate of detonation is 500 ft/sec greater than the tetryl in the booster.

Nomenclature

When under development, Army bombs carry temporary designations which are later dropped when the bombs are standardized. Experimental bombs are indicated by the letter "T" (e.g. T10, T9); modifications incorporated in the basic design carry the letter "E". If the developmental bomb is standardized by the Army through the Ordnance Technical Committee, the "T" designation is dropped and an "M" number is assigned. When a modification on a standard item is under development, the change will be given an "E" designation; if the bomb thus modified is adopted as standard it will take a designation in sequence in the "A" series (AN-M66A1, AN-M66A2) indicating an alteration in the basic design.

In undertaking the development of a new bomb, the Navy Bureau of Ordnance assigns a Mark number which will designate the bomb in the experimental stage as well as in service use. No system of "T" designations is employed. When adopted as standard by the Joint Aircraft Committee, the prefix "AN" is placed before the M or Mk designation.

Anti-Ricochet Attachments

To give a more vertical impact to 100 lb., 250 lb., and 500 lb. G.P. bombs and to break their rapid descent when dropped from low-flying planes, the M16 and M17 anti-ricochet devices have been developed. The device consists of a parachute unit, a modified AN-M112A1 series tail fuze (M151) using an anemometer type arming vane, and a fuze adapter.

Status

Where possible the status of each bomb has been given according to Navy definition. "Service" indicates that the item is under current procurement. "Obsolescent" indicates that the bomb is becoming obsolete, that no future procurement is contemplated, but that large stocks may be on hand. "Obsolete" indicates that the present stock is almost exhausted and that it will not be replenished. Items of Army design not procured by the Navy are not classified.

Clusters, Cluster Adapters

An attempt has been made to differentiate between "clusters" and "cluster adapters". Properly, the cluster adapter is merely the containing device or holder; when the adapter is loaded with bombs, the entire assembly becomes a cluster. In some cases the cluster adapter may closely resemble a bomb in construction (e.g. M15 and M16), while in others the adapter is nothing more than a banding arrangement (AN-M1A1, AN-M4).

Practice Bombs

The mose common practice bomb for Army use is the M38A2, from which the Colored Smoke Streamer M87 was developed (page 323), simulating general purpose bombs. Other Army practice bombs are the M48 (simulating the AN-M41A1 20 lb. Frag, page 87); the M71 and M73 (simulating the AN-M40A1 23 lb. Para-Frag, page 89); and the M85, a substitute for the M38A2 (see pages 45 and 323). The M75, similar in construction to the M84 Target Identification Bomb (see page 321) is used to furnish a target reference for practice bombing over snow-covered ranges. Navy practice bombs are described and discussed on pages 32 and 35.

EXPLOSIVES

GENERAL:

Two scales are emplèyed to compare sensitivity of explosives. 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. 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 is powerful, brisant, easy to load by casting since its melting point (Grade A) is 80.2 degrees C, stable under all stowage 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.

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

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. 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 (130 degrees 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. Tetryl is quite safe to handle and is extremely stable in stowage. Exposed or loose tetryl should not be handled as it may cause 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 more powerful than TNT. Its Laboratory Impact Value is 46. 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 : (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 covering the interior of 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, and it is considered much too sensitive to use alone. 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 appreciably more sensitive to percussion and impact than Tetryl and is, therefore, not used alone as a booster, though it is being used as a base charge in some compound detonators in the way Tetryl is. The tendency of PETN to burn is much less than that of similar explosives. Its main use alone in the service is in primacord. When used alone, PETN is combined with a small quantity of wax to desensitize and lubricate it and is loaded by pressing. 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. The 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)

Haleite 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 degrees 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 be pressed. Its rate of detonation is 25,000 ft/sec at a density of 1.5 . Its Laboratory Impact Value is 46. Its Bullet Impact Value is not available.

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NITROGUANIDINE :

Nitroguanidine is the explosive incorporated in the Navy's new double based propellant powder, SPCG. It is unusual in being a high explosive that is so cool in its reaction that it explodes without flash. 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, a substitute for TNT, 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 the 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 TNT is molten and it therefore must be loaded by extrusion. Amatol has a disadvantage in that it is very hygroscopic and therefore is usually protected by a sealing pour of pure TNT.

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 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, and 1% wax. Composition B2 is a mixture of 60% RDX, 40% TNT. The TNT cuts down the sensitivity of the RDX to a safe range and lowers the melting point to 81 degrees C, allowing the material to be cast loaded.

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 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 produces gas causing pressure in the case. 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 grey.

DBX : (Depth bomb explosive)

DBX is another Aluminized RDX mixture and its name suggests its intended use. It is 21% RDX, 21% Aluminum 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 as the present supply of RDX seems adequate to meet the demand. DBX can be cast though its melting range of 98 - 105 degrees 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 underwater. Its Laboratory Impact Value is not given. Its Bullet Impact Value is 51. Its color is grey.

HBX :

HBX is a new mixture designed to replace Torpex in depth bombs and has been loaded in the AN-Mk 54 Mod 1 flat nose bomb. HBX is 40% RDX, 38% TNT, 17% Aluminum Powder, 5% desensitizer. Tests indicate that it will be about 98% to 100% as powerful as Torpex, that it will definitely be 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.

A 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 HBX 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 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 (70/30 is a frequent 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 auxillary 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 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 stowage, 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 90/10. 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 24,000 ft/sec. Its Laboratory Impact Value is 47. Its Bullet Impact Value is 48.

EDNATOL :

Ednatol is a mixture of 57% EDNA and 43% TNT, designed to ease the shortage of RDX. In the near future, it will be loaded as a substitute for Composition B in large G.P. bombs and frag. bombs. It is somewhat more powerful than TNT and comparable in sensitivity. It becomes soft enough to pour at 80 degrees C and it is, therefore, cast. It is entirely stable in stowage. 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 high explosive equal to Composition B and Pentolite, and superior to Tetrytol and Ednatol. It is less sensitive than Tetrytol and 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 Compostion B, and is about 10% more effective than Tetryl as a booster. It may be used as a booster, as a 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% 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 and 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 being tested for future use. 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.

PICRATROL:

Picratol is a mixture of 52% Explosive D and 48% TNT. It is currently used in the 2000 lb. M103 S.A.P. bomb and is under consideration for appliance in other Army A.P.'s and S.A.P.'s. Picratol's stability is about equal to that of Explosive D and TNT. It has a rate of detonation of 22,875 ft/sec at a normal loading density of 1.625. Brisance tests, peak pressure tests, and impulse tests indicate that Picratol's destructive force is somewhat less than that of TNT, but greater than that of Explosive D.

CYCLOTOL 70/30:

Cyclotol 70/30, a mixture of 70% RDX and 30% TNT, closely resembles Composition B except for the altered proportions of the components, and is designed as a replacement for Pentolite. It will not, however, have Pentolite's resistance to flame. Though results of tests are not available, Cyclotol may be anticipated to be more sensitive than Composition B, but considerably less than Pentolite.

TRITONAL:

Tritonal is composed of 80% TNT and 20% aluminum powder and is contemplated for use in some 4000 lb. AN-M56 light case bombs, the JB-2, and in several G.P. bombs (Army 500 and 1000 lb. G.P.'s), where maximum blast effect is desired. Tritonal is cast, segregation of the aluminum being prevented by a pellet loading technique. The laboratory impact value is 89, bullet impact value is 64, velocity of detonation is 18,000 ft/sec. at a density of 1.70.

MERCURY FULMINATE:

Mercury Fulminate is an initiating explosive that may be used as either 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 lower 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.

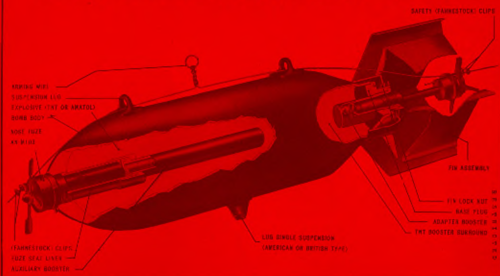
LEAD AZIDE:

Lead Azide 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 Mercury 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.

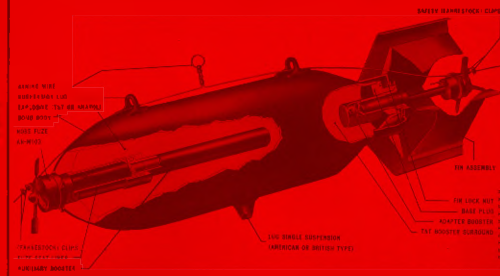
DDNP:

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 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.

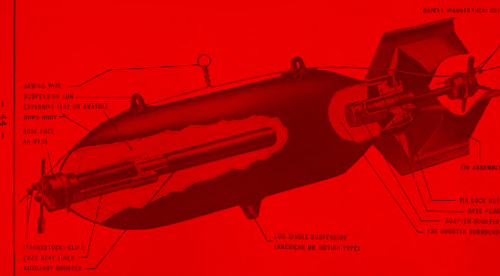
100 LB. GENERAL PURPOSE BOMB AN-M30



100 LB. GENERAL PURPOSE BOMB AN-M30



100 LB. GENERAL PURPOSE BOMB AN-M30



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DATA:

OVERALL LENGTH	38.0 in.
BODY LENGTH	29.0 in.
BODY DIAMETER	8.2 in.
WALL THICKNESS	0.16 in.
TAIL LENGTH	9.75 in.
TAIL WIDTH	11.0 in.
TAIL WEIGHT	3.5 lbs.

ARMY-NAVY BOMB

100 LB. G.P.

AN-M 30
AN-M 30A1

(Service)

WEIGHTS:

	50/50 Amatol	T.N.T.
Type of Filling		
Weight of Filling	54.0 lbs.	57.0 lbs.
Total Weight	110.0 lbs.	115.0 lbs.
Chg / Wt. Ratio	49 %	50 %

FUZING:

Regular Missions

Nose: AN-M103, AN-M103A1, M135, M135A1, M136, M136A1, M139, AN-M139A1, AN-M140A1, M140, M140A1, M149, M163, M164, M165, Mk 239, Mk243-0, Mk244-0

Tail: AN-M100A2, AN-M100A1, M100, M160

Special Missions

Tail: M112, M112A1, (Masthead bombing from land base only)
M115 (Masthead from carrier or land base)
M123, M123A1, M132 (Long Delay Time Fuze against land targets)
M151 (Anti-ricochet)

Nose: Shipping plug when above fuzes used in the tail.

VT Missions

Nose: T50E1, T89, T91, M166(T51E1), T82

Tail: AN-M100A2 (to insure detonation in event of VT fuze failure).

REMARKS:

The AN-M30A1 differs from the AN-M30 in these respects:

(a) The AN-M30A1 incorporates two pins fitted into the base plate which extend into the main filling and prevent removal of the base plate.

(b) The AN-M30A1 uses the M102A1 adapter booster, which has a 3/8" hole, mating with a groove in the internal threads of the base plate. A locking pin, shipped with anti-withdrawal fuzes only, fits through the hole and into the groove and prevents extraction of the adapter booster. The pin is held in place by the fuze body.

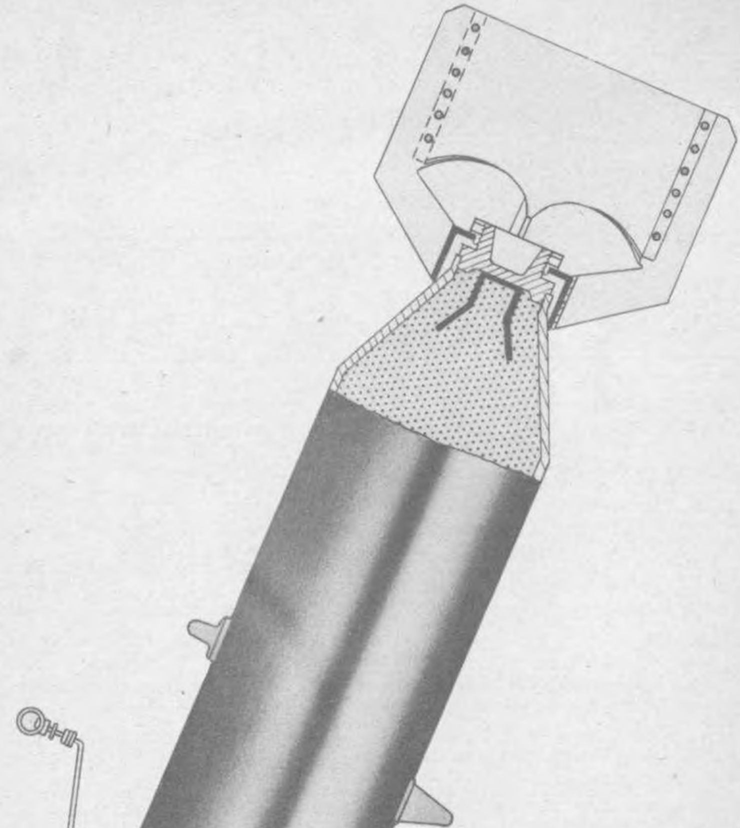
To overcome the erratic flight of AN-M30 and AN-M30A1 bombs when dropped from high altitudes by very heavy bombers, the tail assembly of the M81 260 lb. fragmentation bomb replaces the customary tail unit, which is 2 inches shorter, for such missions.

Use of the M22 cluster adapter permits single suspension for four AN-M30 or AN-M30A1 bombs.

When anti-ricochet action is desired, the M16 anti-ricochet device is employed, consisting of the M7 parachute, M202 fuze adapter, and M151 tail fuze.

For Construction of Body, Suspension, Color & Markings, Type of Filling, and Tail Construction see Introduction, page 37.

In order to alleviate a shortage of 100 lb. M38A2 practice bombs, described on page 324, a concrete practice bomb, the M85, having the same weight, contour, and center of gravity as the AN-M30A1 is being used.



150 LB.
GENERAL PURPOSE BOMB
T-1

DATA:

OVERALL LENGTH	47.43 in.
BODY LENGTH	36.95 in.
BODY DIAMETER	8.1 in.
WALL THICKNESS	0.224 in.
TAIL LENGTH	
TAIL WIDTH	11 in.
TAIL WEIGHT	

U. S. ARMY BOMB

150 LB. G.P.

T1

WEIGHTS:

Type of Filling	T.N.T.
Weight of Filling	82 lbs.
Total Weight	141.61 lbs.
Chg / Wt. Ratio	57 %

FUZING:

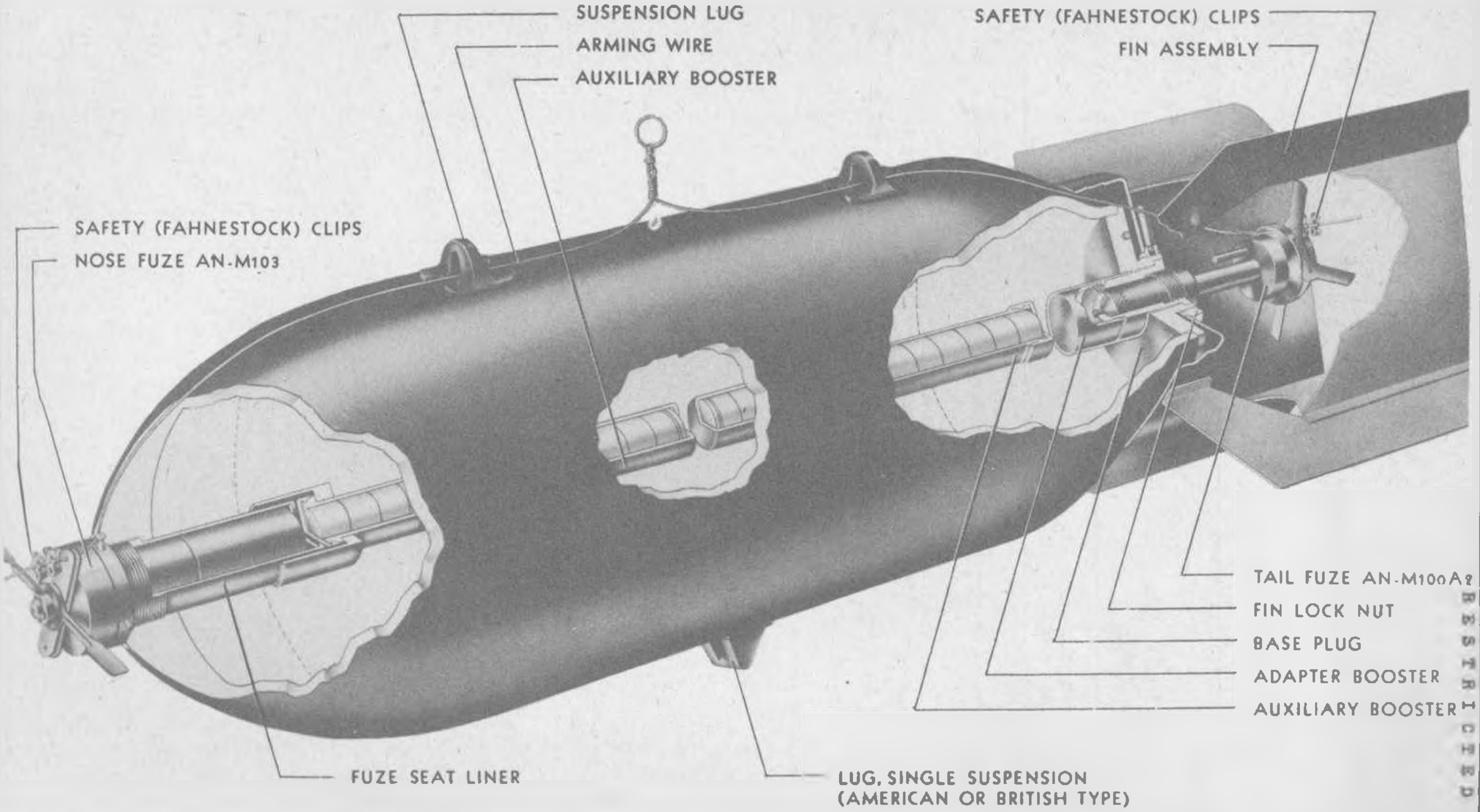
Nose: AN-M103A1; M135; M135A1; M136; M136A1; M139; AN-M139A1, M140, AN-M140A1 M149 or the AN-Mk 219 (with adapter), Mk 239.

REMARKS:

This bomb was developed for use as a substitute to alleviate a temporary shortage of 100 lb. G.P. bombs.

The bomb body consists of a modified M70 Chemical bomb loaded with TNT. The nose has been machined to accommodate an adapter for alternate fuzing. There is no provision for the installation of a tail fuze. Because the bomb was unstable in flight when filled with TNT, the tail unit of the 260 lb. fragmentation bomb, AN-M81, is used instead of the standard M70 tail.

250 LB. GENERAL PURPOSE BOMB AN-M57



DATA:

OVERALL LENGTH	45.4 in.
BODY LENGTH	36.0 in.
BODY DIAMETER	10.9 in.
WALL THICKNESS	0.27 in.
TAIL LENGTH	12.1 in.
TAIL WIDTH	14.9 in.
TAIL WEIGHT	6.0 lbs.

ARMY-NAVY BOMB

250 LB. G.P.

AN-M57
AN-M57A1

(Service)

WEIGHTS:

Type of Filling	50/50 Amatol	T.N.T.
Weight of Filling	123.7 lbs.	129.0 lbs.
Total Weight	255.9 lbs.	260.0 lbs.
Chg / Wt. Ratio	48.0 %	50.0 %

FUZING:

Regular Missions

Nose: AN-M103, AN-M103A1, M103, M135, M135A1, M136, M136A1, AN-M139A1, M140, AN-M140A1, M149, M163, M164, M165, Mk239, Mk243, Mk244, M148
Tail: AN-M100A2, AN-M100A1, M100, M160

Special Missions

Tail: M112, M112A1 (Masthead bombing from land base only)
M115 (Masthead bombing from carrier or land base)
M123, M123A1, M132 (Long Delay Time fuze against land targets)
M151 (Anti-ricochet)
Nose: Shipping plug, when above fuzes are used in the tail

VT Missions

Nose: T50E1, T89, T91, M166(T51E1), T82
Tail: AN-M100A2 (Insure detonation of bomb in event of VT fuze failure)

REMARKS:

The AN-M57A1 differs from the AN-M57 in these respects:

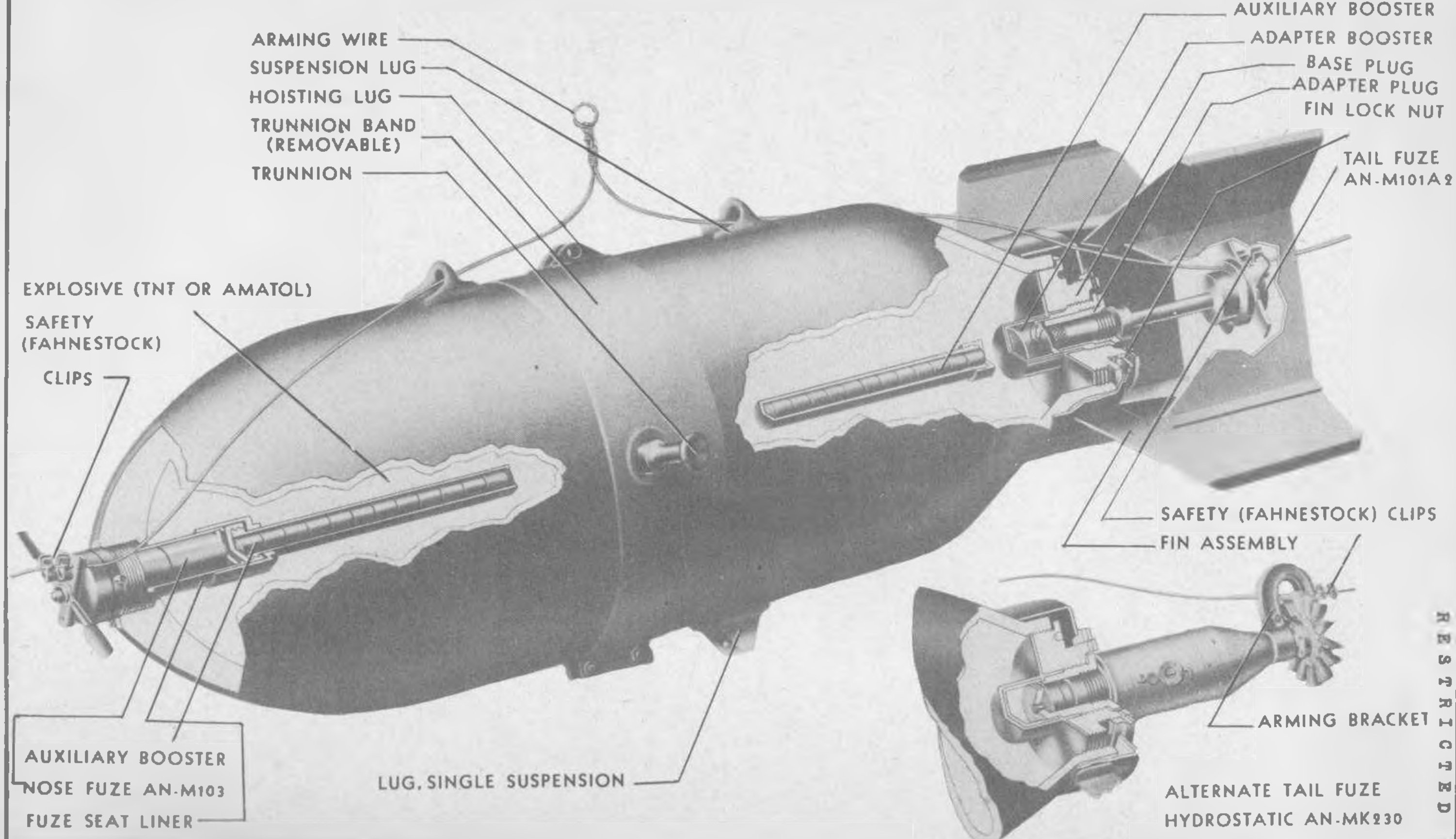
(a) The AN-M57A1 incorporates two pins fitted into the base plate which extend into the main filling and prevent removal of the base plate.

(b) The AN-M57A1 uses the M102A1 adapter booster, which has a 3/8" hole, mating with a groove in the internal threads of the base plate. A locking pin, shipped with anti-withdrawal fuzes only, fits through the hole and into the groove and prevents extraction of the adapter booster. The pin is held in place by the fuze body.

When anti-ricochet action is desired, the M16 anti-ricochet device is installed, consisting of the M7 parachute, M202 fuze adapter, and M151 tail fuze.

For Construction of Body, Suspension, Color & Markings, Type of Filling, and Tail Construction, see Introduction, page 37.

500 LB. GENERAL PURPOSE BOMB AN-M64



RESTRICTED

DATA:

OVERALL LENGTH	56.8 in.
BODY LENGTH	45.0 in.
BODY DIAMETER	14.2 in.
WALL THICKNESS	0.3 in.
TAIL LENGTH	13.9 in.
TAIL WIDTH	18.9 in.
TAIL WEIGHT	12.3 lbs.

ARMY-NAVY BOMBS

500 LB. G.P.

AN-M43 (Obsolescent)
AN-M64 (Service)
AN-M64A1 (Service)

WEIGHTS:

	AN-M43		AN-M64		AN-M64A1	
Type of Filling	Amatol	T.N.T.	Amatol	T.N.T	T.N.T.	Comp. B.
Weight of Filling	262#	267#	262#	267#	267#	274#
Total Weight	510#	525#	510#	525#	525#	535#
Chg / Wt. Ratio	51.2%	51.0%	51.2%	51.0%	51.0%	51.0%

FUZING:

The fuzing of these three bombs is the same with these exceptions: The AN-Mk 230 (and Mods) and Mk 231-0 fuzes can be used in the AN-M64 because this bomb has the M115 (or M115A1 - see Introduction) adapter booster. The M115 adapter booster has a sleeve that can be easily removed making it possible to use a fuze with a larger diameter. With the removable sleeve screwed in the adapter booster, any Army tail fuze may be used. The AN-M43 uses the M102 adapter booster which has no removable sleeve and therefore cannot take the AN-Mk 230 and Mk 231 hydrostatic fuzes.

Regular Missions

Nose: AN-M103, M103, AN-M103A1, M135, M135A1, M136, M136A1, M139, AN-M139A1, M140, AN-M140A1, M149, M163, M164, M165, Mk243, Mk244, Mk239, AN-Mk219
Tail: AN-M101A2, AN-M101A1, M101, M161

Special Missions

Tail: M113, M113A1 (Masthead bombing from land based planes only)
M116 (Masthead bombing from carriers and land bases)
M124, M124A1, Mk 237-0 (Long Delay Time fuze against land targets), M133
M151 (Anti-ricochet)
Nose: Shipping plug, when above tail fuzes used.

Anti-Submarine Missions (AN-M64, AN-M64A1)

Nose: AN-M103A1, AN-M103, M103, M139, AN-M139A1, M140, AN-M140A1, M163, M164, M165, Mk 239, Mk 243, Mk 244-0-1.
Tail: AN-Mk 230-4-5-6, Mk 231-0 (sleeve in M115 adapter booster must be removed before this fuze can be used)

VT Missions

Nose: T50E4, T90, T92, M166(T51E1), T82
Tail: AN-M101A2 (Insure detonation of bomb in event of VT fuze failure)

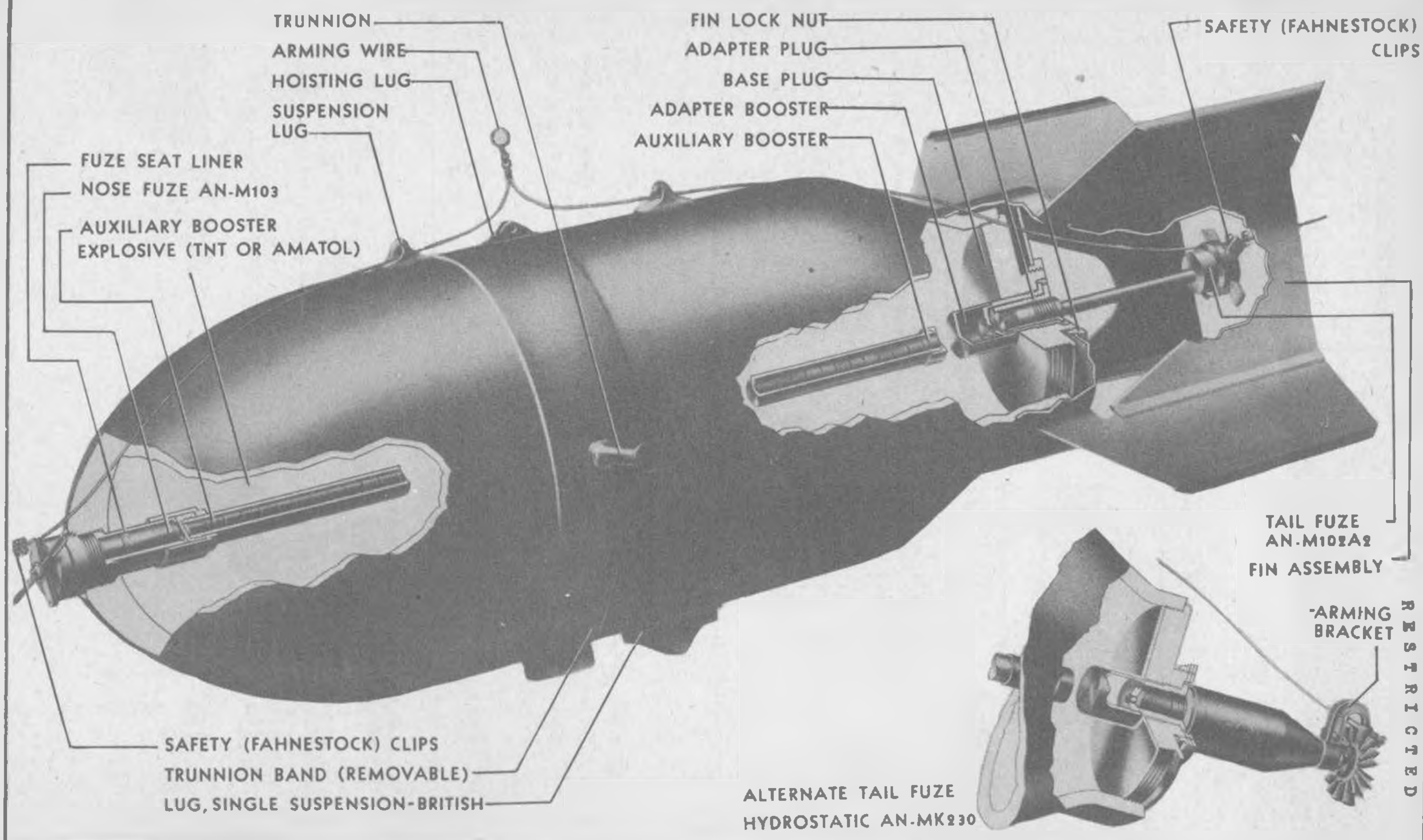
REMARKS:

The AN-M43, AN-M64, and AN-M64A1 are identical types except for the adapter booster which is employed in the base plate to receive the tail fuze. The AN-M43 uses the M102 adapter booster, the AN-M64 uses the M115 adapter booster and the AN-M64A1 uses the M115A1 adapter booster. The A1 modification also includes two base plate locking pins fitting into the main filling, preventing removal of the base plate, and a groove in the internal thread of the base plate which mates with the hole of the M115A1 adapter booster to receive a locking pin, supplied only with anti-withdrawal fuzes. With this pin held in place by the fuze body, the adapter booster cannot be extracted.

When anti-ricochet action is desired, the M17 anti-ricochet device is fitted, consisting of the M6 parachute, M200 fuze adapter, and M151 tail fuze.

For Construction of Body, Suspension, Color & Markings, Type of Filling, and Tail Construction, see Introduction, page 37.

AN-M65 1000 LB. G.P. BOMB



RESTRICTED

DATA:

OVERALL LENGTH . . . . 67.1 in.
BODY LENGTH . . . . 53.1 in.
BODY DIAMETER . . . . 18.8 in.
WALL THICKNESS . . . . 0.5 in.
TAIL LENGTH . . . . 18.5 in.
TAIL WIDTH . . . . 25.4 in.
TAIL WEIGHT . . . . 21.5 lbs.

ARMY-NAVY BOMBS

1000 LB. G.P.

AN-M44 (Obsolesecent)
AN-M65 (Service)
AN-M65A1 (Service)

WEIGHTS:

	AN-M44		AN-M65		AN-M65A1	
Type of Filling	Amatol	T.N.T.	Amatol	T.N.T.	T.N.T.	Comp. B
Weight of Filling	530#	558#	530#	558#	558#	595
Total Weight	964#	990#	965#	990#	990#	1040#
Chg / Wt. Ratio	54.9%	56.0%	55.8%	56.0%	56.0%	57.0%

FUZING:

The fuzing of these bombs is the same with these exceptions: The AN-Mk 230 (with Mods) and Mk 240-0 fuzes can be used in the AN-M65 since this bomb has the M115 (or M115A1) adapter booster. The M115 adapter booster has a sleeve that can be easily removed making it possible to use a fuze with a larger diameter. With the removable sleeve screwed in the adapter booster any Army tail fuze may be used. The AN-M44 uses the M102 adapter booster which has no removable sleeve and therefore cannot take the AN-Mk 230 (with Mods) and Mk 240 hydrostatic fuzes.

Regular Missions

Nose: AN-M103, M103, AN-M103A1, M135, M135A1, M136, M136A1, M139, AN-M139A1, M140, AN-M140A1, M149, M163, M164, M165, Mk239, Mk243 Mk24
Tail: AN-M102A2 AN-M102A1, M102, M162

Special Missions

Tail: M114, M114A1 (Masthead bombing from land based planes only)
M117 (Masthead bombing from carriers or land bases)
M125, M125A1, M134, Mk 238-0 (Long Delay Time Fuze against land targets)
Nose: Shipping plug, when above tail fuzes are used.

Anti-Submarine Missions (AN-M65, AN-65A1 only)

Nose: AN-M103A1, AN-M103, M103, M139, AN-M139A1, M140, AN-M140A1, M163, M164, M165, Mk 239, Mk 243, Mk 244-0-1
Tail: AN-Mk 230-4-5-6, Mk 240-0 (Sleeve in M115 adapter booster must be removed before this fuze can be used)

VT Missions

Nose: T50E4, T90, T92, M166(T51E1), T82
Tail: AN-M102A2 (To detonate bomb in event of VT fuze failure).

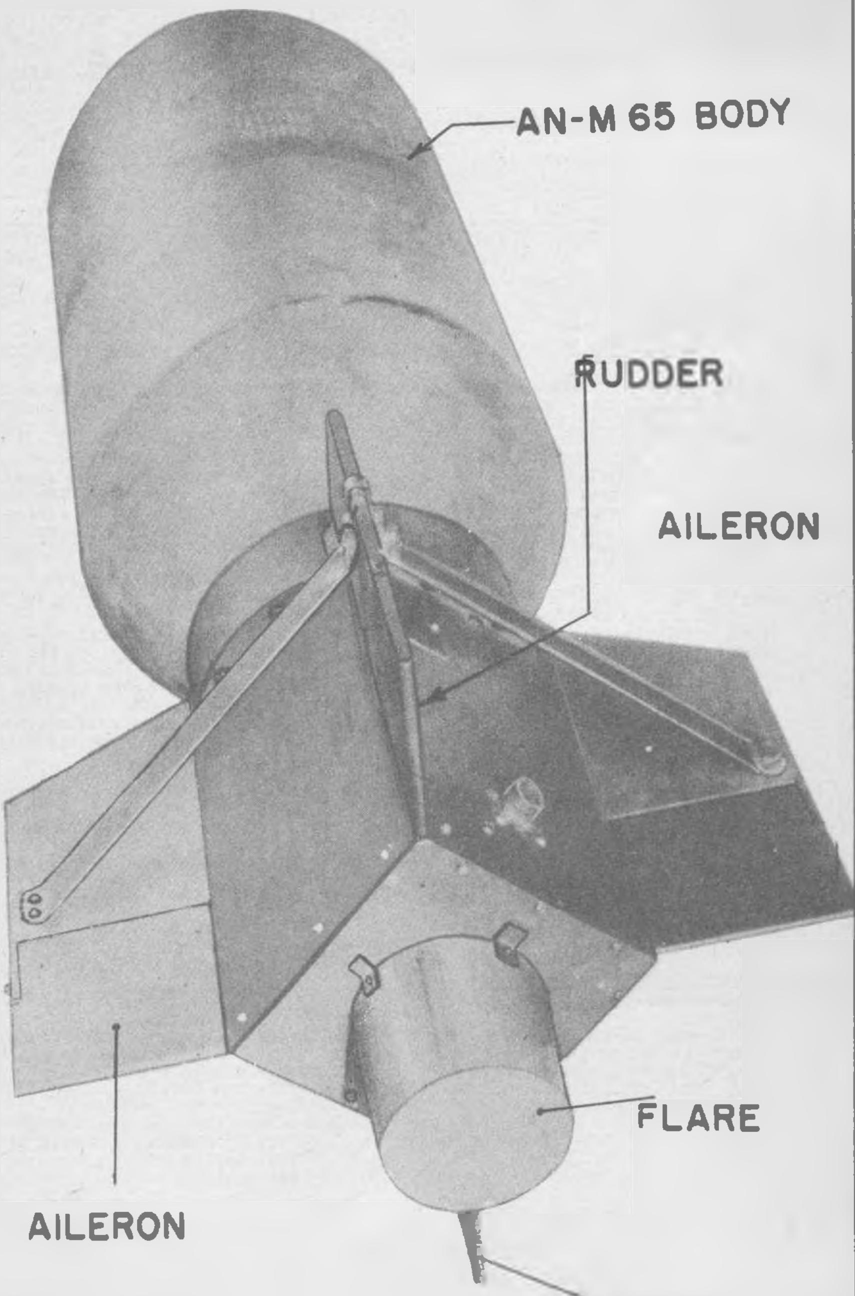
REMARKS:

The AN-M44, AN-M65, and AN-M65A1 differ in the adapter booster which is employed in the base plate to receive the tail fuze. The AN-M44 uses the M102 adapter booster, the AN-M65 uses the M115 adapter booster, and the AN-M65A1 uses the M115A1 adapter booster. The A1 modification also includes two base plate locking pins fitting into the main filling, preventing removal of the base plate, and a groove in the internal threads of the base plate which mates with the hole of the M115A1 adapter booster to receive a locking pin, supplied only with anti-withdrawal fuzes. With this pin held in place by the fuze body, the adapter booster cannot be extracted.

B-29 attacks on Japan have shown that aerodynamic forces at high altitudes of bombing (over 25,000 ft.) are causing the tail assemblies of G.P. bombs to deform, thus inducing erratic bomb flight and side impact. Until standard heavier gauge fins are available, reinforcing fin kits consisting of angles, brackets, and plates are being issued to strengthen tail assemblies.

For Construction of Body, Suspension, Color & Markings, Type of Filling, and Tail Construction, see Introduction, page 37.

CONFIDENTIAL



VB-1 1000 LB. "AZON" BOMB

DATA:

OVERALL LENGTH	
BODY LENGTH	53.1 in.
BODY DIAMETER	18.8 in.
WALL THICKNESS	0.5 in.
TAIL LENGTH	19.0 in.
TAIL WIDTH	19.0 in.
TAIL WEIGHT	

U.S.ARMY BOMB

1000 LB. VB-1

"AZON"

WEIGHTS:

	AN-M44 Body		AN-M65 Body		AN-M65A1 Body	
Type of Filling	Amatol	TNT	Amatol	TNT	Amatol	TNT
Weight of Filling	530#	558#	530#	558#	558#	595#
Total Weight						
Chg / Wt. Ratio						

FUZING:

Nose: AN-M103A1, AN-M103, M139, M139A1, AN-M139A1, M140, M140A1, AN-M140A1
Tail: T75, T75E2 M163, M164 M165

BOMB CONSTRUCTION:

The VB-1 is a guided bomb employing a 1000 lb. G.P. body to which a special tail unit has been attached replacing the standard tail assembly. The VB stands for "Vertical Bomb" and indicates that the bomb is normally released from high altitude by use of a conventional bomb sight and that the guided action for the bomb is relatively small, so that direction of the trajectory at time of impact is essentially vertical.

TAIL UNIT:

More popularly known as the "Azon" bomb since it can be controlled only in azimuth 2000-3000 ft. on either side of the normal point of impact, the VB-1 has its controls in a radio receiver housed in the tail unit. A radio transmitter, operated by the bombardier, in the parent aircraft sends signals to the receiver which in turn activates a servo motor controlling the movement of the rudders in the tail fins. Also incorporated in the tail is a gyro and solenoid system which prevents the bomb from spinning by changing the pitch of the small ailerons in the fins.

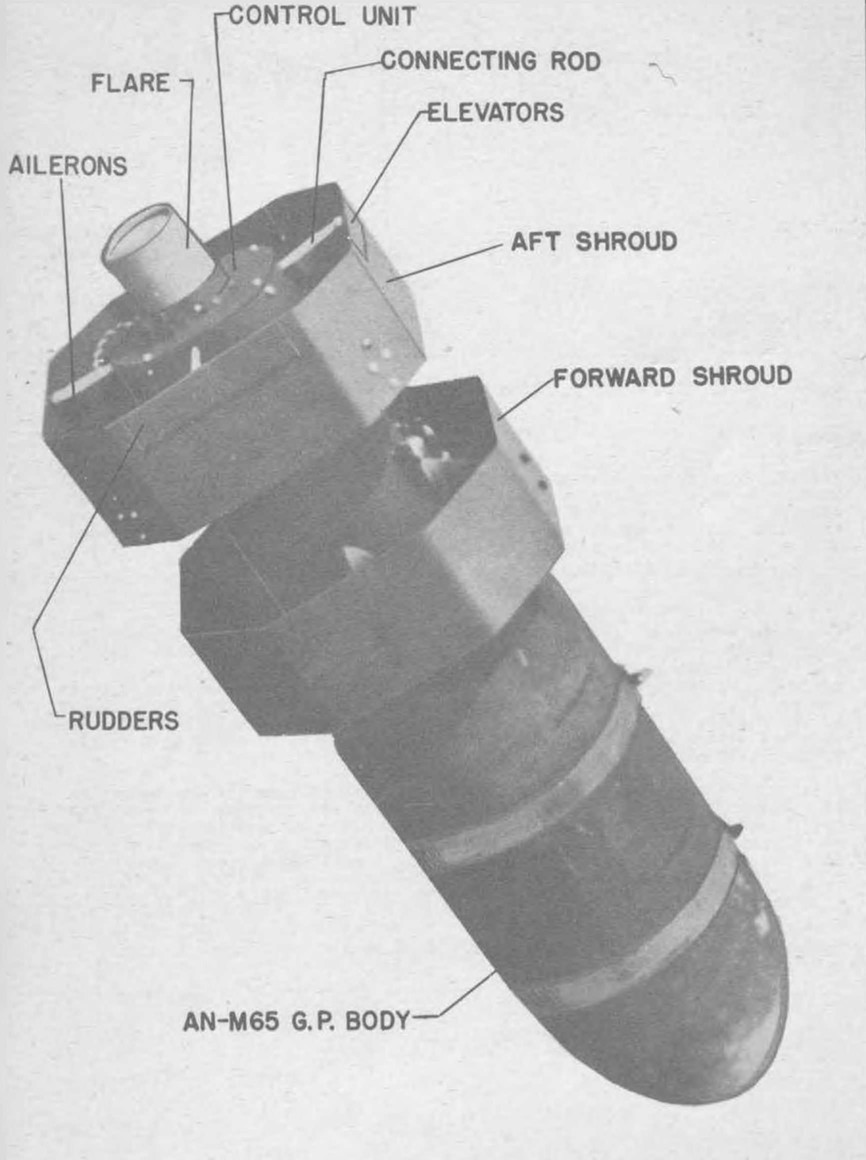
Guide flares attached to the aft end of the tail unit assist the bombardier in following the flight of the VB-1. Three flares, the T6E1 (white), T7E1 (red), and T8E1 (green) with an intensity of 1,000,000 candlepower each, are electrically armed and ignited three to four seconds after release and burn from one to two minutes. Three mechanically armed and ignited flares, T21, T22, and T23 are under development.

SUSPENSION:

Suspension lugs are welded to the case in a manner similar to the G.P. bombs. See Introduction, page 37.

COLOR AND MARKINGS:

The markings are those of the 1000 lb. AN-M65 G.P. bomb. See Introduction, page 37.



VB-3 "RAZON" BOMB

DATA:

OVERALL LENGTH	
BODY LENGTH	53.1 in.
BODY DIAMETER	18.8 in.
WALL THICKNESS	0.5 in.
TAIL LENGTH	
TAIL WIDTH	
TAIL WEIGHT	

U. S. ARMY BOMB

1000 LB. VB-3

"Razon"

WEIGHTS:

	AN-M44 Body		AN-M65 Body		AN-M65A1 Body	
Type of Filling	Amatol	TNT	Amatol	TNT	Amatol	TNT
Weight of Filling	530#	558#	530#	558#	558#	595#
Total Weight						
Chg / Wt. Ratio						

FUZING:

Nose: AN-M103A1, AN-M103, M103, M139, M139A1, AN-M139A1, M140, M140A1, AN-M140A1, M163, M164, M165
Tail: T75E2

BOMB CONSTRUCTION:

The VB-3 is a guided bomb similar to the VB-1 with the major difference that its flight may be controlled in range as well as in azimuth, and is known generally as the "Razon" bomb. Like the VB-1, it has special tail unit fitted to a 1000 lb. G.P. body, and is normally released from high altitude by use of a conventional bomb sight, the guided action being relatively small so that the trajectory at time of impact is essentially vertical.

TAIL UNIT:

The controls for the VB-3 are contained in the cylindrical section of the tail unit and consist of a radio receiver, a gyro, and a servo motor. Surrounding this unit are two shrouds; the forward shroud merely stabilizes the bomb in flight while the after one contains the elevators and rudders.

On each of the four struts supporting the after shroud is an aileron controlled by the gyro. These four ailerons steady the bomb and prevent it from rotating while in flight. They are set 90° apart and operate in pairs, i.e. those ailerons placed opposite to each other move together in unison.

The elevator and rudders located in the after shroud constitute the means for altering flight in azimuth and range. They operate in pairs in a manner similar to the ailerons, with the servo motor controlling their movements through connecting rods extending from the central unit. At present two bombardiers are required with the VB-3; one controls range and the other azimuth. They work independently of each other and by the use of a special bomb sight are always able to see the bomb in flight, superimposed on the target. As the bombardiers manipulate their control switches, radio signals are sent to the receiver; the receiver activates the servo motor which in turn moves the rudders and elevators, adjusting the flight of the bomb.

As in the VB-1, flares are employed to assist the bombardier in the visual control of the flight of the bomb. Currently used flares are the T6E1 (white), T7E1 (red), and T8E1 (green) of 1,000,000 candlepower electrically ignited three to four seconds after release and with one to two minutes burning time. Mechanically-activated flares, T21, T22, and T23 are under development.

SUSPENSION:

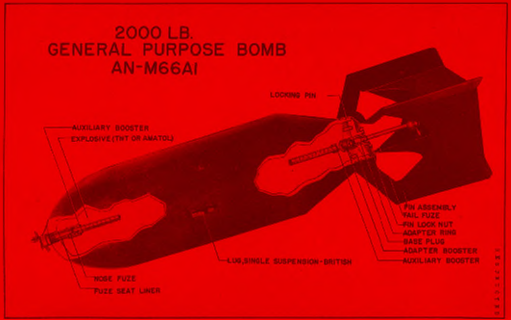
Suspension lugs are welded to the case in a manner similar to the G.P. bombs. See Introduction, Page 37 .

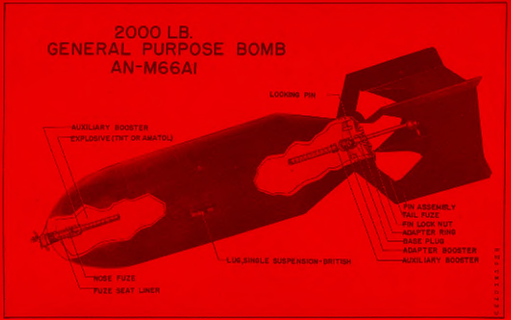
COLOR AND MARKINGS:

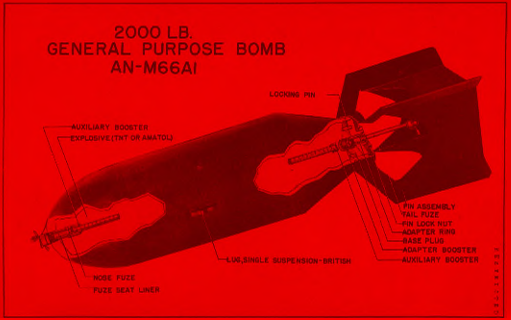
The Markings are similar to those of AN-M65 1000 lb. bombs. See Introduction, page 37 .

REMARKS:

The gyros must be started before the bomb is released.


2000 LB.
GENERAL PURPOSE BOMB
AN-M66A1
LOCKING PIN
AUXILIARY BOOSTER
EXPLOSIVE (TNT OR AMATOL)
FIN ASSEMBLY
TAIL FUZE
FIN LOCK NUT
ADAPTER RING
BASE PLUG
ADAPTER BOOSTER
AUXILIARY BOOSTER
LUG, SINGLE SUSPENSION-BRITISH
NOSE FUZE
FUZE SEAT LINER


2000 LB.
GENERAL PURPOSE BOMB
AN-M66A1
LOCKING PIN
AUXILIARY BOOSTER
EXPLOSIVE (TNT OR AMATOL)
FIN ASSEMBLY
TAIL FUZE
FIN LOCK NUT
ADAPTER RING
BASE PLUG
ADAPTER BOOSTER
AUXILIARY BOOSTER
LUG, SINGLE SUSPENSION-BRITISH
NOSE FUZE
FUZE SEAT LINER


2000 LB.
GENERAL PURPOSE BOMB
AN-M66A1
LOCKING PIN
AUXILIARY BOOSTER
EXPLOSIVE (TNT OR AMATOL)
FIN ASSEMBLY
TAIL FUZE
FIN LOCK NUT
ADAPTER RING
BASE PLUG
ADAPTER BOOSTER
AUXILIARY BOOSTER
LUG, SINGLE SUSPENSION-BRITISH
NOSE FUZE
FUZE SEAT LINER

DATA:

OVERALL LENGTH	90.4 in.
BODY LENGTH	70.0 in.
BODY DIAMETER	23.3 in.
WALL THICKNESS	0.5 in.
TAIL LENGTH	25.7 in.
TAIL WIDTH	31.6 in.
TAIL WEIGHT	38.6 lbs.

ARMY-NAVY BOMBS

2000 LB. G.P.

AN-M34 (Obsolescent)
AN-M66 (Service)
AN-M66A1 (Service)
AN-M66A2 (Service)

WEIGHTS:

	AN-M34		AN-M66		AN-M66A1	
Type of Filling	Amatol	T.N.T.	Amatol	T.N.T.	T.N.T.	Comp. B.
Weight of Filling	1063#	1117#	1063#	1117#	1117#	1142#
Total Weight	2049#	2103#	2052#	2106#	2106#	2140#
Chg / Wt. Ratio	51.9%	53.1%	52.0%	53.0%	53.0%	53.0%

FUZING:

The fuzing of these bombs is the same with these exceptions: The AN-Mk230 (with Mods) and Mk 240-0 fuzes can be used in the AN-M66 because the bomb has the M115 (or M115A1, see Introduction) adapter booster. The M115 adapter booster has a sleeve that can be easily removed making it possible to use a fuze with a larger diameter. With the removable sleeve screwed in the adapter booster any Army tail fuze may be used. The AN-M34 uses the M102 adapter booster which has no removable sleeve and a diameter too small to receive the AN-Mk 230 (with Mods) and Mk 240-0 hydrostatic fuzes.

Regular Missions

Nose: AN-M103, AN-M103A1, M103, M135, M135A1, M136, M136A1, M139, AN-M139A1
M140, AN-M140A1, M149, M163, M164, M165, Mk243, Mk244, Mk239
Tail: AN-M102A2, AN-M102A1, M102, M162

Special Missions

Tail: M114, M114A1 (Masthead bombing from land based planes only)
M117 (Masthead bombing from carrier or land bases)
M125, M125A1, M134, Mk 238-0 (Long Delay Time fuze against land targets)
Nose: Shipping plug, when above tail fuzes are used.

Anti-Submarine Missions (AN-M66, AN-M66A1, AN-M66A2)

Nose: AN-M103A1, AN-M103, M103, M139, AN-M139A1, M140, AN-M140A1, M163, M164, M16
Mk 239, Mk 243, Mk 244-0-1
Tail: AN-Mk 230-4-5-6, Mk 240-0 (Sleeve in M115 adapter booster must be removed before this fuze can be used.)

VT Missions

Nose: T50E1, T89, T91, M166(T51E1), T82
Tail: AN-M102A2 (To detonate bomb in event of VT fuze failure.)

REMARKS:

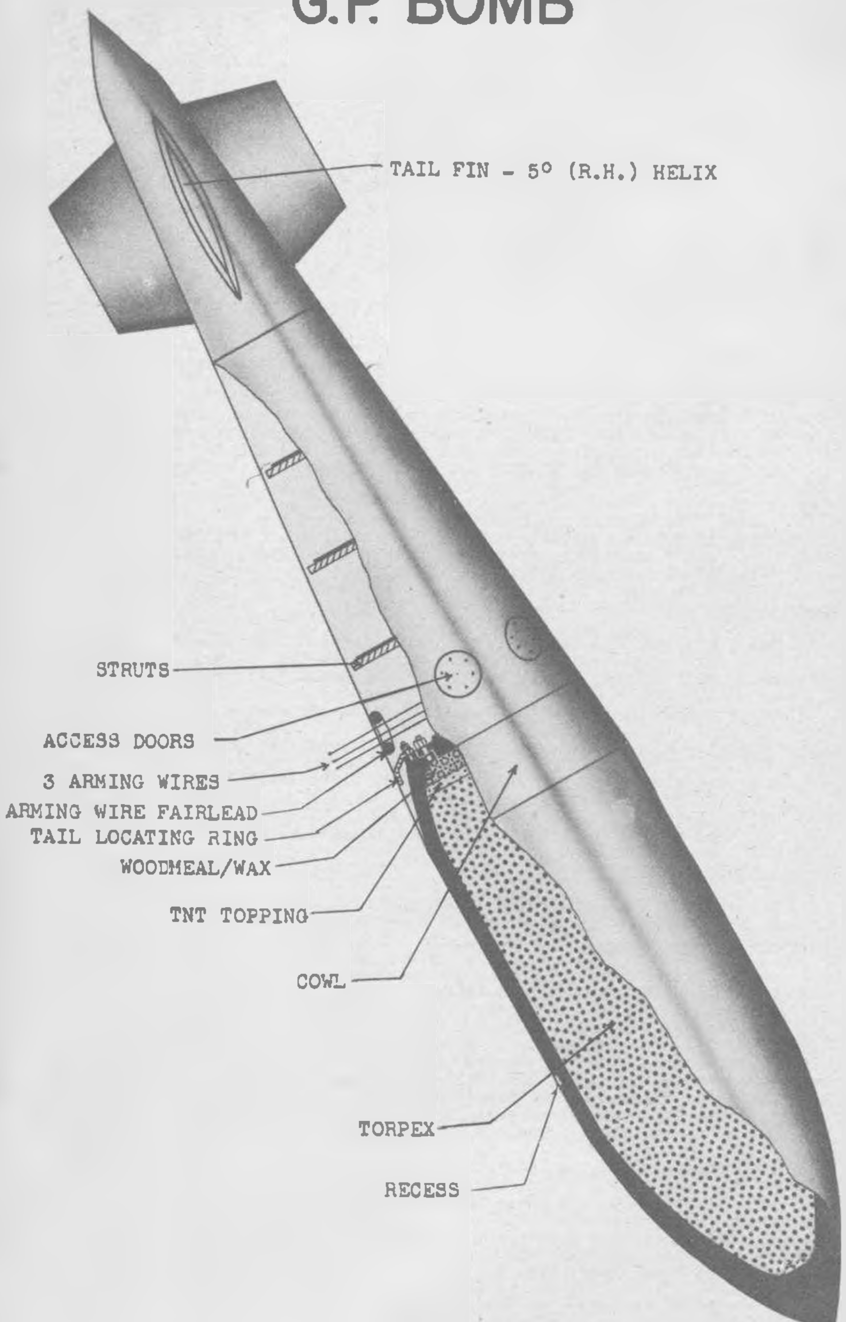
The AN-M34, AN-M66, and AN-M66A1 differ in the adapter booster which is employed in the base plate to receive the tail fuze. The AN-M34 uses the M102 adapter booster, the AN-M66 uses the M115 adapter booster, and the AN-M66A1 uses the M115A1 adapter booster. The A1 modification also includes two base plate locking pins fitting into the main filling, preventing removal of the base plate, and a groove in the internal threads of the base plate which mates with the hole of the M115A1 adapter booster to receive a locking pin, supplied only with anti-withdrawal fuzes. With this pin held in place by the fuze body, the adapter booster cannot be extracted.

A heavier nose section distinguishes the AN-M66A2 from the AN-M66A1.

B-29 attacks on Japan have shown that aerodynamic forces at high altitudes of bombing (over 25,000 ft.) are causing the tail assemblies of G.P. bombs to deform, thus inducing erratic bomb flight and side impact. Until standard heavier gauge fins are available, reinforcing fin kit consisting of angles, brackets, and plates are being issued to strengthen tail assemblies.

For Construction of Body, Suspension, Color & Markings, Type of Filling, and Tail Construction, see Introduction, page 37 .

12,000 LB. & 22,000 LB. G.P. BOMB



DATA:

OVERALL LENGTH	21 ft.
BODY LENGTH	10 ft. 4 in.
BODY DIAMETER	3 ft. 2 in.
WALL THICKNESS	1.2 in.
TAIL LENGTH	10 ft. 4 in.
TAIL WIDTH	3 ft. 6 in.
TAIL WEIGHT	

U. S. ARMY BOMB

12,000 LB. G.P.

T 10

WEIGHTS:

Type of Filling	Torpex	Tritonal
Weight of Filling	4980 lbs.	5100 lbs.
Total Weight	11,630 lbs.	11,750 lbs.
Chg / Wt. Ratio	43%	43%

FUZING:

British Tail Pistol No. 58 Mk I

BODY CONSTRUCTION:

The body is manufactured in two different ways. The British produced model is of cast steel, with a solid nose plug and with three exploders fitted 120° apart in the tail. The bomb bodies are issued with exploders inserted, and the exploders tubes are sealed with shipping plugs. The eventual American T10 will consist of five sections welded together. The solid nose and base section will be of forged steel, while the three center sections will be fabricated from rolled plate, longitudinally welded, taper-bored internally and then set in a die to form the external contour.

The tail is attached to the after end of the bomb body by 12 studs. A cylindrical metal cowling placed between the bomb body and the tail cone, enhances the streamlining of the bomb.

TAIL CONSTRUCTION:

The special tail unit, No. 78 Mk I, is constructed of light alloy and consists of a cone to which are attached four fins of streamline cross-section. The fins are set at an angle of 5° to the axis of the tail cone, giving a slight right hand spin to the bomb as it falls. The tail fits over twelve 7/16 in. studs fitted into the bomb body and is securely fastened to the studs by Simmonds nuts. Three hand-holes in the tail cone give ready access to the three tail pistols.

SUSPENSION:

The bomb is suspended in the plane by twin suspension slings.

FILLING:

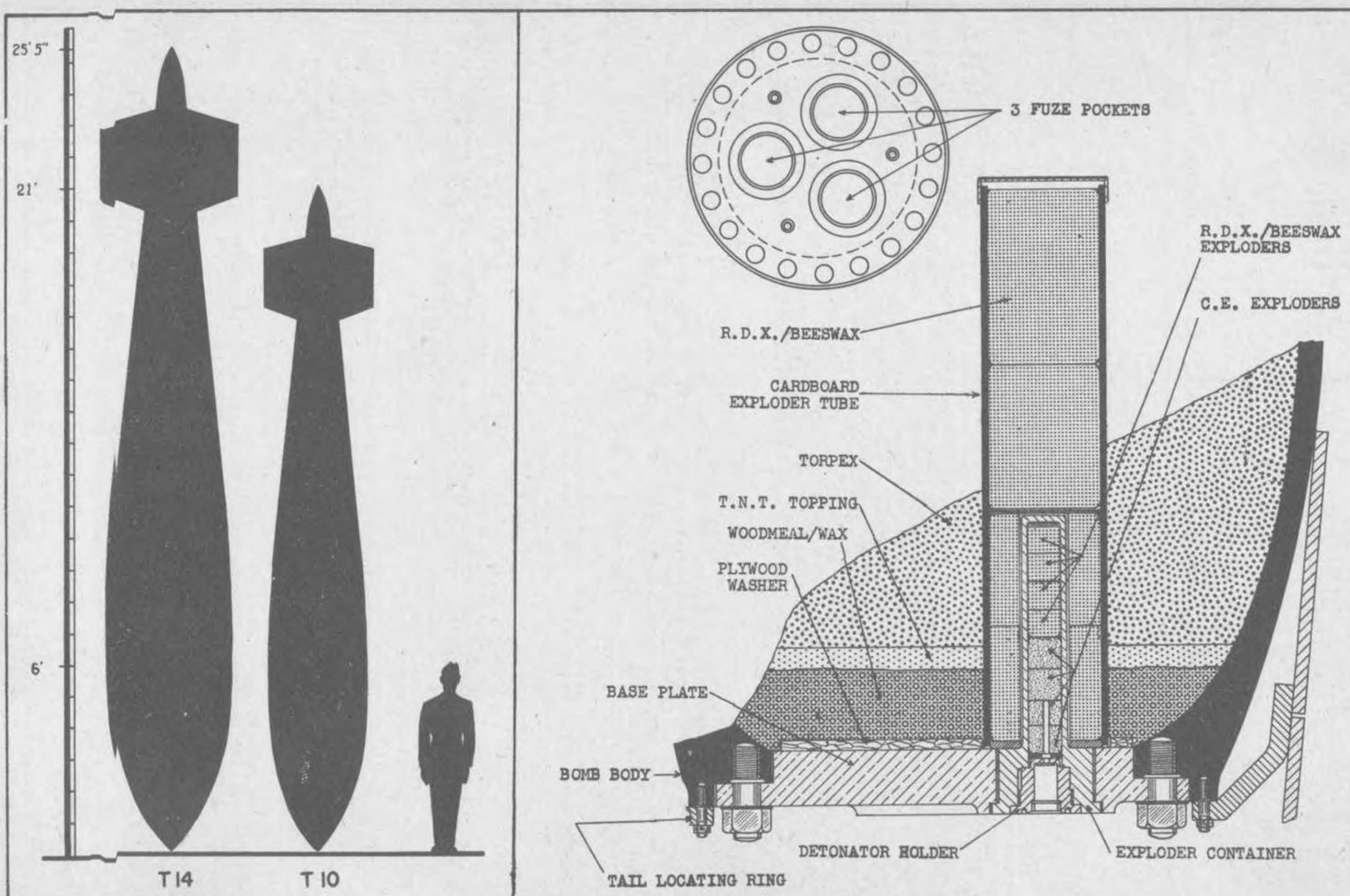
The bomb body contains an explosive filling of Torpex with a 1 in. layer of TNT topping added to the after end. Four inches of woodmeal/wax composition is then added, and the filling sealed with a 1/2 in. plyboard washer. The three exploders pass through holes in this washer and are held in place by a heavy base plate, which is secured by bolts to the bomb body.

REMARKS:

This bomb is designed for limited operational use, and its employment will be restricted to specially adapted very heavy bombers. Although designated a G.P. bomb, the T10 is essentially a deep penetration bomb (though not armor or concrete piercing) depending for its effect upon the production of heavy shock waves as a result of the explosion of its main charge deep within the earth.

The T10 is the American designation for the British 12,000 lb. D.P. (Deep Penetration) "Tallboy" bomb. Except for size, it is similar to the T14, 22,000 lb. G.P. bomb.

12,000 LB. & 22,000 LB. G.P. BOMB



DATA:

OVERALL LENGTH	25 ft. 5 in.
BODY LENGTH	12 ft. 6 in.
BODY DIAMETER	3 ft. 10 in.
WALL THICKNESS	1.75 in.
TAIL LENGTH	13 ft. 4 in.
TAIL WIDTH	4 ft. 4 in.(across fins)
TAIL WEIGHT	

U. S. ARMY BOMB

22,000 LB. G.P.

T 14

WEIGHTS:

Type of Filling	Torpex	Tritonal
Weight of Filling	9200 lbs.	9440 lbs.
Total Weight	21,875 lbs.	22,115 lbs.
Chg / Wt. Ratio	42%	43%

FUZING:

British Tail Pistol No. 58 Mk I

BODY CONSTRUCTION:

The body is manufactured in two different ways. The British produced model is of cast steel, with a solid nose plug and with three exploders fitted 120° apart in the tail. The bomb bodies are issued with exploders inserted, and the exploder tubes are sealed with shipping plugs. The eventual American T 14 will consist of five sections welded together. The solid nose and base sections will be of forged steel, while the three center sections will be fabricated from rolled plate, longitudinally welded, taper-bored internally and then set in a die to form the external contour.

The tail is attached to the after end of the bomb body by 12 studs. A cylindrical cowling, placed between the bomb body and the tail cone, enhances the streamlining of the bomb.

TAIL CONSTRUCTION:

The special tail unit, No. 82 Mk I is constructed of light alloy and consists of a cone to which are attached four fins of streamline cross-section. The fins are set at an angle of 5° to the axis of the tail cone, giving a right-hand spin to the bomb as it falls. The tail fits over twelve 7/16 in. studs fitted into the bomb body and is securely fastened to the studs by Simmonds nuts. Three hand-holes in the tail cone give ready access to the three tail pistols.

SUSPENSION:

The bomb is suspended in the plane by twin suspension slings.

FILLING:

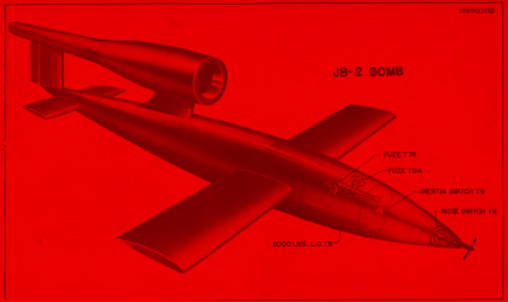
The bomb contains an explosive filling of Torpex or Tritonal with a 1 in. layer of TNT topping added to the after end. Four inches of woodmeal/wax composition is then added, and the filling sealed with a 1/2 in. plyboard washer. The three exploders pass through holes in this washer and are held in place by a heavy base plate, which is secured by bolts to the bomb body.

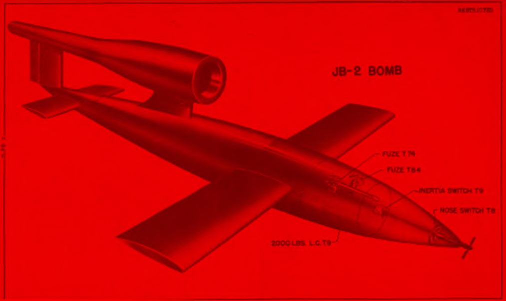
REMARKS:

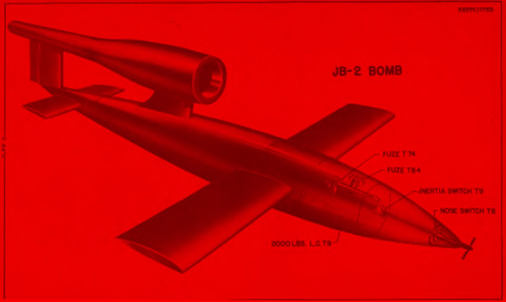
This bomb is designed for limited operational use, and its employment will be restricted to specially adapted very heavy bombers. Although designated a G.P. bomb, the T14 is essentially a deep penetration bomb (though not armor or concrete piercing) depending for its effect upon the production of heavy shock waves as a result of the explosion of its main charge deep within the earth.

The general arrangement of this bomb is identical to that of the 12,000 lb. T10 illustrated on page 6D. The two bombs are identical in all respects, the T14 being merely an enlarged version of the T10.

The T14 is American designation for the British 22,000 lb. D.P. "Grand Slam" bomb.


JB-2 BOMB
FUZE T 74
FUZE T 84
INERTIA SWITCH T9
NOSE SWITCH T6
2000 LBS. L.C. T9


JB-2 BOMB
FUZE T 74
FUZE T 84
INERTIA SWITCH T9
NOSE SWITCH T6
2000 LBS. L.C. T9


JB-2 BOMB
FUZE T 74
FUZE T 84
INERTIA SWITCH T9
NOSE SWITCH T6
2000 LBS. L.C. T9

DATA:

OVERALL LENGTH	46 in.
BODY LENGTH	
BODY DIAMETER	
WALL THICKNESS	
TAIL LENGTH	
TAIL WIDTH	
TAIL WEIGHT	
FORWARD DIAMETER	28 in.
REAR DIAMETER	33½ in.

U.S. ARMY BOMB

2000 LB. L.C.

T 9

WEIGHTS:

Type of Filling	Tritonal
Weight of Filling	1875 lbs.
Total Weight	2100 lbs.
Chg / Wt. Ratio	89 %

FUZING:

The 2000 lbs. L.C. bomb takes two series of athwartships fuzes, the electrical T74 series and the mechanical T84 series. A nose switch, T8, closes the electrical circuit at the moment of impact; an inertia switch, T9 completes the electrical circuit to the T74 on impact.

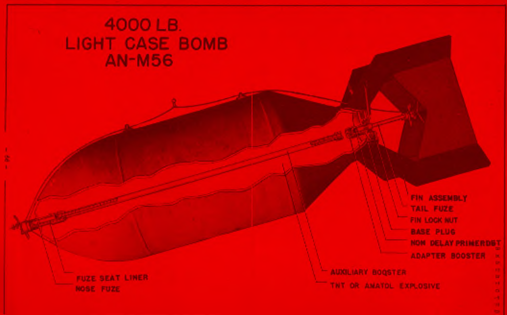
BOMB CONSTRUCTION:

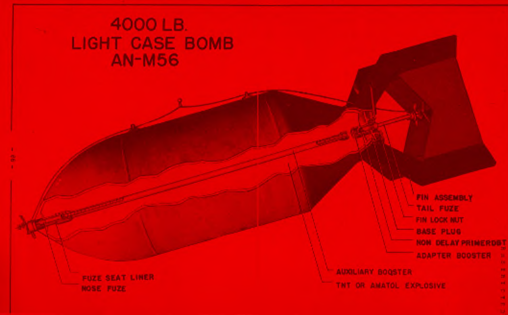
Although designated a bomb, the T9 is more properly a warhead for the JB-2, the American adaptation of the German V-1, a pilotless winged missile which is jet propelled. Constructed of aluminum, the head is roughly cylindrical in shape, positioned aft of the nose piece. To assemble the warhead to the fuselage, four mounting lugs on the warhead are aligned with four lugs on the fuselage, and then bolted together.

FILLING:

Tritonal is the main filling, a mixture of 80% TNT and 20% Aluminum powder, designed to give maximum blast effect.

COLOR AND MARKINGS:




4000 LB.
LIGHT CASE BOMB
AN-M56
FIN ASSEMBLY
TAIL FUZE
FIN LOCK NUT
BASE PLUG
NON DELAY PRIMERDET
ADAPTER BOOSTER
AUXILIARY BOOSTER
TNT OR AMATOL EXPLOSIVE
FUZE SEAT LINER
NOSE FUZE


4000 LB.
LIGHT CASE BOMB
AN-M56
FIN ASSEMBLY
TAIL FUZE
FIN LOCK NUT
BASE PLUG
NON DELAY PRIMERDET
ADAPTER BOOSTER
AUXILIARY BOOSTER
TNT OR AMATOL EXPLOSIVE
FUZE SEAT LINER
NOSE FUZE

DATA:

OVERALL LENGTH	117.3 in.
BODY LENGTH	94.9 in.
BODY DIAMETER	34.0 in.
WALL THICKNESS	0.37 in.
TAIL LENGTH	28.0 in.
TAIL WIDTH	47.6 in.
TAIL WEIGHT	95.0 lbs.

ARMY-NAVY BOMB

4000 LB. L.C.

AN-M56
AN-M56A1

(Service)

WEIGHTS:

Type of Filling	T.N.T.	Amatol	50/50 Amatol
Weight of Filling	3362.0 lbs.	3245 lbs.	3238 lbs.
Total Weight	4205.0 lbs.	4085 lbs.	4232 lbs.
Chg / Wt. Ratio	80.0 %	79.0 %	76.5 %

FUZING:

Nose: AN-M103A1, AN-M103, M103, M135, M135A1, M136, M136A1, M139, AN-M139A1, M140, AN-M140A1, M149, M163, M164, M165, Mk239, AN-Mk219 (set for instantaneous action always)

Tail: AN-M102A2, AN-M102A1, M162 (Non-delay action)

BOMB CONSTRUCTION:

The body is made of several cast pieces welded together. The side walls have a minimum thickness of .3 inch and a maximum thickness of .5 inch. Closed at the base by a female cap, it has a rounded nose and parallel side walls. Suspension is by means of two lugs welded to the case 15 inches on either side of the center of gravity. The normal box type tail is modified on this bomb by eight additional strut rods to give increased stability for this large bomb.

FILLING:

The standard filling for this bomb at present is cast TNT, but some bombs in the future will be loaded with Tritonal. A full length M111 auxiliary booster is employed to insure complete detonation.

COLOR & MARKINGS:

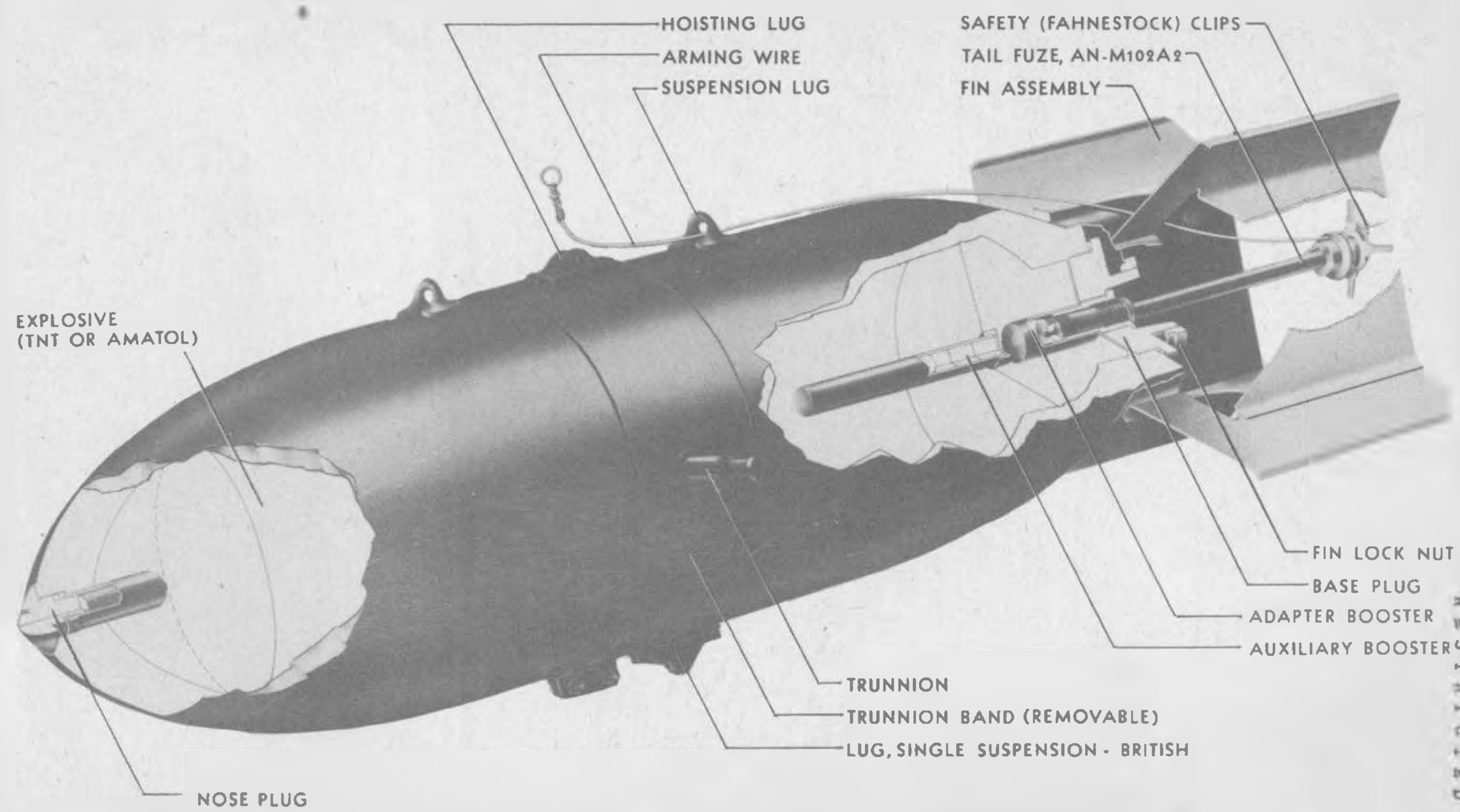
Olive drab overall with one inch yellow band around nose and conical section of bomb.

REMARKS:

The AN-M56A1 differs in that provision is made for a hoisting lug to be added at the center of gravity between the suspension lugs and also for two other suspension lugs to be screwed into the bomb body, 22½ degrees removed, for suspension in British planes.

The AN-M56 and AN-M56A1 are not procured by the Navy at the present time.

1000 LB. SEMI-ARMOR PIERCING BOMB AN-M59



U.S. ARMY-NAVY BOMB

500 & 1000 LB. S.A.P.

AN-M58 (500 lb.)
AN-M58A1 (500 lb.)
AN-M58A2 (500 lb.)
AN-M59 (1000 lb.)
AN-M59A1 (1000 lb.)
AN-M58 (Obsolescent)
Others (Service)

DATA:

	500 lb.	1000 lb.
OVERALL LENGTH	57.8 in.	69.3 in.
BODY LENGTH	46.8 in.	57.3 in.
BODY DIAMETER	11.8 in.	15.1 in.
WALL THICKNESS	0.75 in.	1.0 in.
TAIL LENGTH	15.05 in.	16.8 in.
TAIL WIDTH	16.18 in.	20.7 in.
TAIL WEIGHT	11.4 lbs.	17.0 lbs.

WEIGHTS:

	AN-M58	AN-M58A1	AN-M59
Type of Filling	T.N.T.	T.N.T.	T.N.T.
Weight of Filling	160 lbs.	162 lbs.	320 lbs.
Total Weight	472 lbs.	494 lbs.	995 lbs.
Chg / Wt. Ratio	33.9%	31.0%	32.0%

FUZING:

For ordinary use, only tail fuzes are employed in S.A.P. bomb, but AN-M103 fuzes and variations of this fuze can be employed for fragmentation effect, in which case a non-delay primer detonator is employed in the tail fuze. Otherwise, in regular missions a short delay primer detonator is used in the tail fuze, with a shipping plug in the nose.

Regular Missions (Tail fuzed only)
500 lb.: AN-M101A2, AN-M101A1, M161
1000 lb.: AN-M102A2, AN-M102A1, M162

Special Missions (Fragmentation effect)
Nose: AN-M103. AN-M103A1. M135, M135A1, M136, M136A1, M139, **AN-M139A1, M140, AN-M140A1, M149, M163, M164, M165, Mk239**
Tail:
500 lb.: AN-M101A2, AN-M101A1, M161
1000 lb.: AN-M102A2, AN-M102A1 M162

Other Missions (Tail fuzed only)
500 lb.: M113A1, M113, M116 (minimum altitude)
M124, M124A1, M133 (long delay)
1000 lb.: M114, M114A1, M117 (minimum altitude)
M125, M125A1, M134 (long delay)

VT Missions
Nose: **M166(T51E1),T82**
Tail:
500 lb.: AN-M101A2 (to detonate bomb in event of VT fuze failure)
1000 lb.: AN-M102A2 (to detonate bomb in event of VT fuze failure)

BOMB CONSTRUCTION:

S.A.P. bombs are of single piece construction, either cast or spun, slightly streamlined in shape with semi-pointed noses. The threaded nose opening receives a fuze seat liner and a steel nose plug, which can be removed allowing an instantaneous nose fuze to be inserted when fragmentation effect is desired. Suspension lugs are welded to the case in a manner similar to G.P. bombs (see Introduction, page 37); for dive bombing, trunnions on a band may be installed. The box type tail is characteristic of that used on G.P. bombs (see Introduction, page 37).

FILLING:

Cast TNT is being used currently with a wax pad employed in the nose to cushion the explosive against premature detonation on impact with an armored target. One M104 auxiliary booster is used, positioned just forward of the M102 adapter booster. In the future, Army S.A.P. bombs will have Picratol as their main charge, the filling now standard for the M103 2000 lb. S.A.P.

COLOR & MARKINGS:

Olive drab overall with one inch yellow band around nose and base and 1/4 inch yellow band around center of gravity. Bombs having wax in the nose can be identified by the marking "with pad". Present production eliminates 1/4 inch band.

REMARKS:

In the AN-M58A1, 9.5 lbs of Amatol are removed and replaced by 31.5 lbs. of steel to increase the penetration of the bomb. To enable these S.A.P. bombs to be used with anti-withdrawal fuzes, the AN-M58A2 and the AN-M59A1 incorporate base plate locking pins and the M102A1 adapter booster, thus preventing removal of the base plate and adapter booster.

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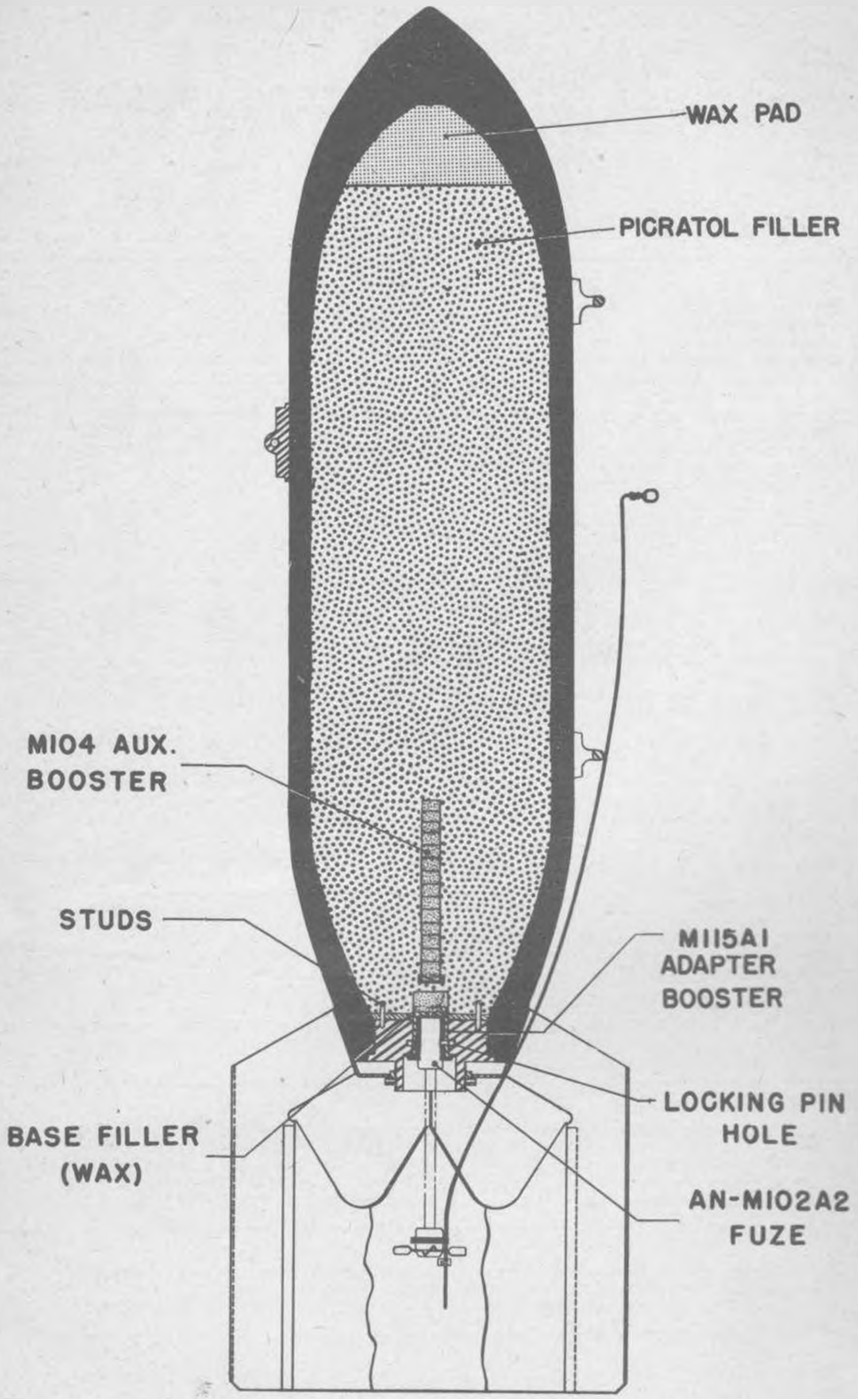


BOMB S.A.P. 2000 LB. M103

DATA:

OVERALL LENGTH	88.5 in.
BODY LENGTH	68.5 in.
BODY DIAMETER	18.75 in.
WALL THICKNESS	1.3 in.
TAIL LENGTH	25.6 in.
TAIL WIDTH	25.8 in.
TAIL WEIGHT	52.7 lbs.

U. S. ARMY

2000 LB. S.A.P.

M 103
(Service)

WEIGHTS:

Type of Filling	Picratol
Weight of Filling	556 lbs.
Total Weight	2039 lbs.
Chg / Wt. Ratio	27 %

FUZING:

Unlike smaller S.A.P. bombs, the M103 has a solid nose, permitting tail fuzing only.

Regular Missions:
AN-M102A2, AN-M102A1, M162

Special Missions:
M114, M114A1, M117 (minimum altitude bombing)
M125, M125A1 (long delay), M134

BOMB CONSTRUCTION:

The body of the M103 is fabricated from seamless steel tubing, somewhat streamlined in shape and with a semi-pointed nose. No provision is made for nose fuzing in this bomb. Suspension lugs are welded to the case in a manner similar to the GP bombs (See Introduction, page 37). Trunnions on a band may be fitted for dive-bombing. A box type tail is employed as on the G.P. bombs (See Introduction, page 37).

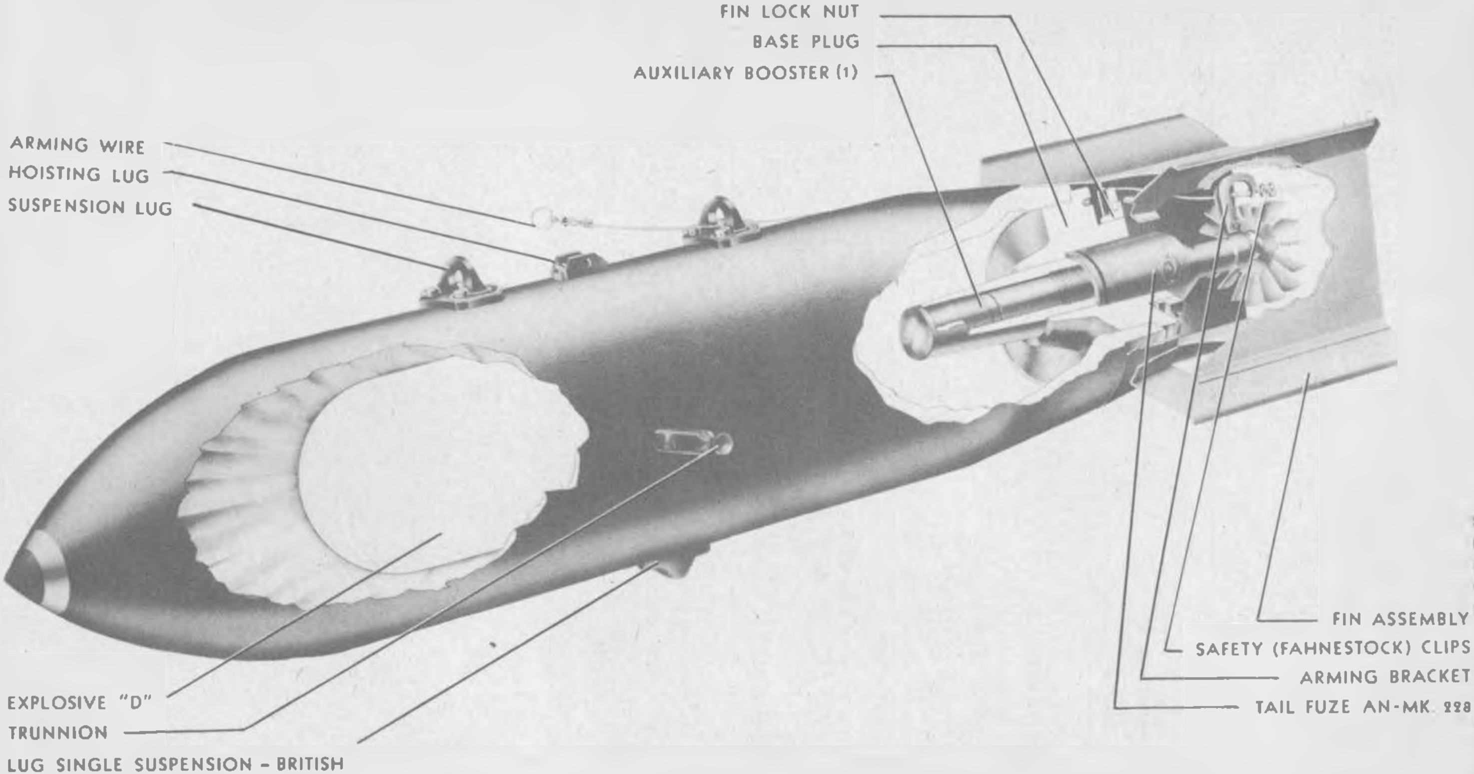
FILLING:

Picratol, a mixture of 52% Explosive "D" and 48% TNT is poured as the main charge, with a wax pad in the nose to cushion the explosive against premature detonation on impact with a hard target. The M115A1 adapter booster replaces the M102A1 fitted in the AN-M58 and AN-M59 S.A.P. bombs.

COLOR & MARKINGS:

Olive drab overall with 1" yellow band around nose and base and 1/4 inch yellow band around center of gravity.

1000 LB. ARMOR PIERCING BOMB, AN-MK. 33



DATA:	1000 lb. AN-Mk 33	1600 lb. AN-Mk 1
OVERALL LENGTH	73.0 in.	83.5 in.
BODY LENGTH	58.0 in.	69.5 in.
BODY DIAMETER	12.0 in.	14.0 in.
WALL THICKNESS		1.3 in.
TAIL LENGTH	17.0 in.	20.5 in.
TAIL WIDTH	16.0 in.	20.6 in.
TAIL WEIGHT		

ARMY-NAVY BOMBS

1000 & 1600 LB.A.

AN-Mk 33 (1000 lb.)
AN-Mk 1 (1600 lb.)
(Service)

WEIGHTS:	1000 lb. AN-Mk 33	1600 lb. AN-Mk 1
Type of Filling	Explosive D, Cast TNT	Explosive D, Cast TNT
Weight of Filling	140 lbs.	215 lbs.
Total Weight	1025 lbs.	1590 lbs.
Chg / Wt. Ratio	14.0 %	14.0 %

FUZING:

Tail: AN-Mk 228 (.08 sec. delay)

BOMB CONSTRUCTION:

The bodies are of single piece, forged, machined construction with pointed noses, parallel sides and slight boat tailing. The base plate is of the male type. Suspension in the Mk 1 1600 lb. design was by means of lugs welded to bands, the bands being positioned by grooves on the external bomb surface. The newer designs, AN-Mk 1 & Mk 33 are suspended by fittings which screw into holes drilled in the bomb case and secured by bolts. The normal box type tail assembly is used on these bombs. (Introduction, pg 37).

FILLING:

The main filling of these bombs is pressed Explosive "D" or cast T.N.T. The tail fuze pocket requires the use of the Mk 1 granular T.N.T. auxiliary booster.

COLOR & MARKINGS:

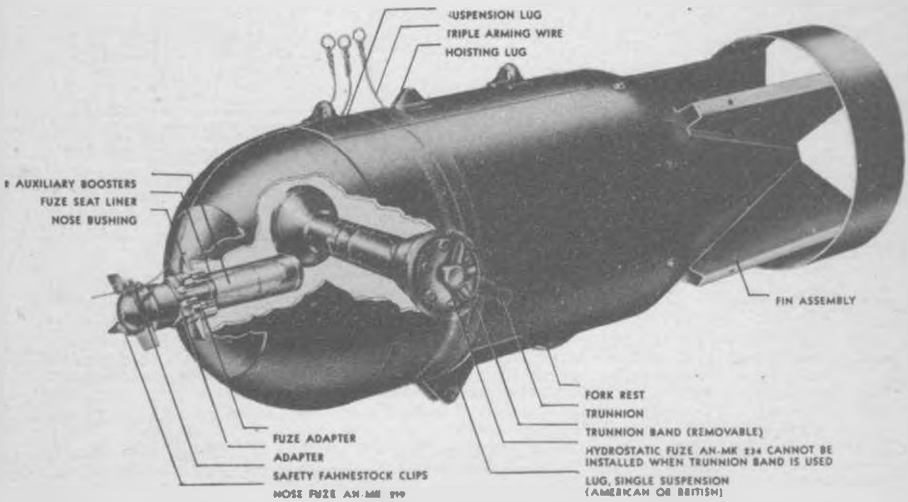
Olive drab overall with 1" yellow bands around nose and base and 1/4" yellow band around center of gravity. Recent production eliminates the 1/4" band. The Mk I is grey overall with a yellow disc.

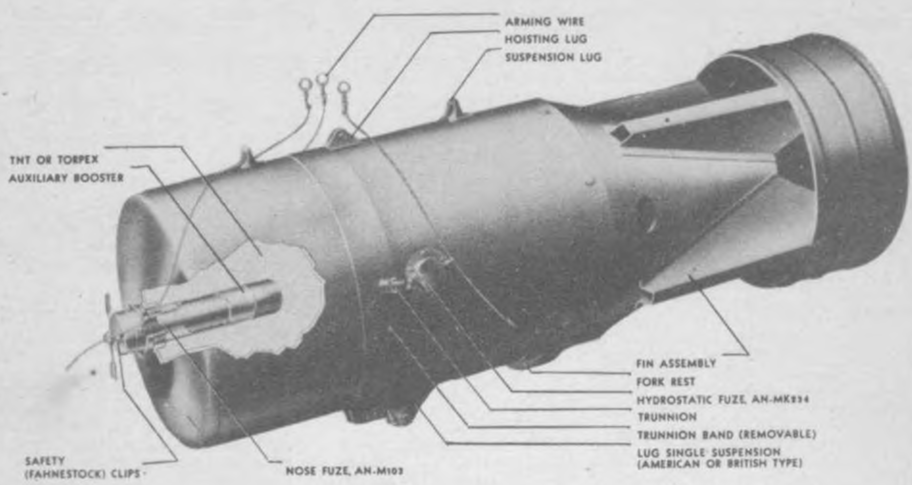
REMARKS:

The later Mk I bombs were grooved to position the suspension band. Older bombs had a stud which fitted into a hole in the bomb body.

MK 17 MOD 1, MK 17 MOD 2, MK 44 DEPTH BOMB

MARK 17 MOD. 1 OR AN-MARK 17 MOD. 2, TNT LOADED, WEIGHS [illegible] LBS. AN-MARK 44, TORPEX LOADED, WEIGHS [illegible] LBS





MK 41, MK 47 DEPTH BOMB

AN-MARK 41, TNT LOADED, WEIGHS APPROXIMATELY 325 LBS. AN-MARK 47, TORPEX LOADED, WEIGHS APPROXIMATELY 350 LBS.

DATA:	Mk 17-2 / Mk 44	Mk 41 / Mk 47
OVERALL LENGTH	52.5 in.	49.9 in.
BODY LENGTH	31.1 in.	27.8 in.
BODY DIAMETER	15.0 in.	15.0 in.
WALL THICKNESS	0.06 in.	0.06 in.
TAIL LENGTH	20.2 in.	24.6 in.
TAIL WIDTH	20.6 in.	15.4 in.
TAIL WEIGHT		

NOTE: Mk 17-2 & Mk 44 have round nose, can use flat nose attachment; Mk 41, Mk 47 are flat nosed: Mks 44, 47 weigh 350#, use TPX.

ARMY-NAVY BOMBS

325, 350 LB. DEPTH

Mk 17	(T.N.T.)
Mk 17-1	(T.N.T.)
Mk 17-2	(T.N.T.)
Mk 44	(Torpex)
Mk 41	(T.N.T.)
Mk 47	(Torpex)

WEIGHTS:	Mk 17-2	Mk 44	Mk 41	Mk 47
Type of Filling	T.N.T.	Torpex	T.N.T.	Torpex
Weight of Filling	224 lbs.	249 lbs.	227 lbs.	252 lbs.
Total Weight	325 lbs.	350 lbs.	347 lbs.	355 lbs.
Chg / Wt. Ratio	68.9%	71.1%	65.4%	70.9%

FUZING:

Because of numerous instances in water crash landings where depth bombs fuzed with the AN-Mk 224 or AN-Mk 234 exploded, these two fuzes have been suspended from use. As a consequence, the Mk 17, Mk 41 and Mk 44 may be used only if a nose impact fuze is installed.

Nose: AN-Mk 219 will not arm if dropped from below 2500 ft. when used on bomb with flat nose attachment or flat nose. Requires auxiliary booster and Mk 219 adapter ring. Gives instantaneous action.

Mk 221, Mk 239, delay of .01 seconds; will not arm on flat nose if dropped from below 2500 ft.

AN-M103, AN-M103A1 (Instantaneous only); special vanes for flat nose bombs.

BODY CONSTRUCTION:

Mk 17-2 and Mk 44: These depth bombs are made with round noses welded to a cylindrical steel tube. There is a strengthening disc around the nose and a steel strip along the suspension lugs to reinforce the body. The transverse fuze pocket is 11.9 in. aft of the nose. To prevent ricochet and improve underwater trajectory a flat nose attachment is made for these bombs, the attachments being in the shape of a bucket which fits down over the nose and is filled with plaster of paris, increasing the weight of the bomb by 44 lbs. Bomb case extremely thin.

Mk 41 and Mk 47: These bombs constructed with a flat nose, there being a slight taper from the walls to the nose. The body is in three pieces, the sides being tubular with a transverse fuze pocket tube welded in place 15 in. aft of the nose.

SUSPENSION:

Suspension of these bombs is by the usual dual or single lugs, the lugs being welded to the bomb. The single lug is actually somewhat different than is usually found, being in the form of a bracket rather than a lug. Trunnions on a band are for displacement gear in dive bombing.

TAIL CONSTRUCTION:

Instead of employing the box type tail these bombs use a drum tail. Looking at it from the after end, it is circular and has four fins extending at right angles to each other. The fins are spot welded to a cone which fits over the after end of the bomb. The fins are also spot welded to the drum shroud. The tail is bolted onto the base of the bomb.

COLOR & MARKINGS:

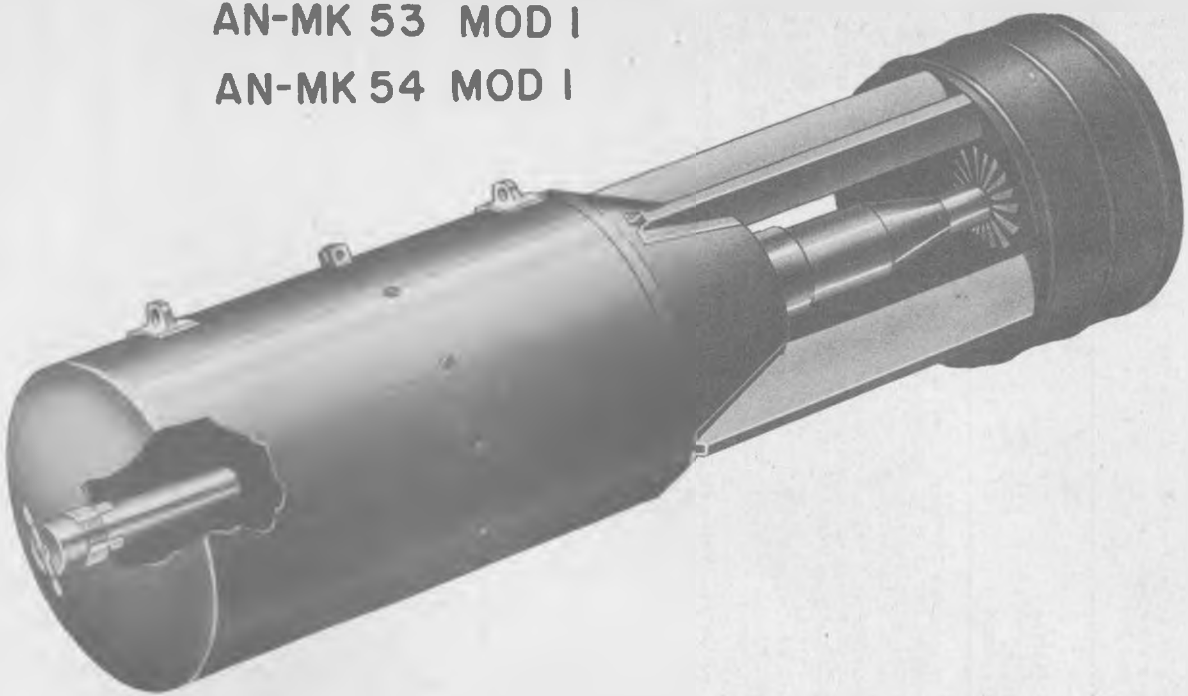
Olive drab overall with 1" yellow band around nose, 1" band on each side around athwartship fuze well, and 1/4" band around center of gravity. TNT loaded bombs have weight and Mark number stencilled in yellow; Torpex loaded have items stencilled in blue.

REMARKS:

The Mk 17 - 325 lb. bomb is TNT loaded but has a light tail assembly; the Mk 17-1 is the same except a sturdier tail assembly is used; the Mk 17-2 is similar to the Mod 1 but has a larger filling hole.

The Mk 17 is obsolete; the Mk 17-1-2, the Mk 44, 47, and 41 are obsolescent.

AIRCRAFT DEPTH BOMB
AN-MK 53 MOD I
AN-MK 54 MOD I



DATA:

OVERALL LENGTH	52.5 in.
BODY LENGTH	33.25 in.
BODY DIAMETER	13.8 in.
WALL THICKNESS	.06 in.
TAIL LENGTH	24.5 in.
TAIL WIDTH	13.9 in.
TAIL WEIGHT	

U. S. NAVY BOMBS

325, 350 LB. DEPTH

AN-Mk 53-1 (T.N.T.)
AN-Mk 54-1 (H.B.X.)
Mk 53 (T.N.T.)
Mk 54 (Torpex)

(Service)

WEIGHTS:

	AN-Mk 53-1 Mk 53	Mk 54	Mk 54-1
Type of Filling	T.N.T.	Torpex	H.B.X.
Weight of Filling	225 lbs.	250 lbs.	250 lbs.
Total Weight	330 lbs.	354 lbs.	354 lbs.
Chg / Wt. Ratio	68 %	70.6 %	70 %

FUZING:

Nose: AN-M103, AN-M103A1(must have modified arming vanes for use with flat nose bomb).
AN-Mk 219 (with an adapter ring may be used in the nose if the AN-M103 with the modified vanes is not available. The AN-Mk 219 requires 2500 feet of air travel to arm).

Tail: AN-Mk 230-4-5-6, Mk 231 (hydrostatic tail fuze).

BODY CONSTRUCTION:

Cylindrical welded sheet steel body with a flat nose. A base closing plate is secured to the rear of the bomb by four bolts.

SUSPENSION:

These bombs are suspended horizontally by two lugs 7" on each side of the center of gravity, or by a single lug at the center of gravity and 180° removed from the other lugs. There is no external band, the bombs being strengthened internally by a band which is fitted into the bombs at the center of gravity. Trunnions for dive bombing may be threaded to the case and internal strengthening band.

TAIL CONSTRUCTION:

Welded to the tail cone are four vanes which are strengthened by interior box type struts, and an exterior wide ring strut. The tail cone is secured to the base closing plate by four bolts.

COLOR & MARKINGS:

Olive drab overall. "Mk 53 - 325 lb. depth bomb", "Mk 54 - 350 lb. depth bomb" stencilled on the respective bomb bodies in yellow if the filling is TNT, or in blue if the filling is Torpex.

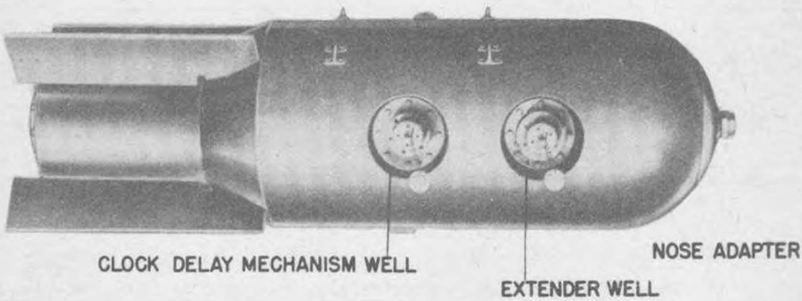
REMARKS:

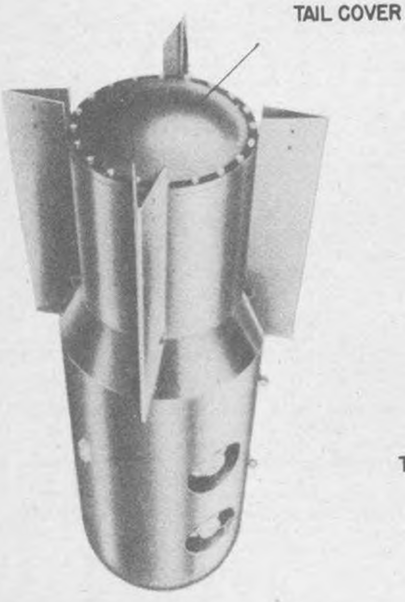
These two bombs (identical except for filling) have been designed to replace depth bombs using athwartship fuzes, since difficulties have been encountered at times in the past with the AN-Mk 224 and AN-Mk 234. The Mk 53 and Mk 54 will use the AN-Mk 230 and a nose fuze, having no athwartship pocket.

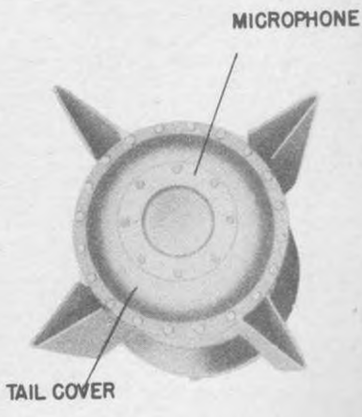
The AN-Mk 53-1 and AN-Mk 54-1 differ from the Mk 53 and Mk 54 respectively in that the suspension lugs are welded on instead of being of the screw type. In addition, the walls of the explosive cavity of the two bombs are coated with an asphaltic composition known as Hot Melt. The AN-Mk 54-1 is loaded with HBX rather than Torpex.

Only the modifications of the Mk 53 and Mk 54 have been standardized as AN bombs.

MINE, MK.13 AND MODS.







MK.13. MOD.5

MK.13 MODS. 0.3.4

RESTRICTED

U. S. NAVY MINE

1000 LB. AIRCRAFT MINE

Ground Influence Fired
Mk 13 Mod 0 Magnetic Induction
Mk 13 Mod 3 Magnetic Induction
Mk 13 Mod 4 Magnetic Induction
Mk 13 Mod 5 Acoustic
(Service)

DATA:

LENGTH OVERALL . . . . 68.75 in.

DIAMETER
- Case . . . . 19.875 in.
- Tail section . . . . 15.25 in.
- Fins on tail section . . . . 25.50 in.

WEIGHTS:

	Mk 13 Mods 0,3,4		Mk 13 Mod 5	
Type of Filling	T.N.T.	Torpex	T.N.T.	Torpex
Weight of Filling. . . .	640 lbs.	700 lbs.	640 lbs.	700 lbs.
Total Weight	1030 lbs.	1090 lbs.	1000 lbs.	1060 lbs.
Chg / Wt. Ratio	62.0%	63.3%	64.0%	66.0%
Negative Bucyancy . . .	430 lbs.	490 lbs.		

FUZING:

For Use as Mine: Athwartship - Mine Mechanisms

Forward well: Extender and Booster
After well: Clock Starter and Clock Delay

For Use as Bomb:

Nose: AN-M103, AN-M103A1, M135, M135A1, M136, M136A1, M139, M139A1, AN-M139A1, M140, M140A1, AN-M140A1, M149, M163, M164, M165. AN-Mk 219 (by using adapter ring and one Mk 1 aux. booster).

GENERAL:

The Mk 13 is designed as a ground influence mine, laid offensively by aircraft from altitudes of 100 to 500 feet in 16 to 75 ft. of water (40-100 ft. for Mk 13-5) against surface craft and up to 500 ft. against submarines. The Mk 13-0-3-4 are magnetic induction mines using the M-4 Search Coil firing mechanism, while the Mk 13-5 is an acoustic mine utilizing the A-3 acoustic firing mechanism.

When dropped as a bomb, the minimum altitude of release for the mine is 1200 ft. to ensure pilot safety. Because of the shape of the mine, the standard bomb nose fuzes require longer air travel to arm.

MINE CONSTRUCTION:

The body is a cylindrical steel case with a welded hemispherical nose containing a fuze seat liner which houses an adapter ring and two Mk 1 auxiliary boosters. The cylindrical tail section is of a smaller diameter and is welded to the body. The dome steel tail cover of the Mk 13-5 is modified to contain the MI-2 microphone; the rubber diaphragm microphone cover of the Mk 13-5 is stamped with the word "BRUSH". Horizontal suspension is accomplished by either of three sets of lugs placed 45° apart; each set consists of two standard lugs 14 in. apart.

COLOR AND MARKINGS:

Black overall.

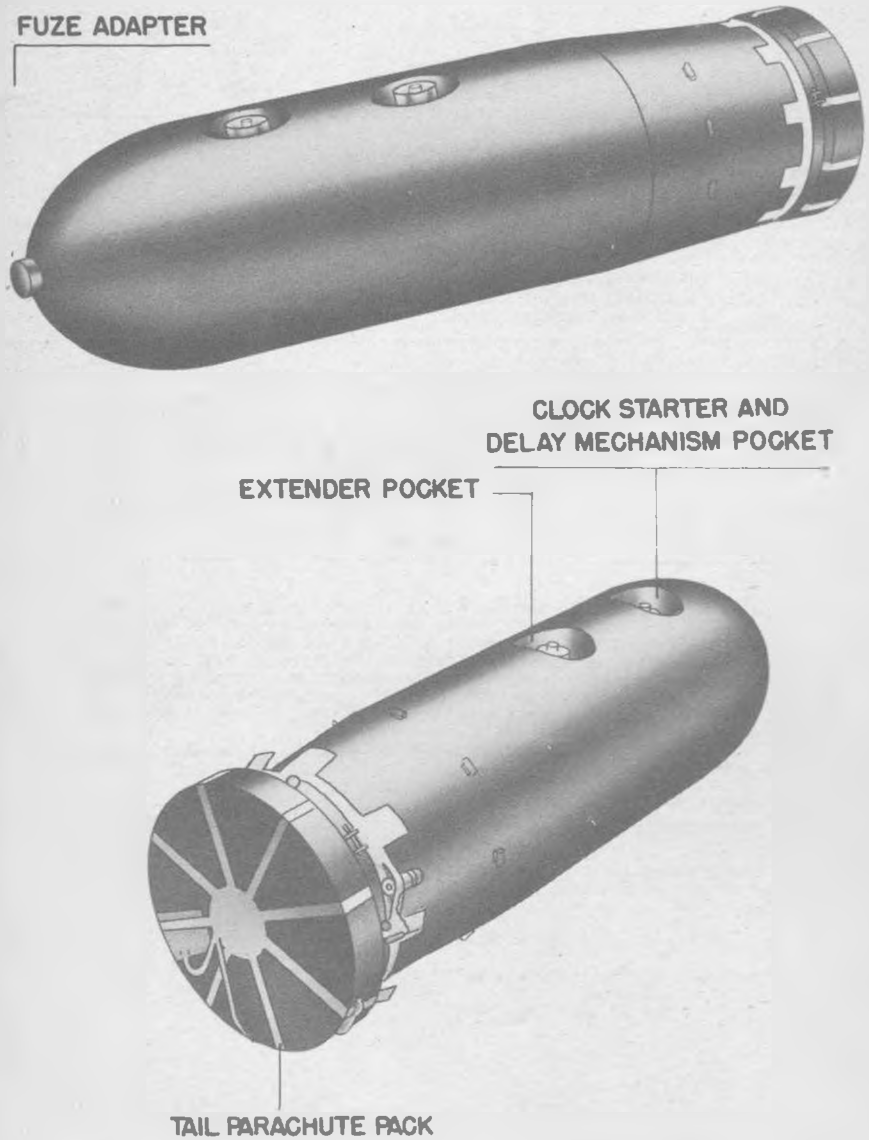
REMARKS:

The Extender and Clock Starter are functioned by hydrostatic pressure at a depth of 16 ft. or greater. The Clock Delay runs off in 45 minutes to arm the mine.

The Mk 13-3 is a Mk 13-0 fitted with the Tail Parachute Pack Mk 1.

In the Mk 13-4, the Extender and Clock Starter are modified for shallow water planting, allowing the mine to function in 10 ft. of water. In other respects the Mk 13-4 is identical to the Mk 13-0.

MINE, AN-MK 26 MOD. I



CONFIDENTIAL

U. S. NAVY MINE

1000 LB. AIRCRAFT MINE

AN-Mk 26 Mod 1
Ground, Influence Fired
(Service)

LENGTH OVERALL

With parachute pack	68.5 in.
Without parachute pack	64.5 in.

DIAMETER

Case	18.625 in.
Tail section	15.75 in.
Parachute pack	18.50 in.

WEIGHTS:

	T.N.T.	TORPEX
Weight of filling	465 lbs.	525 lbs.
Total weight	1000 lbs.	1060 lbs.
Charge/Weight ratio	46.5 %	49.5 %
Negative buoyancy	400 lbs.	460 lbs.

FUZING:

For Use as Mine: Athwartship - Mine Mechanisms
Forward Well: Clock Starter and Clock Delay
After Well: Extender and Booster

For Use as Bomb:
Nose: AN-M103, AN-M103A1, M135, M135A1, M136, M136A1, M139, M139A1, AN-M139A1, M140, M140A1, AN-M140A1, M149, M163, M164, M165, AN-Mk 219 (with adapter ring and additional Mk 1 Aux. Booster).

MINE CONSTRUCTION:

The AN-Mk 26-1 consists of a cylindrical steel case with a welded hemispherical nose and tapered tail section. The tail is closed by a concave cover secured with cap screws. A ring for mounting the parachute assembly is welded around the after end of the case. The Tail Parachute Pack, Mk 1, containing Parachute Mk 2, is fitted to the tail when the mine is installed in plane. This parachute slows fall of the mine thru the air to lessen shock of water impact, and is released from the case on striking water by an impact release mechanism. Suspension is horizontal, two standard lugs being welded onto the body 14" apart and placed 90° from the side pockets. There is a removable British single suspension lug 180° removed.

COLOR & MARKINGS:

Black overall.

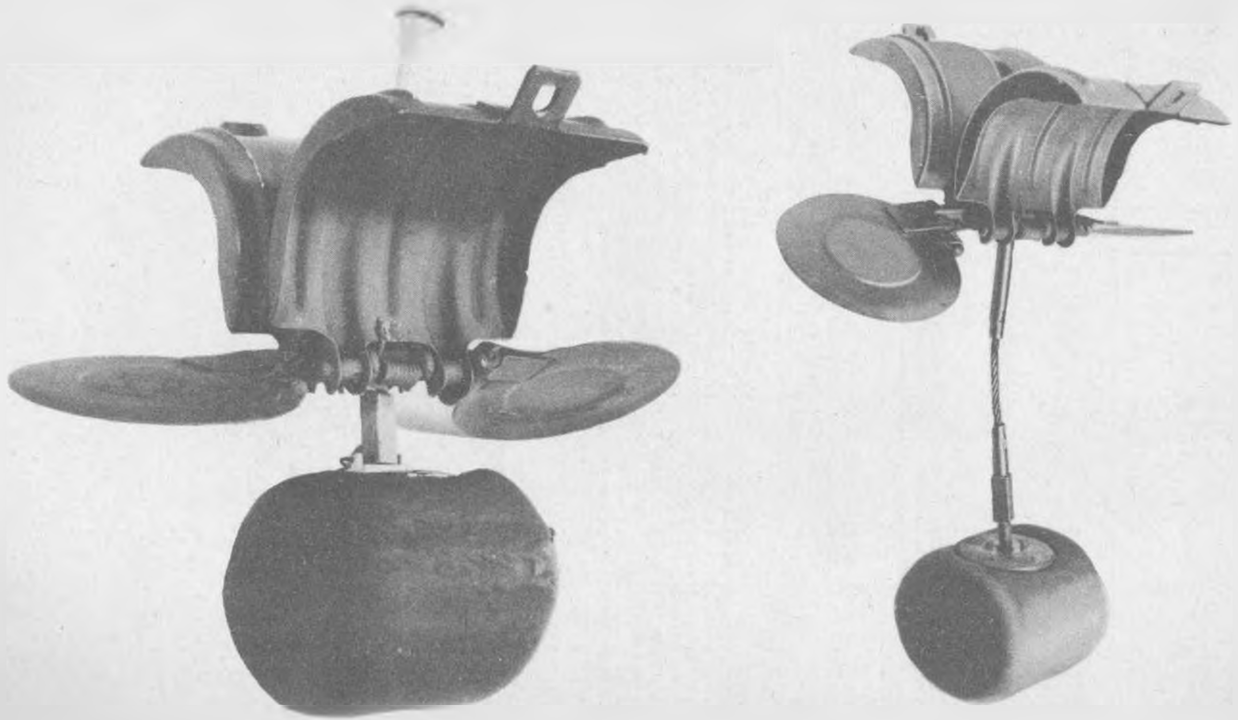
REMARKS:

Normal Use: As ground, magnetic induction mine (M-9-1 Search Coil firing mechanism). Aircraft laid, with parachute (Release altitude - 200 ft. or higher). Laid offensively in depths of water from 16 ft. to 120 ft. against surface craft, and up to 500 ft. against submarines.

Extender and Clock Starter are functioned by hydrostatic pressure at depths of 16 ft. or greater. Clock Delay runs off in 170 minutes to arm mine.

Use as Bomb: This mine is poorly suited for use as a bomb since accurate dropping by parachute is difficult; and if parachute is not used, the case tumbles. Fuzes require longer air travel to arm than usual because of the shape of the mine and the manner of fall thru the air.

U.S. FRAGMENTATION BOMB (BUTTERFLY)
M 83



U. S. ARMY BOMB

4 LB. FRAG (BUTTERFLY)

M 83
(Service)

DATA:

	M 83
OVERALL LENGTH	3.0 in.
BODY LENGTH	3.0 in.
BODY DIAMETER	3.1 in.
WALL THICKNESS	0.25 in.
TAIL LENGTH	
TAIL WIDTH	
TAIL WEIGHT	

WEIGHTS:

Type of Filling . . .	T.N.T.
Weight of Filling . .	.47 lbs.
Total Weight	3.2 lbs.
Chg / Wt. Ratio . . .	15%

FUZING:

M 129 (Air or ground burst)
M 130 (Time maximum 30 min.)
M 131 (Anti-disturbance)

BODY CONSTRUCTION:

The bomb body is cylindrical in shape, cast in two halves and welded together. The fuze cavity is situated athwartships in the body, is 1-3/4 inches in diameter, and is threaded with a left-hand thread. The left-hand thread is to prevent unscrewing of the fuze while the bomb is in flight.

ARMING VANE ASSEMBLY:

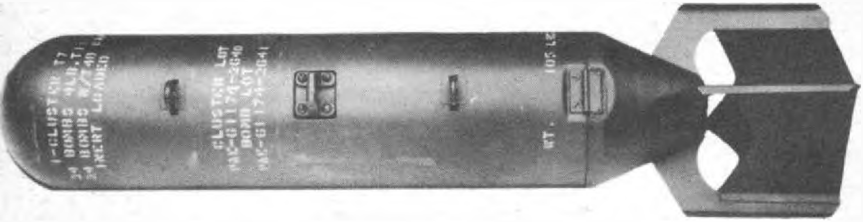
The vane assembly consists of four pieces hinged together - two semi-cylindrical surfaces (wings) and two discs (propeller blades) inclined at a slight angle. While the bomb is still in the cluster the vane assembly is folded around the bomb to form a cylindrical casing which can be closed against the pressure of the vane coil springs by means of a safety clip. The arming spindle projects through the bomb casing.

When the bombs are packed in the cluster adapter the safety clips are removed but the bombs remain in their closed status due to their proximity to each other. When the cluster adapter bursts open the bombs scatter and the vane assembly on each bomb is spread open by the force of its coil springs. The vane assembly is forced to the top of the arming spindle by air resistance, where the square head on the spindle engages the square hole in the assembly. The two "wings" reduce the velocity of descent of the bomb. The two "propellers", being set at angles to each other, cause the vane assembly to turn in a counter-clockwise direction, thereby screwing the arming spindle out of the fuze body and permitting the fuze to arm. The arming spindle is not completely withdrawn from the fuze, being retained in the fuze by a collar on the spindle.

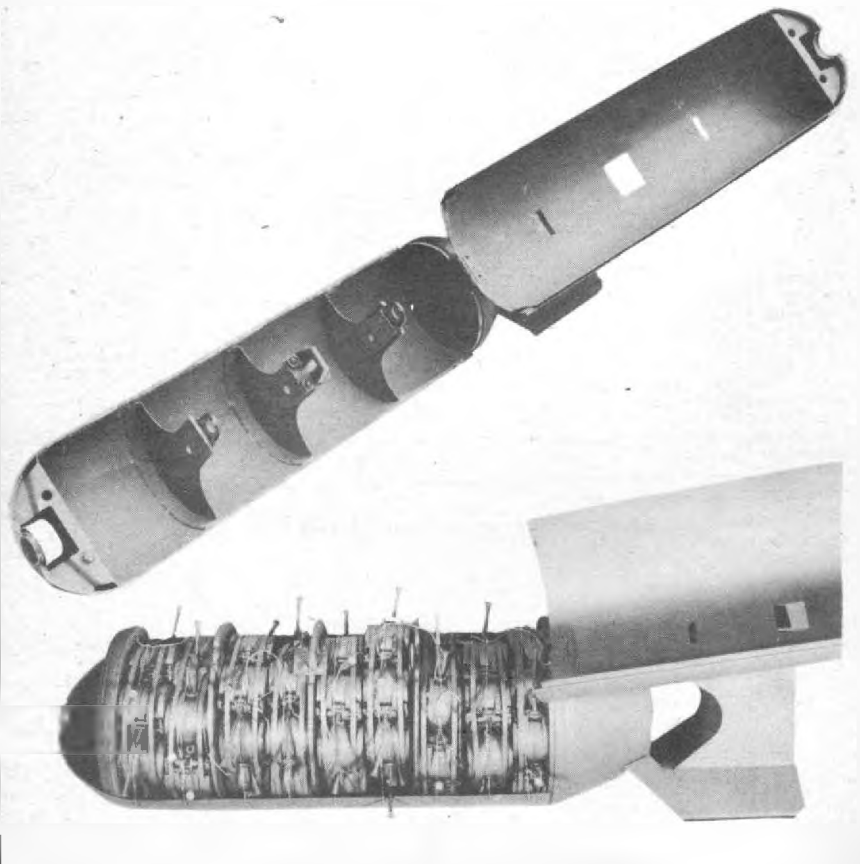
COLOR AND MARKINGS:

The bombs are painted olive drab with a .5 in. yellow band running horizontally around the folded "wings".

BUTTERFLY BOMB CLUSTER ADAPTERS



M 28 CLUSTER (MI5 CLUSTER ADAPTER)



M29 CLUSTER (MI6 CLUSTER ADAPTER)

RESTRICTED

U. S. ARMY CLUSTER ADAPTER

M15, M16 CLUSTER ADAPTERS

M15A1
M15A2
M16A1

Data:	M15	M16
OVERALL LENGTH	47.35 in.	59.635 in.
BODY DIAMETER	8.0 in.	13.89 in.
TAIL WIDTH	11.0 in.	18.9 in.
WEIGHT LOADED	155 lbs.	415 lbs.

FUZING:

M155 (replacing M111A2)
AN-M146 (subsitute for M155)
M111A2 (to be used if neither M155 and M146 available. Partially arm by rotating vanes 130 turns clockwise).

GENERAL:

The M15 is a cylindrical sheet metal case which opens longitudinally, being hinged at the rear and closed by a nose cup. When loaded it contains twenty-four 4 lb. frag. bombs, forming the M28 cluster. The cluster is designed to fit 100 lb. bomb stations.

The M16 is similar to the M15 except for size. The M16 contains ninety 4 lb. frag. bombs when loaded and forms the M29 cluster. The adapter is loaded with bombs in wafer form, each wafer being comprised of 10 bombs. The cluster can be carried on any 500 lb. bomb station. It has a third lug for suspension in British planes.

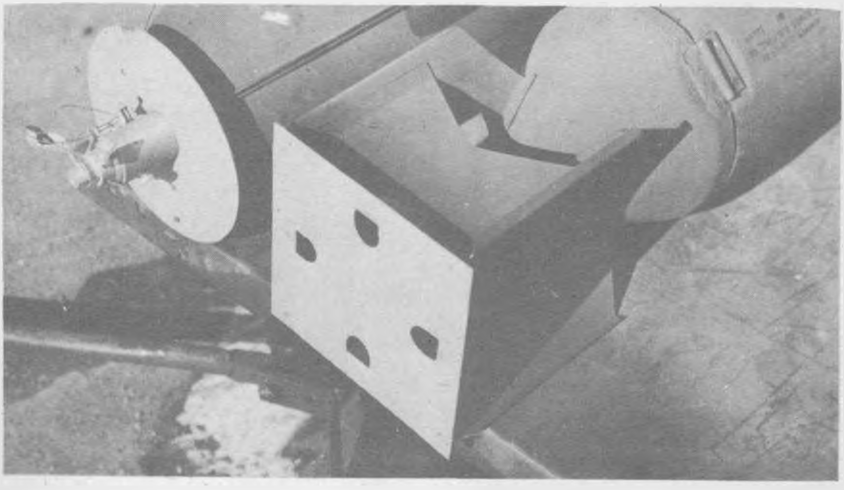
OPERATION:

Clusters are released from altitudes of not less than 3000 ft. and not more than 5000 ft. Fuze settings for functioning after release are varied from 5 seconds at minimum release altitude to 8 seconds at maximum release altitude. When the fuze fires it releases the nose closing cup, allowing the adapter to open and release the bombs. The bombs scatter to form a pattern over an area of approximately 300 by 200 ft.

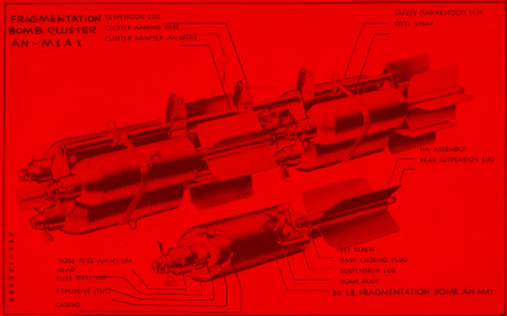
REMARKS:

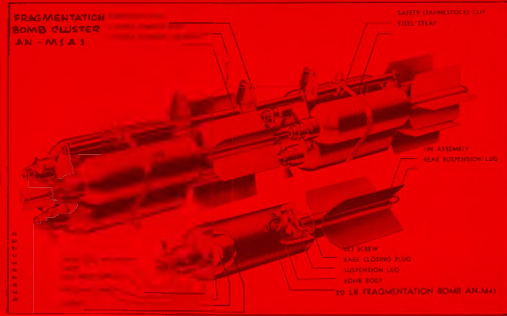
The M28A1 cluster is the same as the M28 except that it incorporates a spoiler ring around the nose and a drag plate secured to the tail by four screws. These two devices were added because the dropping altitude for the M28 was limited by the high velocity attained by the clusters at high altitudes, resulting in damage to the butterfly when the cluster opened. When drag plates and spoiler rings are used, the recommended release altitude is 1500 feet with a six second fuze setting, or any higher altitude which will open the cluster at a height between 1000 and 2500 feet.

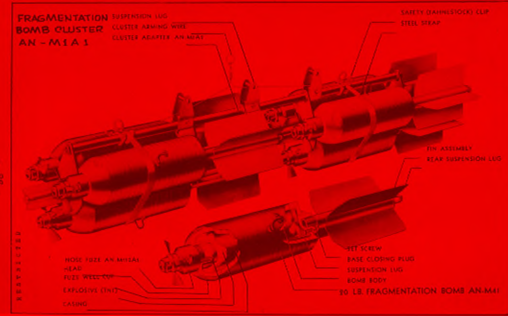
The M28A2 and M29A1 clusters modify the M28A1 and M29A1 clusters by newly designed locking cups, which are secured to the cluster adapter by two slotted screws. The M16 cluster adapter becomes the M16A1 and the M15A1 becomes the M15A2.



M28A1 CLUSTER, SHOWING SPOILER RING AND DRAG PLATE


FRAGMENTATION BOMB CLUSTER AN-M1A1
SUSPENSION LUG
CLUSTER ARMING WIRE
CLUSTER ADAPTER AN-M1A2
SAFETY (FAHNESTOCK) CLIP
STEEL STRAP
FIN ASSEMBLY
REAR SUSPENSION LUG
SET SCREW
BASE CLOSING PLUG
SUSPENSION LUG
BOMB BODY
20 LB. FRAGMENTATION BOMB AN-M41
NOSE FUZE AN-M110A1
HEAD
FUZE WELL CUP
EXPLOSIVE (TNT)
CASING
RESTRICTED





ARMY-NAVY BOMBS

20 LB. FRAG.

AN-M41 (20 lb.) and A1 Mod
M48 (20 lb.) Practice

DATA:

OVERALL LENGTH	19.5 in.
BODY LENGTH	11.3 in.
BODY DIAMETER	3.6 in.
WALL THICKNESS	0.56 in.
TAIL LENGTH	9.25 in.
TAIL WIDTH	5.1 in.
TAIL WEIGHT	1.6 lbs.

WEIGHTS:

Type of Filling	T.N.T.
Weight of Filling	2.7 lbs.
Total Weight	20.3 lbs.
Chg / Wt. Ratio	13%

FUZING:

AN-M110A1; M110; M109; AN-M120; AN-M120A1; M158

BODY CONSTRUCTION:

Bomb is constructed of the following: (1) cast steel nose and tail pieces; (2) seamless steel inner tube; (3) helically-wrapped drawn steel wire wrapping around inner tube. The tube is threaded to hold the nose and tail sections.

SUSPENSION:

For individual suspension of this bomb, a U-shaped eyebolt of steel is welded to the body at the center of gravity for horizontal suspension, and an eyebolt is welded to the tail for vertical suspension.

Bomb may be dropped in a cluster of 6 bombs in the AN-M1A2 or M1 cluster adapter forming the AN-MA1 or M1 cluster. The cluster adapter is made of sheet steel, and does not use eyebolts of bombs for suspension.

TAIL CONSTRUCTION:

Four rectangular sheet steel vanes welded to a length of 1" cast iron pipe which screws into the base filling plug.

COLOR AND MARKINGS:

Olive drab with 1" yellow band around the nose and extreme rear of the bomb and a ½" band around the center of gravity. Present production eliminates the ½" yellow band.

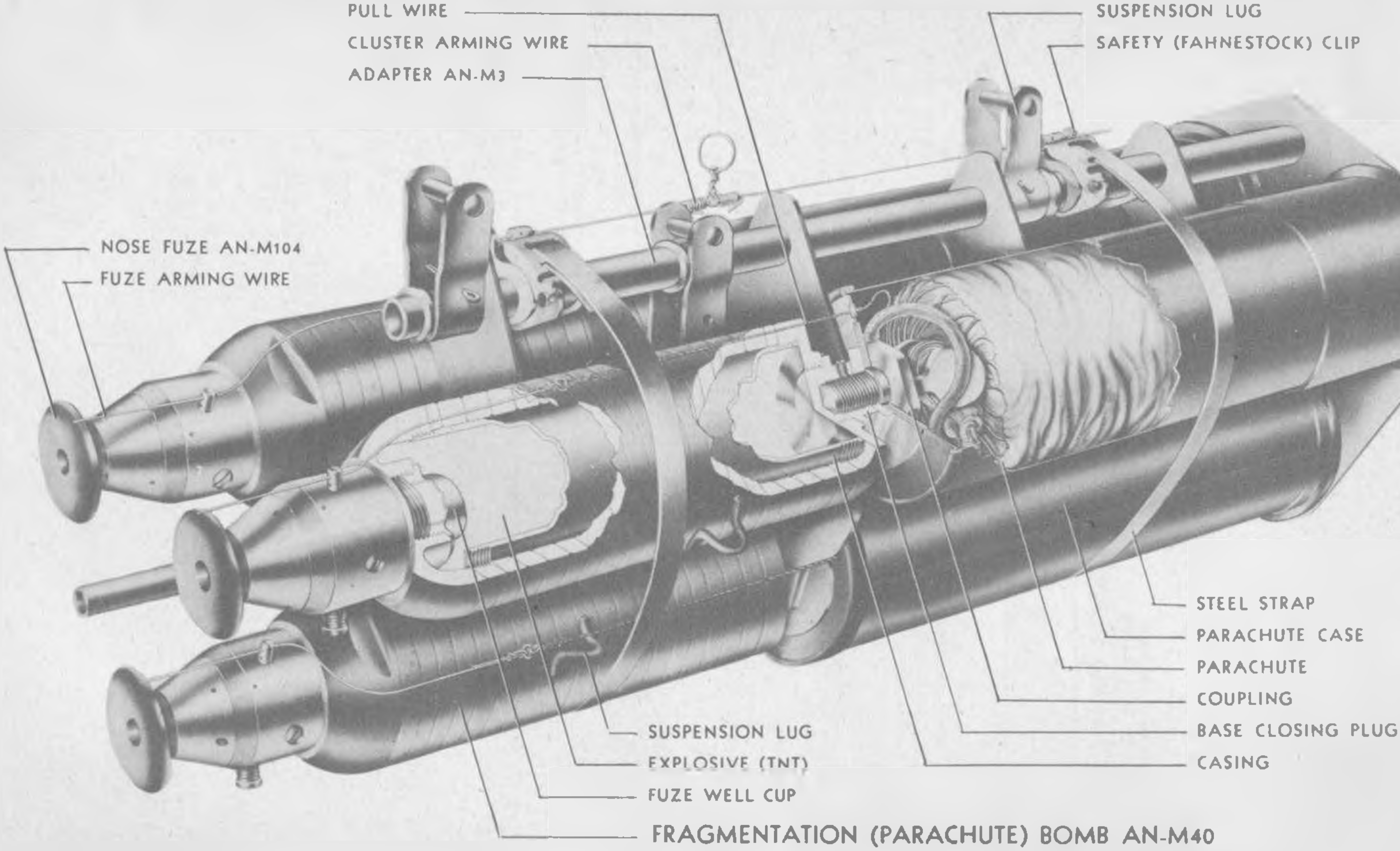
REMARKS:

Bomb is a high-level fragmentation bomb and should be dropped from a minimum altitude of 400 feet.

The A1 modification of this bomb consists of adding a 1½" shoulder around the nose to facilitate clustering with unfuzed bombs. Heretofore the spacers of the cluster adapter have fitted against the fuze, thereby making it requisite that the bombs be clustered and shipped with fuzes inserted.

The M48 is a practice bomb, simulating the AN-M41A1.

FRAGMENTATION BOMB CLUSTER, AN-M4



ARMY-NAVY BOMBS

23 LB. PARA-FRAG.

AN-M 40 (23 lb.) and A1 Mods
M 72 (23 lb.) and A1 Mods

DATA:

	23 lbs. AN-M 40 & M 72
OVERALL LENGTH	26.7 in.
BODY LENGTH	11.3 in.
BODY DIAMETER	3.6 in.
WALL THICKNESS	0.56 in.
TAIL LENGTH	13.9 in.
TAIL WIDTH	4.35 in.
TAIL WEIGHT	5.3 lbs.

WEIGHTS:

Type of Filling	T.N.T.
Weight of Filling	2.7 lbs.
Total Weight	24.5 lbs.
Chg / Wt. Ratio	11.0%

FUZING:

AN-M120A1; AN-M104; M170; AN-M120

BODY CONSTRUCTION:

These bombs are constructed of the following: (1) cast steel nose and tail pieces; (2) seamless steel inner tube; (3) helically-wrapped drawn steel wire wrapping around inner tube. The tube is threaded to hold the nose and tail sections.

SUSPENSION:

For individual suspension of these bombs, a U-shaped eyebolt of steel is welded to bomb at the center of gravity.

The AN-M40 bombs are always clustered, three of the bombs with the AN-M3 cluster adapter forming the AN-M4 cluster.

The M72. slightly modified version of the AN-M40, is adapted for individual vertical suspension and can be carried in vertical cellular racks by several types of Army planes.

TAIL CONSTRUCTION:

AN-M40 and M72 are fitted with cylindrical sheet steel parachute housings which have end caps at the rear and contain a white silk parachute. The parachute unit M3 is used in the M40 and M71 bombs; the M4 parachute unit is used in the M72 and M73 bombs.

COLOR AND MARKINGS:

Olive drab with a 1" yellow band around the nose and extreme rear of the bomb and a 1/4" band around the center of gravity. Present production eliminates the 1/4" yellow band.

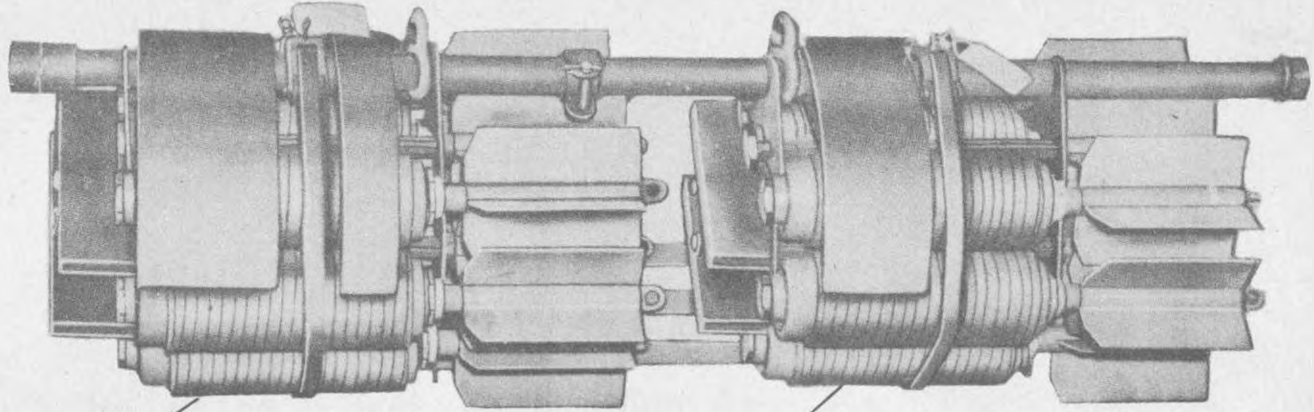
REMARKS:

The M71 and M73 are practice bombs.

The AN-M40 and M72 are low-level fragmentation bombs and should be dropped from a maximum altitude of 400 ft.

The A1 modification of these bombs consists of adding a 1½" shoulder around the nose of the bomb to facilitate clustering with unfuzed bombs. Heretofore the spacers of the cluster adapters have fitted against the fuze, thereby making it requisite that the bombs be clustered and shipped with the fuzes inserted. Bombs with this modification are designated the AN-M41A1 and M72A1 fragmentation bombs with the practice bombs being designated M71A1 and M73A1.

CLUSTER ADAPTER M13



FRAGMENTATION BOMB CLUSTER M-26

CLUSTERS, CLUSTER ADAPTERS

AN-M1A1 CLUSTER, AN-M1A2 CLUSTER ADAPTER:

This cluster consisting of the AN-M1A2 or M1 cluster adapter and six AN-M41 fragmentation bombs, is made of sheet metal and does not use eye-bolts for suspension.

AN-M1A2 CLUSTER, AN-M1A3 CLUSTER ADAPTER:

With the modification of AN-M41 bombs to permit fuzing in the field, the following changes are made in the AN-M1A2 cluster adapter: (1) flat springs are substituted for the fuze lock plates; and (2) the suspension lugs were changed from a strip type to a type similar to those on G.P. bombs. The new lugs were designed to permit suspension of the clusters in all existing types of bomb racks. The modified cluster adapter becomes the AN-M1A3, forming with six AN-M41A1 fragmentation bombs the AN-M1A2 cluster.

If the modified cluster adapter AN-M1A3 is used with unmodified bombs AN-M41; or the unmodified cluster AN-M1A1 is used with modified bombs AN-M41A1; or the unmodified cluster adapter AN-M1A1 is used with unmodified bombs AN-M41, no change will be made in the designation of the AN-M1A1 cluster. The bombs, in these latter cases, will be fuzed when the bombs are clustered at the loading plant.

Unmodified bomb AN-M41 with cluster adapter AN-M1A1 not suitable for Navy use. The modified adapter AN-M1A2 can be used and cluster is designated 81ZVL.

AN-M4 CLUSTER, AN-M3 CLUSTER ADAPTER:

The AN-M3 cluster adapter and three AN-M40 fragmentation bombs form the AN-M4 cluster.

AN-M4A1 CLUSTER, AN-M3 CLUSTER ADAPTER:

When AN-M40A1 bombs are clustered, the AN-M3 cluster adapter is still used without any alteration in design, but the designation of the cluster is the A N-M4A1

M26 CLUSTER, M13 CLUSTER ADAPTER:

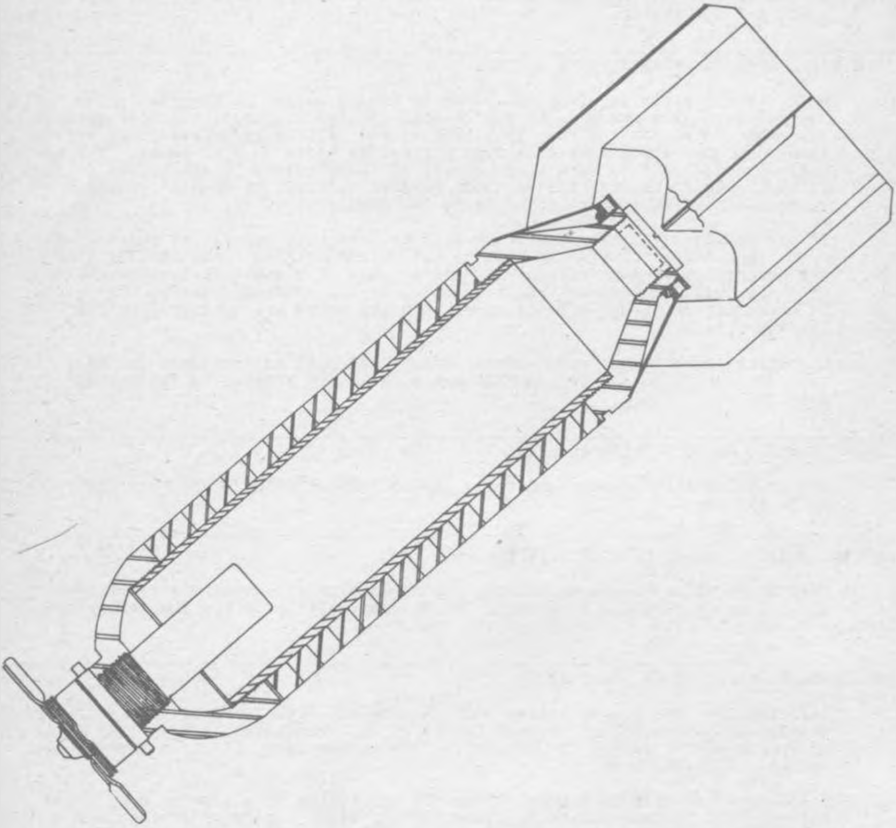
Description: The fragmentation bomb cluster M26 (T4E4) consists of a cluster adapter M13 to which are secured twenty 20 lb. fragmentation bombs, AN-M41A1 in groups of ten each. The cluster is 53½ inches long, 14-11/16 inches wide, and 13-3/4 inches high.

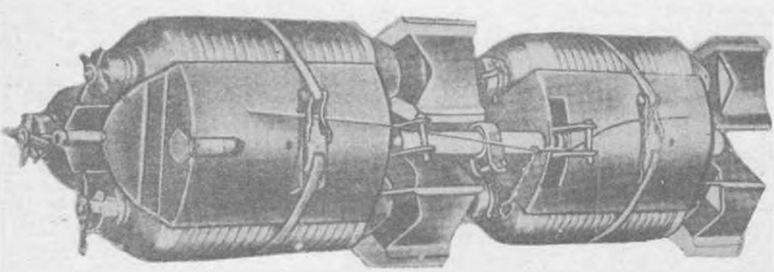
The cluster adapter is a steel framework consisting of a tubular suspension bar to which the suspension lugs are fitted, steel separator plates, and two metal straps secured by release buckles. The separator plates located forward of each group of the bombs are built with arming vane stops for the M110A1 nose fuzes used in the individual bombs. The cluster can be adapted for either quick or delayed opening.

Operation: Quick opening is accomplished by the arming wires which are fed through the release buckles and are withdrawn on the release of the cluster from the plane. In delayed opening, a mechanical time nose fuze, M155 (T71) or M111A2, is screwed to the fuze adapter in the forward end of the tubular suspension bar. When the fuze detonates at the preset delay, the explosion drives a steel slug rearward to cut the shear wires in both the forward and aft release buckles, thereby permitting the cluster to open.

Tumbling of the M26 cluster prevents the M111A2 from arming correctly, and therefore the fuze has been modified by the substitution of anemometer type arming vane for the standard vane. So modified, the fuze is known as the T77. Modification can be accomplished in the field by kits now being issued.

M82 90 LB. FRAGMENTATION BOMB





M27 FRAGMENTATION BOMB CLUSTER
M14 CLUSTER ADAPTER

U. S. ARMY BOMB

90 LB. FRAG.

M 82
M 27 Cluster
(Service)

DATA:

OVERALL LENGTH	28 in.
BODY LENGTH	19.8 in.
BODY DIAMETER	6 in.
WALL THICKNESS	.94 in.
TAIL LENGTH	9.3 in.
TAIL WIDTH	8.1 in.
TAIL WEIGHT	2.8 lbs.

WEIGHTS:

Type of Filling	Comp. B
Weight of Filling	12.0 lbs.
Total Weight	91.6 lbs.
Chg / Wt. Ratio	13.1 %

FUZING:

M103, AN-M103, AN-M103A1, M135, M135A1, M136, M136A1, M139, AN-M139A1, M140, AN-M140A1, M149, M163, M164, M165, M166, T82

BOMB CONSTRUCTION:

Nose and tail pieces of cast steel screw on to a central section of seamless steel tubing. A square helical steel spring is wound around the steel tubing. The nose and tail pieces are partially cut through to afford greater fragmentation. The bomb is suspended by single lug or in a cluster (M27) of six bombs. The tail is of normal U.S. box construction and is secured to the bomb by a locking ring.

COLOR & MARKINGS:

Olive drab overall. One inch yellow band around the nose and extreme rear of the bomb, and a 1/4 inch band around the center of gravity. Present production eliminates the 1/4 inch band.

M 27 CLUSTER, M 14 CLUSTER ADAPTER:

GENERAL:

The M27 cluster consists of a 500 lb. cluster of six 90 lb. fragmentation bombs (M82) and the cluster adapter M14 (T3), fuzed with the M155 nose fuze.

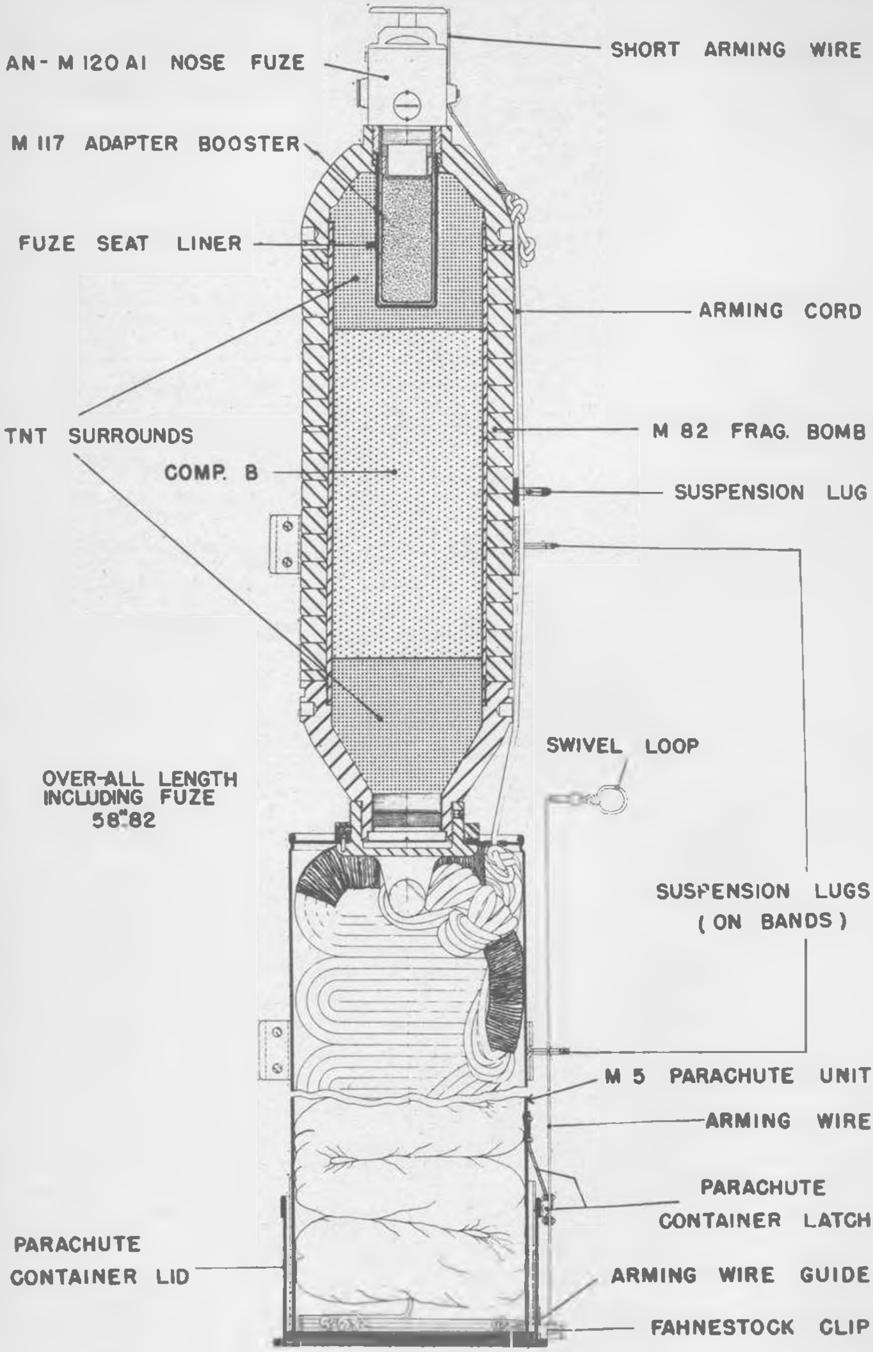
CONSTRUCTION AND OPERATION:

The M14 cluster adapter consists of two longitudinal steel tubes, 56 inches long, to which are welded four steel plates forming the support for the six bombs. The lower tube serves as the backbone of the cluster and the upper tube carries the suspension lugs, buckles for the releasing straps and the adapters for the nose and tail fuzes. The nose fuze M111A2 or M155 is used; however, a mechanical time fuze for the tail is not available to be fitted.

The cluster may be adjusted to release the bombs immediately or, through the use of mechanical time fuzes, to discharge the bombs 5 to 92 seconds after the release of the cluster from the plane. If it is intended that the cluster is to open immediately, the shear wire is cut after the arming wire is installed and no fuze is used.

REMARKS:

The immediate opening of the cluster produces the most favorable impact pattern. The cluster must open at a minimum altitude of 1000 feet in order that the bomb fuze can arm.



M86 120 LB. FRAGMENTATION BOMB

RESTRICTED

Data

DIMENSIONS OF BOMB . . . . . Refer page 57, 90# frag., M82.

PARACHUTE CONTAINER LENGTH . 35.5 in.
PARACHUTE CONTAINER DIAM . . 6.5 in.
FUZING . . . . AN-M120 or AN-M120A1

U. S. ARMY

120 LB. PARA-FRAG.

M 86

DESCRIPTION:

The M 86 consists of the 90 lb. fragmentation bomb, M 82 and a parachute unit M5 which is screwed to the base of the bomb body in place of the normal tail fin assembly. Both units are issued separately and must be assembled prior to use.

The parachute unit M5 consists of a cylindrical container housing the parachute. The lid of the container is fastened by a latch which is secured by the arming wire.

The bomb is fuzed with the AN-M120 or AN-M120A1 by using the M117 adapter booster.

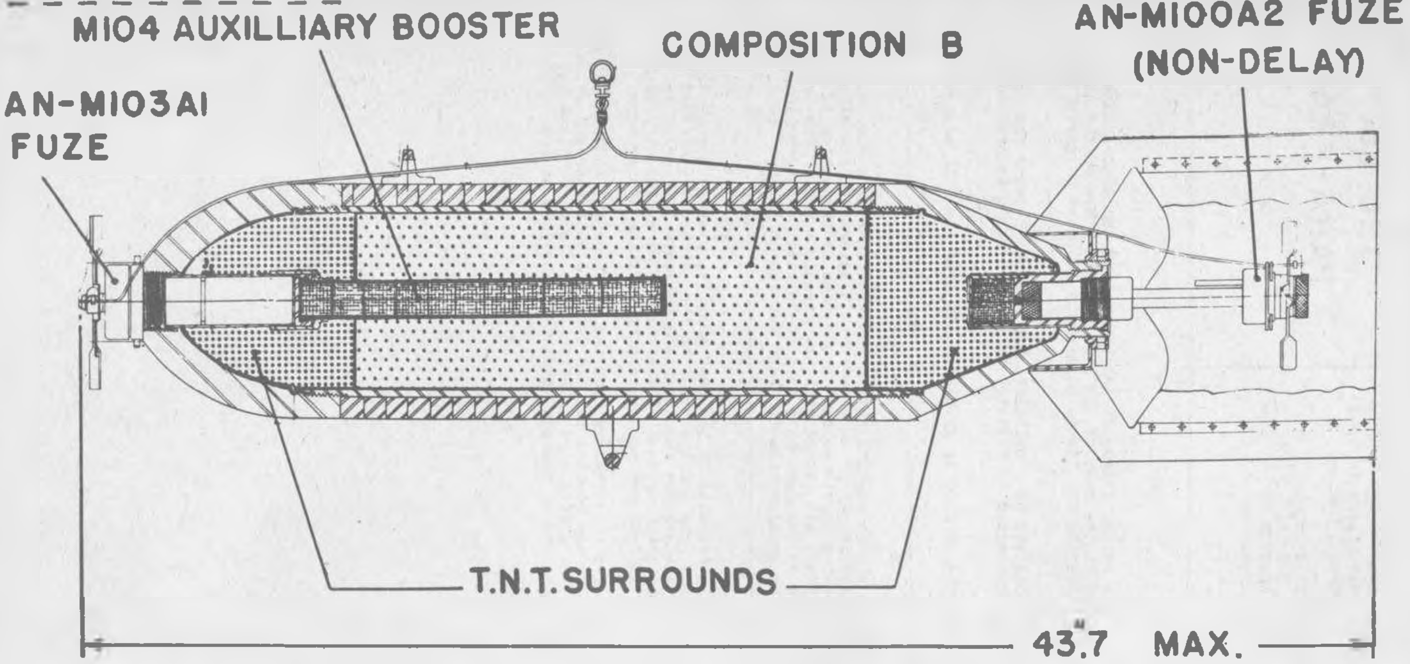
SUSPENSION:

The bomb can be used in a bomb station having the clearance of a 500 lb. bomb, and may be suspended singly or as a two-bomb cluster with the cluster adapter M12. One suspension lug is welded to the bomb at the center of gravity and two suspension bands are issued with the parachute unit. The larger diameter band is secured on the parachute unit to be used in conjunction with the suspension lug or the smaller diameter band secured on the bomb body.

OPERATION:

The arming wire, which is fastened to the bomb shackle, passes through the lug of the rear suspension band and the latch on the parachute container but not through the fuze. This secures the latch and prevents the parachute from opening until immediately after release of the bomb. The arming wire which passes through the fuze is fastened to the parachute by the arming cord.

On release, the arming wire is withdrawn from the latch on the container. As the bomb falls, the air stream removes the lid from the container and allows the parachute to open. The arming cord is attached to the shroud line and is pulled as the parachute opens, thereby permitting the fuze to arm.



AN-M 88 220 LB. FRAGMENTATION BOMB

ARMY-NAVY BOMB

220, 260 LB. FRAG.

AN-M 88 (220 lb.)
M 81 (260 lb.)

(Service)

DATA:	AN-M88	M81
OVERALL LENGTH	43.7 in.	43.7 in.
BODY LENGTH	32.8 in.	32.8 in.
BODY DIAMETER	8 in.	8 in.
WALL THICKNESS	1 in.	1.25 in.
TAIL LENGTH	11 in.	11 in.
TAIL WIDTH	11.5 in.	11.5 in.
TAIL WEIGHT	4.1 lbs.	4.1 lbs.

WEIGHTS:	AN-M88	M81
Type of Filling	Comp. B. (TNT surround)	Comp. B (TNT Surround)
Weight of Filling	34.1 lbs.	46.69 lbs.
Total Weight	260.0 lbs.	216.17 lbs.
Chg / Wt. Ratio	14.0 %	21.6 %

FUZING:

Nose: AN-M103, AN-M103A1, M139, AN-M139A1, M140, AN-M140A1 (All Instantaneous Setting), M135, M135A1, M136, M136A1, M163, M164, M165, M166, T82, M149 T50E1, T89, T91.

Tail: AN-M100A2 or AN-M100A1, M161. (A non-delay M14 primer detonator must be used.

BOMB CONSTRUCTION: (AN-M88 and M81)

The AN-M88 differs from the M81 only in that it has a .75 inch steel coil around the body instead of the one inch. Both bombs are constructed in these two ways. In initial production, nose and tail pieces are of cast steel construction and screw onto a central section of seamless steel tubing. A square helical steel spring is wound around the steel tubing. The nose and tail pieces are partially cut through to afford greater fragmentation (this is similar to the M82 except for the provision for tail fuzes and the M104 auxiliary booster in the larger bombs). The majority of AN-M88's and M81's, however, have a one piece steel tubing, and the helical steel spring is wound around the steel tubing, (and the helical steel spring is wound around the tubing) for the entire length of the body.

Suspension is horizontal; two eyebolts are welded to body along longitudinal axis of the bomb, 14 in. apart. A third eyebolt is welded to the body at center of gravity 180° removed from the other eyebolts. The tail is the normal box type, secured to the bomb by a locking ring.

COLOR & MARKINGS:

Olive drab overall. One inch yellow band around the nose and extreme rear of the bomb, and a 1/4 inch band around the center of gravity.

REMARKS:

The initial bombs were filled with TNT; later productions are filled with Composition B with TNT surrounds. All types have the M104 auxiliary booster.

SECTION II

INCENDIARY & CHEMICAL BOMBS

CONFIDENTIAL

INTRODUCTION

CHEMICAL, INCENDIARY, AND SCREENING SMOKE BOMBS

Chemical:

In general the chemical bombs are of two types, classified according to case construction. The light case bombs have the advantage of higher charge weight ratio, whereas the heavy case bombs have better stowage and handling characteristics. Both types have full length burster charges to split the bomb case and disperse the filling over the area to be contaminated. Fuzing must always be instantaneous or aerial burst to maintain maximum dispersion of contents. Various fillings can be employed for different effects.

Incendiaries:

Incendiaries in use at the present time are classified by their construction and use into two types. The intensive type burns as a unit, confining its intense heat to a relatively small area. The bombs are small in size and are always dropped in clusters to give area coverage. They are normally employed against targets having a high percentage of roof coverage, such as industrial establishments and crowded residential areas. Since the bombs have heavy nose plugs and substantial case strength, some penetration can be expected, and the high burning temperature of its filling will be effective in industrial areas.

The scatter type is usually a larger bomb which disperses small chunks of its burning material over a large area to ignite many small fires. It is normally employed against readily inflammable targets such as frame construction, material storage and grain fields. These bombs explode on impact to throw burning fragments of gasoline gel or other sticky emulsions against its target.

Screening Smokes:

Only the screening smokes will be considered in this section, signalling and illuminating smokes being treated under Pyrotechnics. This division follows in large part the allocation of responsibility for smoke munitions made between the Chemical Warfare Service and the Ordnance Department of the Army. CWS supervises matters relating to screening smokes and the Ordnance Department performs the same functions for signalling and illuminating items.

Color and Markings:

Chemical bombs have different markings than other types of ordnance. The bomb body is painted light grey, and colored bands indicate the nature of the filling. The bands are located between the dual suspension lugs and forward of the center of gravity. One band indicates a non-persistent filler. Two bands indicate a persistent filler. Green indicates casualty agents; red, harassing agents; yellow, smoke or screening agents; purple, incendiaries.

Incendiary bombs may follow the scheme of chemical bombs, with light grey body color and a purple band, or more recently, an olive drab body color with a purple band has been standardized.

CAUTION: All of these items represent a different type of hazard than high explosive filled bombs. They are particularly susceptible to fire and proper precautions should be observed. In handling several of the pyrotechnics and incendiaries, remember to avoid friction as would be caused by rolling or dragging the missile.

Suspension:

Heavy case chemical bombs are suspended in the same manner as G.P. bombs; that is, by dual lugs or by a single lug welded to the bomb case. The light case chemical bombs are suspended by lugs welded to bands which fit around the bomb body. Incendiary bombs of the large scatter type have the same suspension as the chemical bombs. The smaller incendiary bombs are always clustered, and for maximum packing efficiency are hexagonal in shape. The clusters employed on incendiaries are of two types, the quick opening variety and the aimable type with cluster opening controlled by an aerial burst fuze. The quick opening clusters come in two sizes -- 100 lb. and 500 lb. The cluster adapters for 4 lb. intensive incendiaries will carry 34 bombs in the 100 lb. size or 128 bombs in the 500 lb. size. The adapters for 6 lb. scatter incendiaries carry 14 bombs or 60 bombs. The cluster adapters consist of steel tubes supported by plates with the bombs assembled around the tubes. The bombs are held in place by spring steel bands secured by an arming wire running through a buckle at the end of the band. Removal of the arming wire assembly as the cluster drops releases the buckles and the bands open to release the bombs immediately.

CHEMICAL, INCENDIARY AND SCREENING SMOKE BOMBS (cont)

The aimable clusters are relatively new. They fit a 500 lb. bomb station and are designed for precision bombing from high altitudes. To give the cluster the desired ballistic properties, a standard box type tail assembly is attached by a single bolt to the aft plate of the cluster adapter. A strip of primacord (PETN) running full length along the side of the cluster serves to break the spring steel bands and allow the bombs to scatter when the aerial burst nose fuze functions. The AN-M17A1 500-lb. aimable cluster is filled with 110 AN-M50A2 and AN-M50XA3 4-lb. incendiary bombs. The E6R2 cluster adapter (500-lb.), contains either AN-M69 or M74 incendiary bombs. The M23 500-lb. aimable cluster adapter contains 38 bombs of either the AN-M69, the M74, or the M77 incendiary and smoke bombs.

Status

Where possible, the status of each bomb has been given according to Navy definition. "Service" indicates that the item is under current procurement. "Obsolescent" indicates that the bomb is becoming obsolete, that no future procurement is contemplated, but that large stocks may be on hand. "Obsolete" indicates that the present stock is almost exhausted and that it will not be replenished. Items of Army design not procured by the Navy are not classified as to status.

Nomenclature

When under development, Army Bombs carry temporary designations which are later dropped when the bombs are standardized. Experimental bombs controlled by the Army Ordnance Department are indicated by the letter "T"; modifications incorporated in the basic design carry the letter "E". Items in the developmental stage designed by the Chemical Warfare Service, such as incendiary cluster adapters, are indicated by the letter "E" rather than "T", and subsequent revisions in "E" designs carry the letter "R".

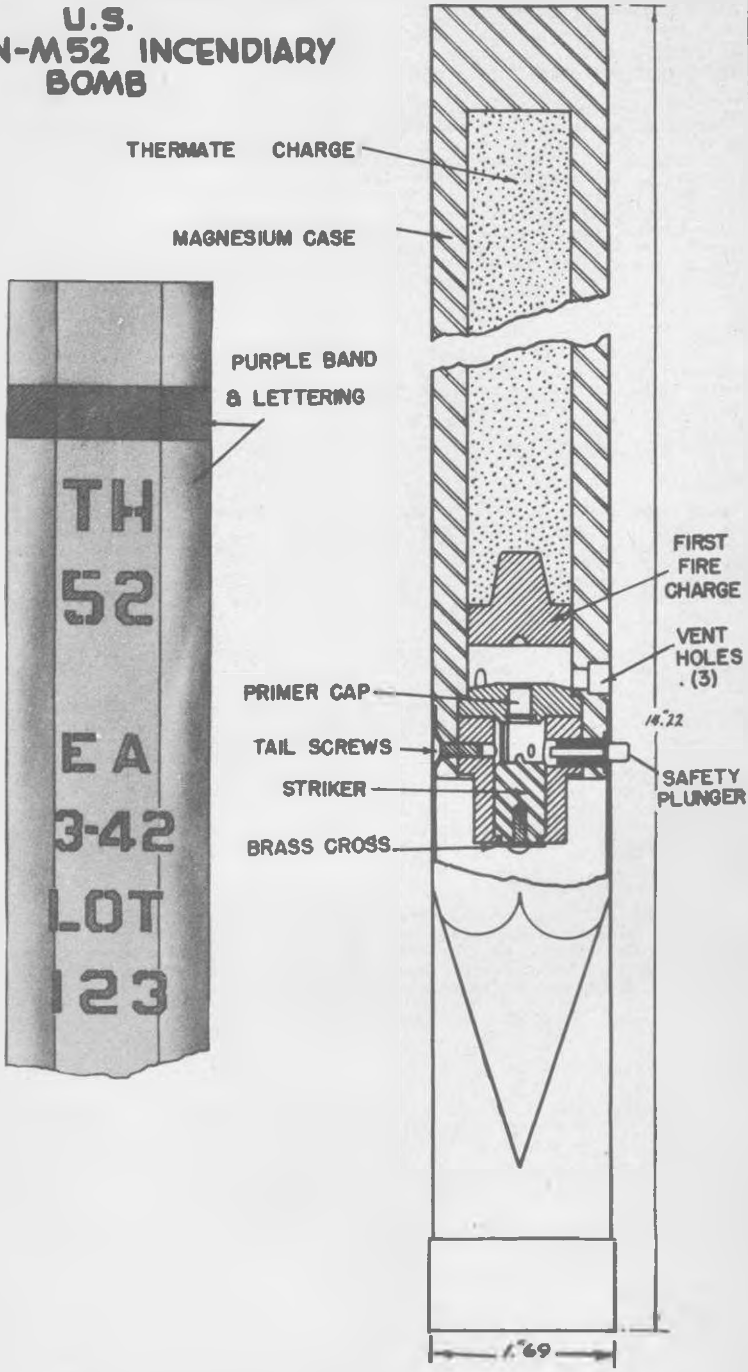
If the developmental bomb is standardized for Army use by the Ordnance Technical Committee, the "T" or "E" designation is dropped and an "M" number assigned. When a modification on a standard item is under development, the change will be given an "E" or "R" designation; if the bomb thus modified is adopted as standard, it will take a designation in sequence in the "A" series, indicating an alteration in the basic design.

In undertaking the development of a new bomb, the Navy Bureau of Ordnance assigns a Mark number which will designate the bomb in the experimental stage as well as in sevice use. No system of "T" or "E" designations is employed. When adopted as standard by the Joint Aircraft Committee, the prefix "AN" is placed before the M or Mk. designation.

Clusters, Cluster Adapters

An attempt has been made to differentiate between "clusters " and "cluster adapter Properly, the cluster adapter is merely the containing device or holder; when the adapter is loaded with bombs, the entire assembly becomes a cluster. In some cases the cluster adapter may closely resemble a bomb in construction(e.g. M23,M10A1), while in others the adapter is nothing more than a banding arrangement(e.g.M6).

U.S. AN-M52 INCENDIARY BOMB



RESTRICTED

DATA:

OVERALL LENGTH	14.22 in.
BODY LENGTH	9.13 in.
BODY DIAMETER.	1.68 in.
WALL THICKNESS	.35 in.
TAIL LENGTH	5.79 in.
TAIL WIDTH	1.68 in.

ARMY-NAVY BOMB

2 LB. INCEND.

AN-M52
AN-M52A1
AN-M52XA1
(Obsolete)

WEIGHTS:

Type of Filling	Thermate
Weight of Filling.	0.4 lbs.
Total Weight	2.0 lbs.
Chg / Wt. Ratio	20 %

BODY CONSTRUCTION:

Hexagonal cast magnesium alloy body weighing 1.13 lbs, with bore one inch shorter than the body length, thus making a solid nose. There are three vent holes below the primer cap assembly to assist in initial burning.

TAIL CONSTRUCTION:

Hexagonal sheet metal tail, secured to body with three screws.

SUSPENSION:

Cluster	Cluster Adapter	Size	No. of Bombs Carried	Status
M10	M5	100 lb.	42 AN-M52A1 9 AN-M52XA1	Obsolete
M11	M8	500 lb.	153 AN-M52A1 39 AN-M52XA1	Obsolete

FILLING:

Thermate is a composition of 80% Thermite and 20% First Fire Charge:

Thermite	First Fire Charge	
Iron Oxide 76%	Sodium Nitrate 50%	
Aluminum Powder 24%	Aluminum Powder 45%	75%
	Sulphur 4%	
	Boiled Linseed Oil 1%	
	Black Powder	25%

ACTION:

Spring loaded safety plunger is depressed by adjacent bomb; upon release from cluster it jumps out, leaving a thin brass cross holding striker. On impact, striker breaks free from cross, igniting primer, first fire charge and thermate. The thermate burns, igniting the magnesium alloy case. Total burning time is 8 minutes.

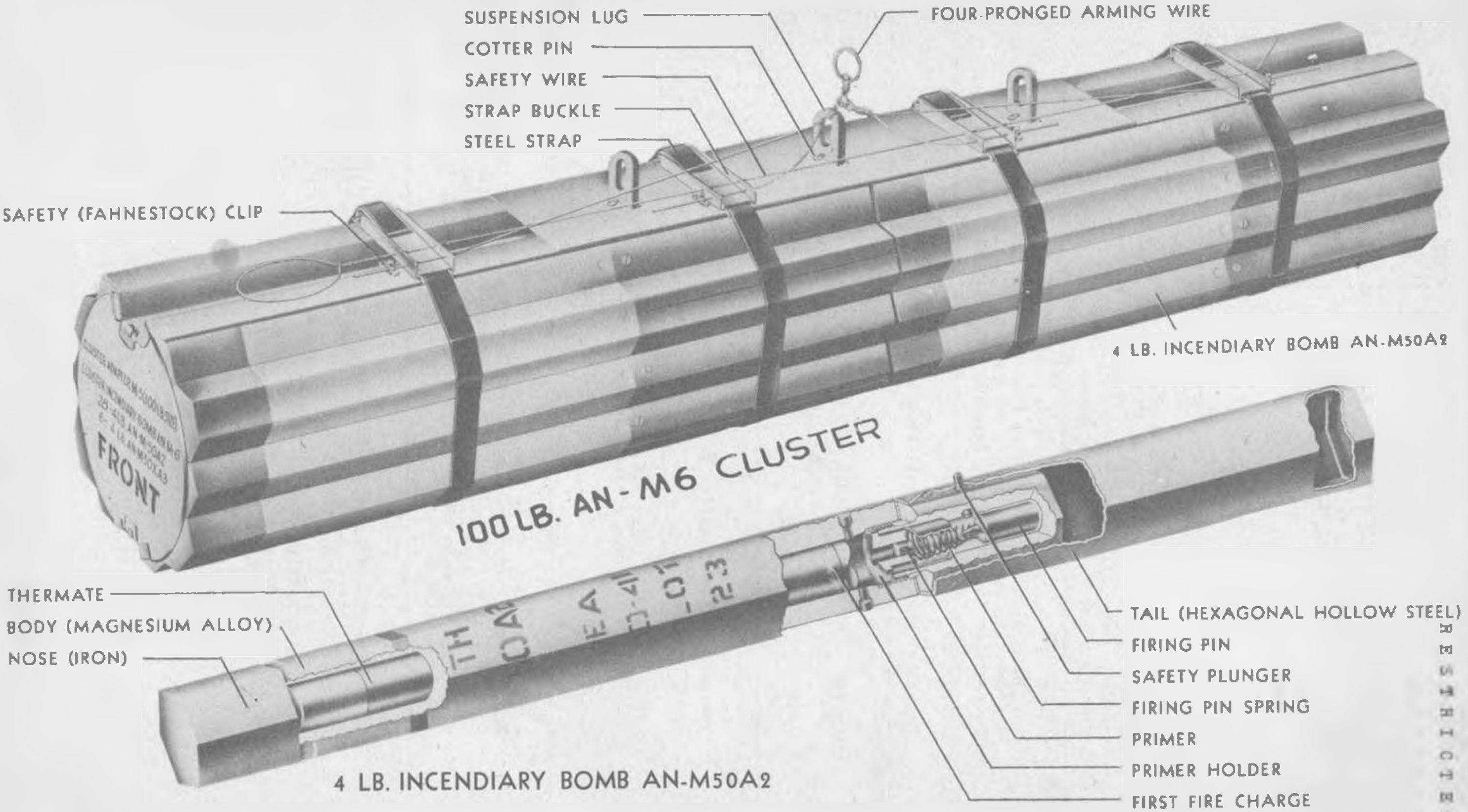
REMARKS:

In the AN-M52A1 a primer of heavier metal is used and the composition of the first fire charge is altered. The AN-M52XA1 incorporates an explosive charge otherwise duplicates the AN-M52A1.

For COLOR & MARKINGS, see

INTRODUCTION, Page 100

4LB. INCENDIARY AN-M50A2



DATA: AN-M50A1 (Obsolete)

OVERALL LENGTH	21.3 in.
BODY LENGTH	13.4 in.
BODY DIAMETER	1.69 in.
WALL THICKNESS	
TAIL LENGTH	8.7 in.
TAIL WIDTH	1.69 in.
TAIL WEIGHT	

ARMY-NAVY BOMBS

4 LB. INCEND.

AN-M50A1
(and modifications)
(Service)

WEIGHTS:

Type of Filling	Thermate
Weight of Filling	0.63 lbs.
Total Weight	3.6 lbs.
Chg / Wt. Ratio	17%

BODY CONSTRUCTION

Hexagonal body of magnesium alloy, weighing 1.25 lbs., with an iron nose plug. There are three vent holes below the primer cap assembly to assist in initial burning.

TAIL CONSTRUCTION:

Hexagonal sheet metal secured to body with three screws.

SUSPENSION:

Cluster	Cluster Adapter	Size	No. of Bombs Carried	Status
AN-M6	M5	100 lb.	28 AN-M50A2 6 AN-M50XA3	Service
E31	M5	100 lb.	34 AN-M50TA2	Service
M7	M6	500 lb.	102 AN-M50A2 26 AN-M50XA3	Service
AN-M14	M10A1	500 lb. Aimable	104 AN-M50TA2 6 AN-M50XA3	Service
M17	M10	500 lb. Aimable	88 AN-M50A2 22 AN-M50XA3	Service
AN-M17A1	M10A1	500 lb. Aimable	88 AN-M50A2 22 AN-M50XA3	Service

OPERATION:

Spring loaded safety plunger is depressed by adjacent bomb; upon release from cluster it jumps out leaving a thin brass cross holding striker, which breaks free on impact and ignites primer. The thermate burns, igniting the magnesium alloy case. Total burning time is 9.5 to 10.5 minutes.

REMARKS:

AN-M50XA1, (Army: limited standard; Navy: obsolescent) contains 170 grains of black powder in a steel capsule at nose, replacing portion of thermate. The bomb burns approximately 1.5 minutes, black powder explodes, scattering burning magnesium over wide radius.

AN-M50A2, (similar to AN-M50A1) is waterproofed around the primer cap and first fire charge.

AN-M50XA2, (similar to AN-M50XA1) has an explosive head consisting of a steel nose cap which houses three tetryl pellets, a detonator and a delay fuze. The delay fuze is ignited and sets off the detonator, exploding tetryl pellets, projecting fragments of steel and burning magnesium.

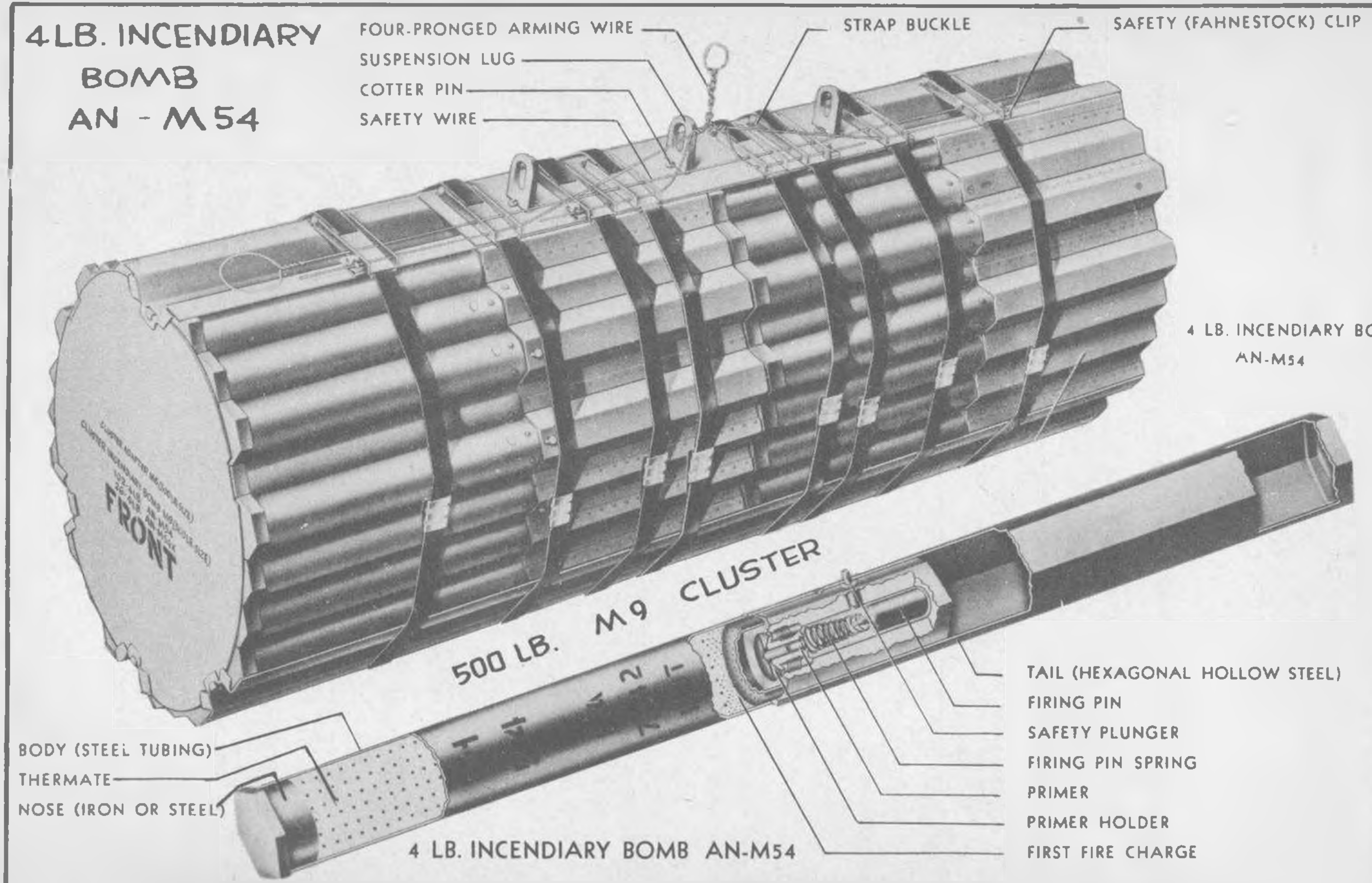
AN-M50XA3 is identical to AN-M50XA2 except the assembly around primer cap and first fire charge is waterproofed.

AN-M50TA2 is identical to AN-M50A2 except it contains a secret toxic agent, which does not affect the burning properties of the incendiary. Clusters carrying these bombs will have a green and a purple band painted around them.

Type A and Type B:
AN-M50XA2 and AN-M50XA3 each have a Type A and Type B. Type A indicates that the delay from impact to explosion is two to four minutes; Type B indicates that the delay from impact to explosion is sixty to seventy seconds.

For COLOR & MARKINGS, see

INTRODUCTION, Page 100


4 LB. INCENDIARY BOMB AN - M54
FOUR-PRONGED ARMING WIRE
SUSPENSION LUG
COTTER PIN
SAFETY WIRE
STRAP BUCKLE
SAFETY (FAHNESTOCK) CLIP
4 LB. INCENDIARY BOMB AN-M54
FRONT
500 LB. M9 CLUSTER
TAIL (HEXAGONAL HOLLOW STEEL)
FIRING PIN
SAFETY PLUNGER
FIRING PIN SPRING
PRIMER
PRIMER HOLDER
FIRST FIRE CHARGE
BODY (STEEL TUBING)
THERMATE
NOSE (IRON OR STEEL)
4 LB. INCENDIARY BOMB AN-M54

RESTRICTED

DATA: **AN-M54**

OVERALL LENGTH	21.35 in.
BODY LENGTH	13.6 in.
BODY DIAMETER	1.69 in.
WALL THICKNESS	
TAIL LENGTH	10.0 in.
TAIL WIDTH	1.69 in.
TAIL WEIGHT	

ARMY-NAVY BOMBS

4 LB. INCEND.

AN-M54
(And Modifications)
(Obsolete)

WEIGHTS:

Type of Filling	Thermate
Weight of Filling	1.6 lbs.
Total Weight	4.0 lbs.
Chg / Wt. Ratio	40%

BODY CONSTRUCTION

Steel cylinder having a hexagonal nose plug. The fuze is installed in the tail plug assembly. There are three vent holes below the primer cap assembly to assist in initial burning.

TAIL CONSTRUCTION:

Hexagonal hollow sheet metal tail.

SUSPENSION:

Cluster	Cluster Adapter	Size	No. of Bombs Carried	Status
AN-M8	M5	100 lb.	27 AN-M54 7 AN-M54XA1	Obsolete
M9	M6	500 lb.	102 AN-M54 26 AN-M54XA1	Obsolete

OPERATION

Spring loaded safety plunger is depressed by adjacent bomb; upon release from cluster it jumps out leaving the firing pin riding on a creep spring. On impact the firing pin overcomes its creep spring and strikes primer, igniting the thermate which melts the steel body and releases molten iron.

REMARKS:

AN-M54X is the same as AN-M54 except that next to the hexagonal nose plug a small portion of the thermate charge is replaced by a steel capsule containing 170 grains of black powder which explodes and scatters the molten iron after bomb has burned about one minute. It is limited standard for the Army, obsolete for the Navy.

AN-M54XA1 is the same as the AN-M54 except inside the hexagonal nose plug there is a steel cylinder containing a tetryl high explosive charge with a delay fuze and a detonator. A thin spacer of magnesium is between thermate and fuze opening of explosive cylinder. After one minute of burning the fuze is ignited, exploding the tetryl. These bombs are no longer being procured for naval service, and should not be used except when AN-M50A2 or AN-M69 bombs are not available. It is limited standard for the Army, obsolete for the Navy.

For Color and Markings, see Introduction, page 100 .

DATA: AN-M69 (Service)

OVERALL LENGTH . . . . 19.5 in.
BODY LENGTH . . . . 19.5 in.
BODY DIAMETER . . . . 2.87 in.
WALL THICKNESS . . . . .042 in.
TAIL LENGTH (Streamer) . . 114.0 in.
TAIL WIDTH
TAIL WEIGHT

ARMY-NAVY BOMB

6 LB. INCEND.

AN-M69
AN-M69X
(Service)

WEIGHTS:

Type of Filling . . . . . . Gelled Gasoline (NP or IM)
Weight of Filling . . . . . 2.8 lbs.
Total Weight . . . . 6.0 lbs.
Chg / Wt. Ratio . . . . . . 46 %

FUZING: M1

Hexagonal case with a nose cup welded to the forward end. The nose cup, fuze and powder charges are sealed off from the rest of the case by an impact diaphragm and plug held in a cup-shaped sealing diaphragm. The incendiary oil filling is held in a cheesecloth sack situated between the forward sealing diaphragm and the tail cup.

TAIL CONSTRUCTION:

Tail assembly consists of a tail cup, tail retainer and disc. The tail cup is secured to the hexagonal case by beading, crimping and heating. Four gauze streamers, each 114 inches long, are attached to the tail retainer by tail disc to stabilize the bomb and reduce the terminal velocity.

SUSPENSION:

Cluster	Cluster Adapter	Size	No. of Bombs Carried	Status
AN-M12	M4	100 lb.	14 AN-M69	Service
AN-M13	M7	500 lb.	60 AN-M69	Service
M19	M23	500 lb. Aimable	38 AN-M69	Service
AN-M17A1	M10A1	500 lb. Aimable	AN-M69	Service
E28	E6R2	500 lb. Aimable	38 AN-M69	
M21 (E74)	M23	500 lb. Aimable	38 AN-M69X	Service

OPERATION:

Spring loaded safety plunger jumps out of M1 fuse upon release from cluster, arming fuze. On impact the striker overcomes spring, detonates primer cap, which ignites a lead-coated spitter fuze. The spitter fuze burns from 3 - 5 seconds, allowing penetration, and ignites black powder booster charge. This ignites the igniter-ejector charge consisting of 2 bags of black powder and oiled magnesium powder. The combustion blows off tail cup, ignites incendiary filling and ejects it for a maximum of 75 yards.

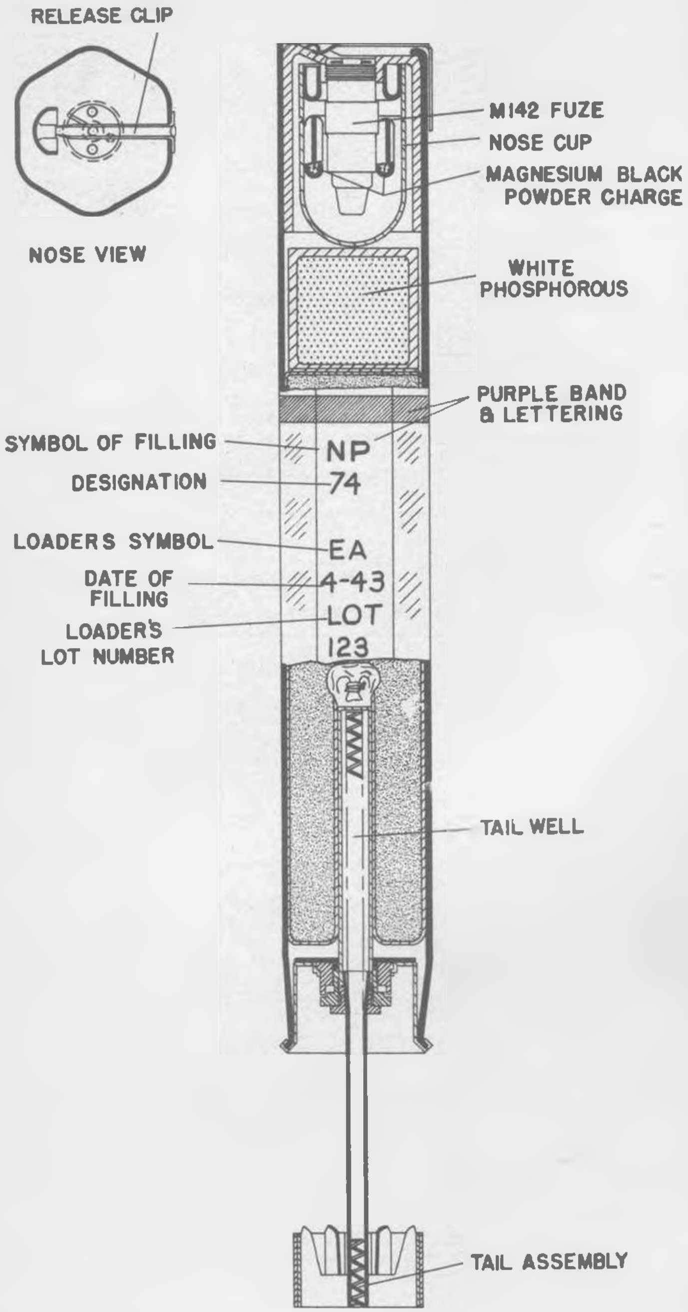
REMARKS:

The bomb and the delay are calculated to permit penetration inside of a structure before detonation. The incendiary oil filling is of a very sticky composition and will normally adhere to any object, including vertical walls.

The M69X incorporates a 4.5 ounce charge of tetryl to produce an anti-personnel effect. Overall dimensions of the M69X duplicate those of the AN-M69, but the amount of incendiary mix is reduced (.4 lb. less). Operation of the M1 fuze ignites a safety fuse lead terminating in the M106 detonator, which explodes the tetryl fragmenting 65% of the bomb case after ejection of the incendiary material, following a pre-determined time delay of .5 to 6 minutes (30% - 1/2 min.; 30% - 2 min.; 20% - 4 min.; 20% - 6 min.). The time delay is varied by adjusting the length of the safety fuse.

For COLOR AND MARKINGS, see

INTRODUCTION, Page 100



10 LB. INCENDIARY BOMB

U. S. ARMY BOMB

10 LB. INCEND.

M74 Incendiary
(Service)

DATA:

	M74
OVERALL LENGTH	19.4 in.
BODY LENGTH	19.4 in.
BODY DIAMETER	3.0 in.
WALL THICKNESS	
TAIL LENGTH	6.3 in.
TAIL WIDTH	2.5 in.
TAIL WEIGHT	

WEIGHTS:

Type of Filling . . . . .PT 1 or NP
Weight of Filling
Total Weight
Chg / Wt. Ratio

FUZING:

M142, M142A1, M3

BODY CONSTRUCTION:

Same type of construction as the AN-M69 6 lb. oil incendiary, with a sheet steel leak-proof casing and a nose cup housing the fuze. A small chemical container, located immediately behind the dome of the nose cup, is filled with white phosphorous to aid ignition of the incendiary composition and produce smoke. In bombs with NP, the filling is enclosed in a cheesecloth sock; if PT 1 is used, it is loaded directly into the bomb.

TAIL CONSTRUCTION:

The M74 has a telescope type tail which fits inside the tail cup and is ejected under spring pressure when the bomb is released from the cluster. A well inside the tail cup holds the tail sleeve when the assembly is compressed in the cup.

SUSPENSION:

Cluster	Cluster Adapter	Size	No. of Bombs Carried
	E6R2	500 lb. Aimable	38 M74
E48	M23	500 lb. Aimable	38 M74
E61	M23	500 lb. Aimable	38 E5R8

OPERATION

The M142 (or M142A1) fuze striker ignites the primer which sets off the booster and main ejection charge. This activates the auxiliary ejection-ignition charge. Expanding gases rupture the dome shaped ejection diaphragm, which forces the WP filled cup, incendiary filling, tail cup, and tail assembly out of the bomb casing.

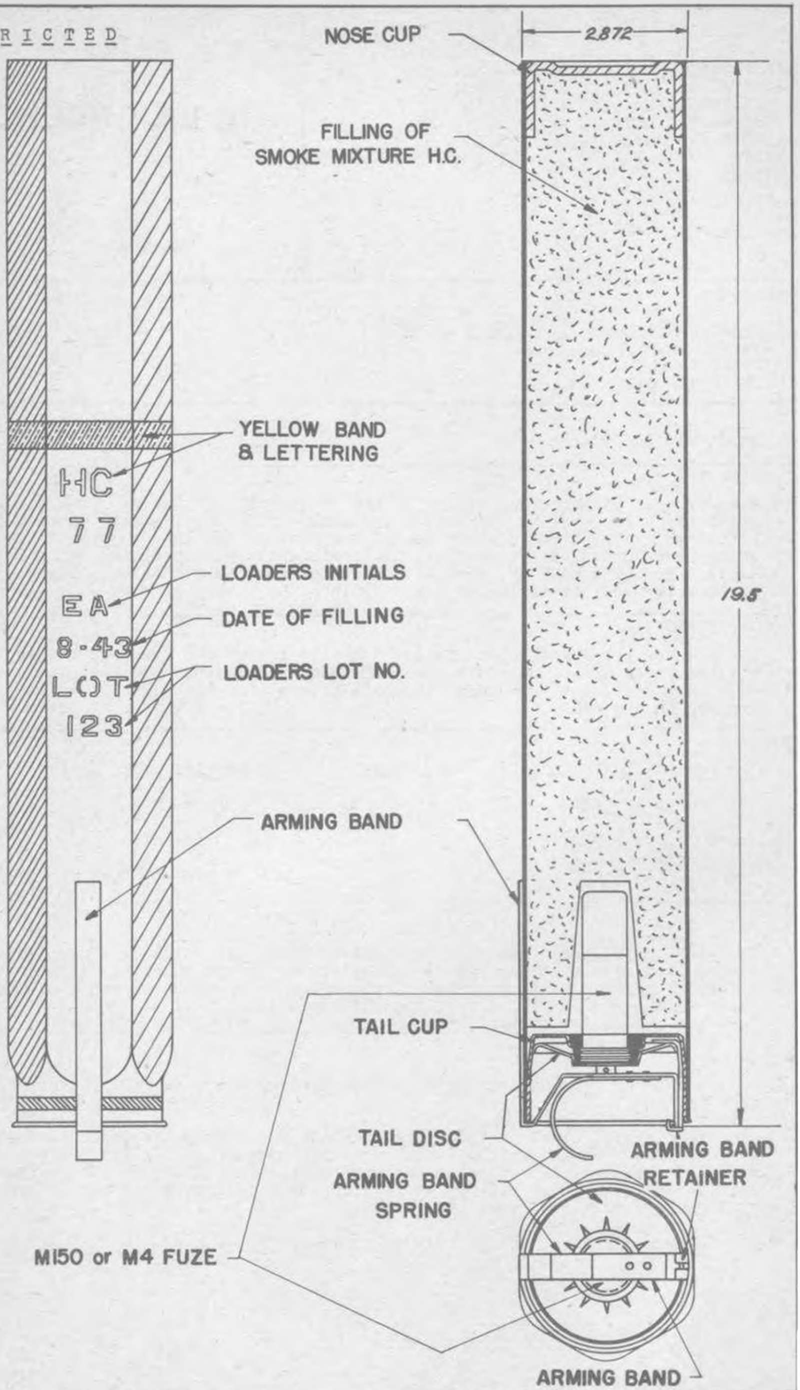
REMARKS:

Do not reinsert arming pin after it has been ejected, as it may cause the fuze to function.

The experimental bombs of this type with other fillings are designated the E5 series. The experimental bomb with a white phosphorous filling has been rejected; however, the one with the mustard filling, E5R8, is still under development. This bomb will be carried in the E61 cluster holding 38 bombs (M23 cluster adapter - page 119.)

For Color & Markings, See Introduction, page 100 .

RESTRICTED



10 LB. SMOKE BOMB (HC) M 77

DATA:

	M77
OVERALL LENGTH	19.5 in.
BODY LENGTH	19.5 in.
BODY DIAMETER	2.9 in.
WALL THICKNESS	
TAIL LENGTH	
TAIL WIDTH	
TAIL WEIGHT	

U. S. ARMY BOMB

10 LB. SMOKE

M77
(Service)

WEIGHTS:

Type of Filling . . . . HC
Weight of Filling . . . . 9.5 lbs.
Total Weight . . . . 13 lbs.
Chg / Wt. Ratio . . . . 73 %

FUZING:

M150

BODY CONSTRUCTION:

The body is a sheet steel casing extending the entire length of the bomb. The tail cup fits into the aft end of the casing, having a dome housing the M4 fuze. The bomb does not have a device for stabilization in flight and therefore an all-ways fuze is employed.

SUSPENSION:

Cluster	Cluster Adapter	Size	No. of Bombs Carried	Status
M25	M4	100 lb. Quick opening	14 M77	Service
E67	M23	500 lb. Aimable	38 M77	
E62	E6R2	500 lb. Aimable	38 M77	

OPERATION

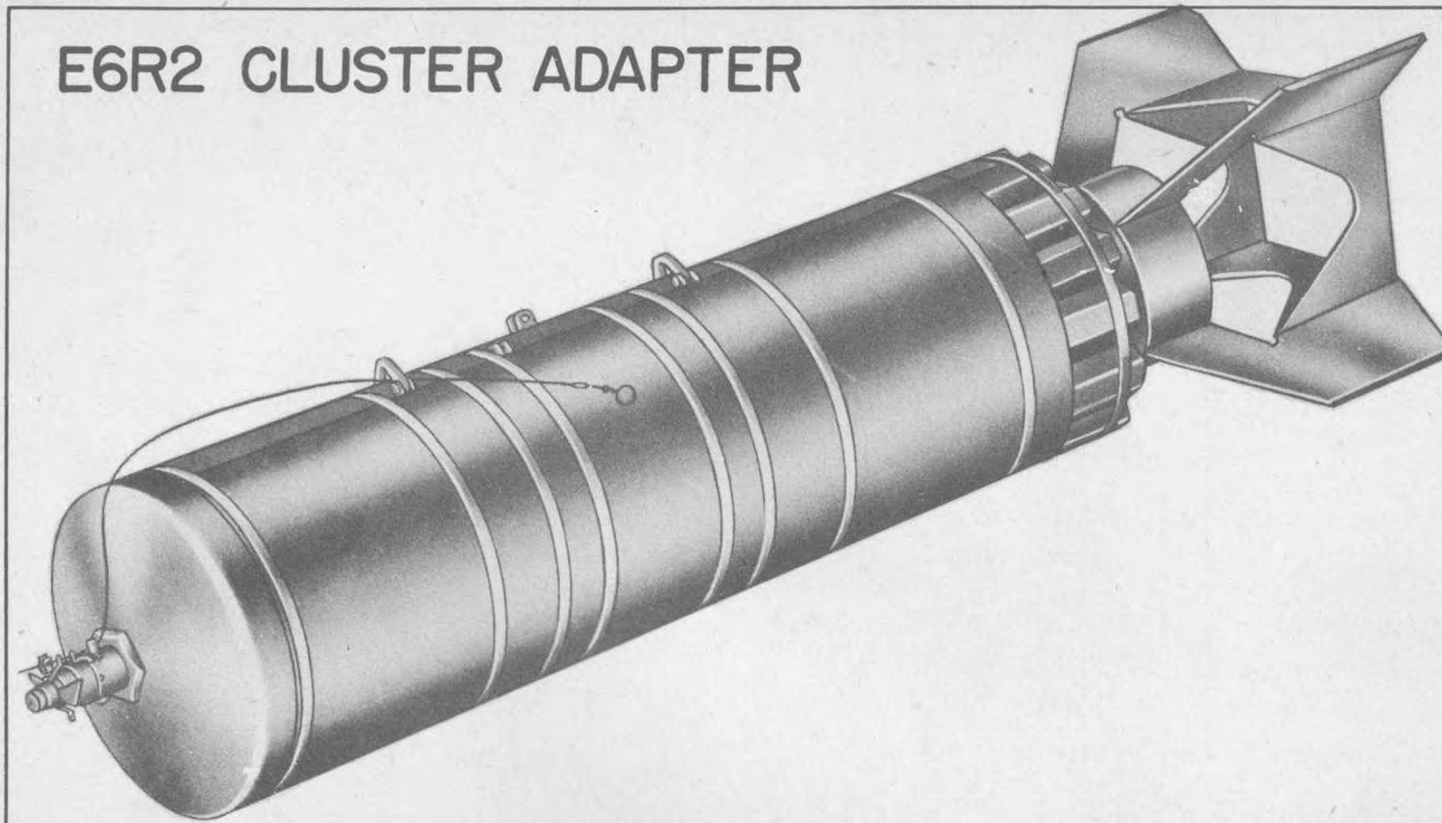
As the bombs are released from the cluster, the arming pin is forced out by its spring, permitting the safety pin to enter the cavity in the striker. Impact forces the striker and sleeve together, piercing the primer which in turn ignites the first fire mixture and subsequently the HC Smoke Mixture. The heat generated by the burning of the first mixture and the HC Smoke Mixture melts the zinc alloy fuze body. The smoke is then emitted through the fuze hole in the tail cup.

REMARKS:

Once the arming pin jumps out, the fuze is armed and any attempt to reinsert the pin may cause the fuze to function.

For Color and Markings, See Introduction, page 100 .

E6R2 CLUSTER ADAPTER



RESTRICTED

DATA:

OVERALL LENGTH . . . . 59.06 in.
DIAMETER OF BODY . . . . . . 14.69 in.
WIDTH OF TAIL . . . . 16 - 18 in.

FUZING:
Mechanical Time Flare Fuze M138,AN-M145

U. S. ARMY CLUSTER ADAPTER

E6R2

CLUSTER ADAPTER

GENERAL:

The cluster adapter has a thin steel body that is shaped like a bomb, except the nose is not rounded off to make a full hemisphere. A standard type bomb fin is affixed to the rear of the adapter and a fuze fits in the nose. Hoisting and suspension lugs are located at the top. Internally, the adapter is equipped with cluster bars for positioning of the bombs when loaded. An L-shaped angle bar runs the entire length of the adapter along the bottom cluster bar. Into the angle bar is fitted a light steel tube which encloses a length of primacord that extends from the nose fuze to the other end of the cluster adapter.

When filled the bombs are packed nose forward, 19 in the front half of the adapter and 19 in the after portion. The assembly is held together by nine nailless steel straps. The cluster adapter then becomes a 500 lb. aimable cluster that will fit any 500 lb. bomb station, and when dropped from high altitudes approximates the trajectory of a 100 lb. demolition bomb.

BOMB CLUSTERS:

E28	(38)	AN-M69 (NP, IM) Incendiary bombs.
E29	(38)	E5 (NP, IM) Incendiary bombs
E33	(38)	E5 (WP) Chemical bombs
E34	(38)	E5 (H) Chemical bombs
E52	(38)	AN-M69 (Practice) Incendiary bombs
E54	(38)	E5 (Simulated H) Chemical bombs
E62	(38)	M77 (HC) Chemical bombs

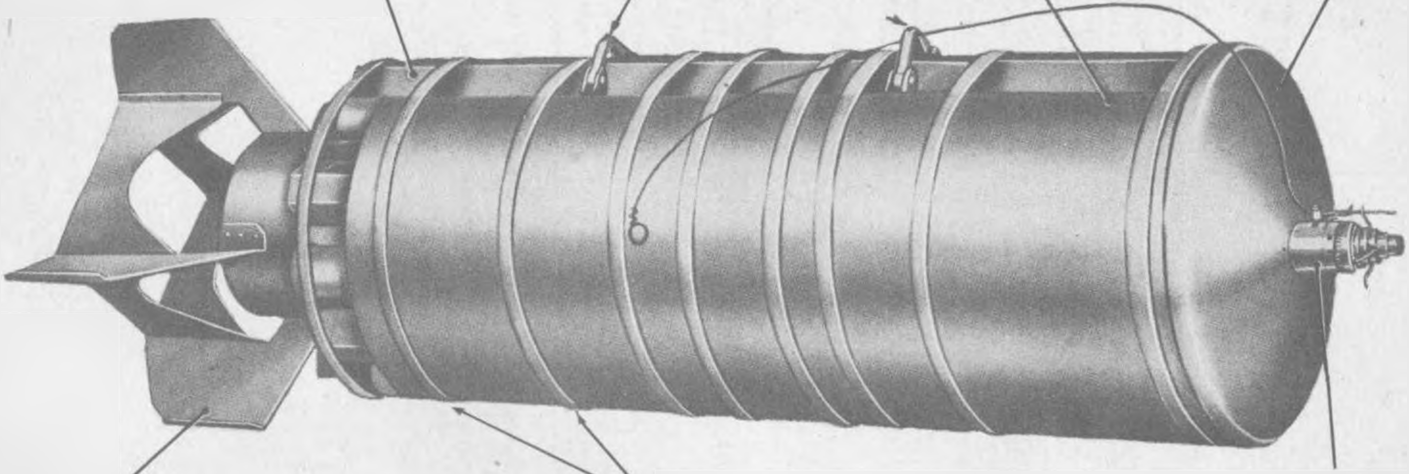
OPERATION:

On release, the arming wire is pulled allowing the clockwork to start and the vanes to turn. When the vanes have made the proper number of turns, a striker pin safety block falls out, completely arming the fuze so that it functions upon expiration of the predetermined time setting. Firing of the fuze detonates the primacord which runs the full length of the adapter. Explosion of the primacord breaks the nine nailless steel straps, allowing the cluster adapter wall to open and the bombs to scatter.

REMARKS:

If desired, the cluster adapter may be kept intact during the entire period of flight, bursting open on impact.

This adapter is being replaced by the M23 cluster adapter.



M10A1 CLUSTER ADAPTER

RESTRICTED

DATA:

OVERALL LENGTH . . . . . 56.0 in.
DIAMETER . . . . 15.3 in.
WIDTH OF TAIL . . . . .

FUZING:
M127

U. S. ARMY CLUSTER ADAPTER

M10A1 CLUSTER ADAPTER

M10A1

GENERAL:

The cluster adapter is streamlined in shape, and when filled it becomes a 500 lb. aimable cluster designed to be carried by any plane equipped to carry a 500 lb. bomb. Clusters formed with this adapter are the M14 which contains 110 AN-M50T-A2 incendiary bombs, and the M17A1 which contains 88 AN-M50-A2 and 22 AN-M50X-A2 incendiary bombs.

The cluster adapter consists of a thin metal case with a channel bar extending through the center, and a standard tail fin fixed to the aft end plate by means of a single, heavy bolt. At the forward end, a rounded nose fairing is fastened to the forward end plate. From the fuze seat, a length of primacord extends through a thin metal tube to the aft end of the adapter. The adapter is equipped with three suspension lugs, the center lug added for use in British planes.

When the cluster adapter is loaded the bombs are packed around the channel bar and the assembly is held in place by nine metal straps.

OPERATION:

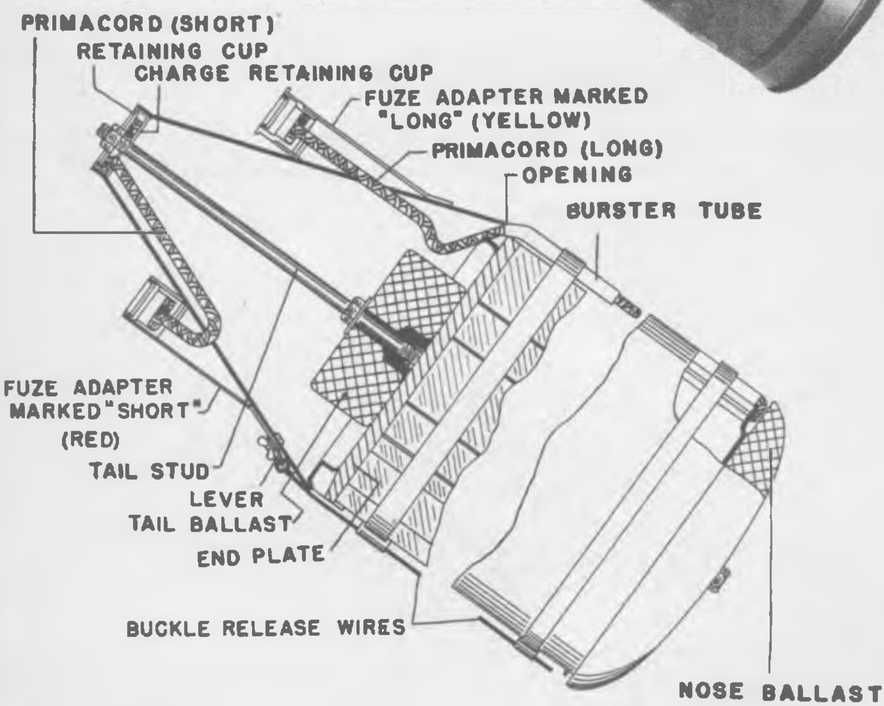
On release, the arming wire is pulled allowing the fuze to arm and fire at the pre-set time. When the fuze fires, the primacord is detonated, breaking the metal straps holding the assembly together and allowing the bombs to fall free.

REMARKS:

The cluster adapter is filled and shipped to the field with a single cluster in each crate. Further assembly consists primarily of fixing the tail in place and installing the fuze and arming wire. The fuze is put in the cluster after it is loaded in the plane.

The M10A1 cluster adapter is similar in appearance to the E6R2, but differs internally. The bombs in the M10A1 are packed around a channel bar while in the E6R2 cluster bars surrounding the bombs hold them in place.

M 23 CLUSTER ADAPTER



RESTRICTED

U. S. ARMY

M23 CLUSTER ADAPTER

M23
(E23)

DATA:

OVERALL LENGTH	59.5 in.
DIAMETER OF BODY	14.75 in.
WIDTH OF TAIL	19.0 in.

GENERAL:

M23 cluster adapters are used in forming 500 lb. aimable clusters of incendiary or chemical bombs. Clusters may be carried by planes equipped to handle 500 lb. bombs. They are designed for use in high and medium altitude bombing, the flight characteristics resembling that of the M 38A2 practice bomb.

DESCRIPTION:

The cylindrical halves of the cluster wall are joined at the top by a suspension bar and at the bottom by a burster shield support bar. Cluster bars, fitted into the end plates, hold the bombs in position inside the adapter. Ballast weights are bolted by studs to front and rear of the adapter's end plates. Nine steel straps drawn tight and fastened by a metal connector, are attached to release buckles which are placed on alternate sides of the suspension bar. The buckles are held closed by two release wires attached to a release lever, which in turn is attached to a stud on the tail cone. The tail assembly is comprised of a modified box type fin on a conical support with two tail fuze adapters attached to opposite sides of the cone. The long stud that extends through the rear ballast weight, supports the tail assembly.

The Primacord wiring of the adapter is in two sections. A metal tube channels a 60-inch length of primacord from the forward end of the burster shield, through the tail cone, and into the base of the 'long' fuze adapter. A 31-inch length extends from the tail cup into the 'short' fuze adapter. (See Remarks).

BOMB CLUSTERS:

Bombs are clustered in two sections, 19 bombs in each, with the nose to the front of the cluster.

M 19 Cluster	(38)	AN-M69 (IM, NP) Incendiary bombs
M 21 (E7) Cluster.	(38)	AN-M69X (IM, NP) Incendiary bombs
E 48 Cluster	(38)	M74 (PT 1, NP) Incendiary bombs
E 61 Cluster	(38)	E5R8 (H) Gas bombs
E 67 Cluster	(38)	M 77 (HC) Smoke bombs

FUZING:

Two mechanical time fuzes are used, one being placed in the 'long' and one in the 'short' fuze adapters. Two M 153 fuzes are now used but are being replaced by two M 152 fuzes.

OPERATION:

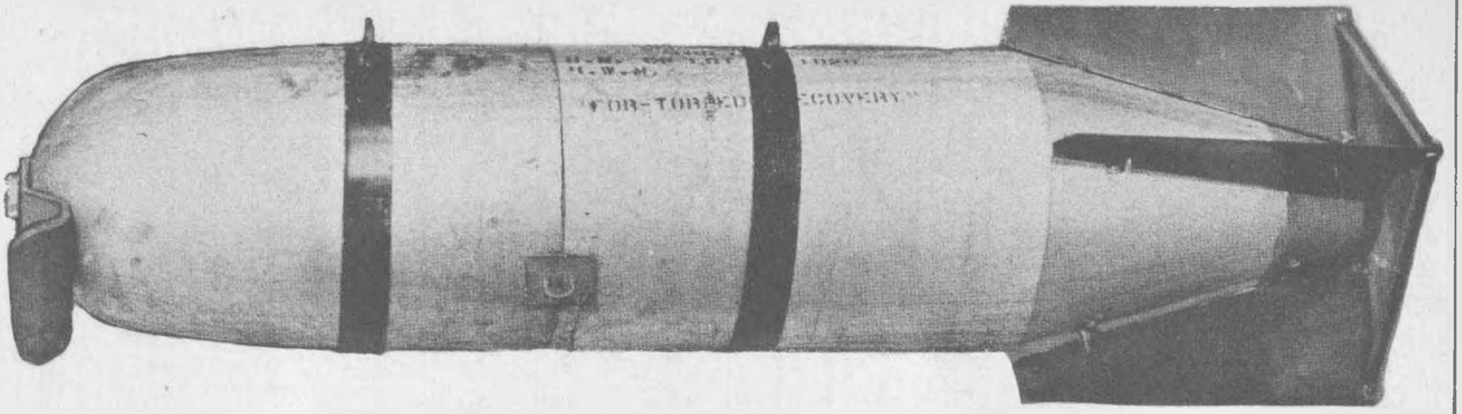
On release, the arming wires are withdrawn and the two fuzes arm. Upon expiration of time setting, the 'short' fuze operates to set off the booster and primacord which is channeled to the fin retaining cup. The cone is blown off by the primacord detonation, thereby withdrawing the buckle release wires and opening the cluster.

Upon failure of the 'short' fuze to function, the 'long' fuze operates 2 seconds later. This detonates the primacord extending the length of the cluster which shears the steel straps and releases the bombs.

REMARKS:

Some lots of adapters were shipped without buckles and release wires, the release of the bombs being dependent on the severing of the steel strapping bands. The primacord from the 'short' fuze is taped at a right angle to the primacord leading from the 'long' fuze, to form one primacord assembly. Operation of either fuze would detonate the primacord extending the length of the cluster, thereby severing the steel strapping bands and releasing the bombs.

This cluster adapter is not procured by the Navy



100 LB. SMOKE BOMB, MK. 3

DATA:	Mk 3
OVERALL LENGTH	48.5 in.
BODY LENGTH	
BODY DIAMETER	10.25 in.
WALL THICKNESS	
TAIL LENGTH	13 in.
TAIL WIDTH	14.25 in.
TAIL WEIGHT	

U. S. NAVY BOMB

50, 100 LB. FLOATING SMOKE

Mk. 3 (100 lb.)
Mk. 1 Mod 1 (50 lb.)
Mk. 1 Mod 2 (50 lb.)
(Obsolescent)

WEIGHTS:

Type of Filling . .	HC mixture
Weight of Filling .	59 lbs.
Total Weight . . .	102 lbs.
Chg / Wt. Ratio . .	57.8%

FUZING:

Mk 3 Mod 1. Special nose fuze actuated on water impact.

BODY CONSTRUCTION:

Aluminum nose casting carrying a pyrotechnic charge, attached to a hollow wood float which provides buoyancy. The nose carries a water impact fuze, and at the tail of the float is a valve cap with the valve to prevent water from leaking into the interior of the bomb. The rear of the bomb is conical in shape and the aluminum nose is hemispherical.

TAIL CONSTRUCTION:

The tail consists of four fins bolted to the rear of the bomb with four tubular struts bolted to the fins. The fins do not extend upon the rear end of the bomb.

SUSPENSION:

Two movable suspension bands in Mk 3; one in Mk 1.

ACTION:

Impact operates the firing mechanism in the nose, detonating the primer which in turn ignites a length of time fuse giving a delay of 18 seconds, during which time the smoke bomb is returning to and becoming stable on the surface of the water. The time fuse ignites the quickmatch which in turn ignites the starting mixture and this initiates the action of the smoke mixture. Gas pressure formed by the burning smoke mixture breaks the vent discs and opens the valve cap at the tail end of the wooden float. The bomb then evolves a dense white smoke for about 7.5 minutes in the Mk 3, and 3 minutes in the Mk 1.

REMARKS:

This bomb should be dropped from an altitude of over 500 feet and should not be dropped in less than 40 feet of water where the bottom is soft enough to cause the bomb to stick and fail to return to the surface. While designed for use over water, the bomb may also be effective if dropped over ordinary loam soil if dropped from an altitude under 2000 feet. If dropped from over 2000 feet or if dropped from any altitude onto very hard rocky ground the bomb will usually deflagrate. The HC mixture is a pressed powder safe under any normal storage or handling conditions. The smoke, while harmless in the concentrations found in smoke screens in the open, is toxic in more concentrated form.

The Mk 1 Mod 2 differs from the Mod 1 in that it has a longer burning time with a maximum of 7.5 minutes, as in the 100 lb. Mk 3, and a minimum of 6 minutes. It also has the two suspension bands of the Mk 3.

100 LB. INCENDIARY MK. 28

DATA:

OVERALL LENGTH	45.5 in.
BODY LENGTH	33.7 in.
BODY DIAMETER	8.0 in.
WALL THICKNESS	.05 in.
TAIL LENGTH	11.75 in.
TAIL WIDTH	11.3 in.
TAIL WEIGHT	

U. S. NAVY BOMB

100 LB. INCEND.

Mk 28
(Obsolete)

WEIGHTS:

Type of Filling	Water or sand for practice. Gasoline, gasoline-gel, gasoline & waste, rubber.
Weight of Filling	42 - 45 lbs.
Total Weight	65 - 68 lbs.
Chg / Wt. Ratio	65% approx.

FUZING:

AN-M126A1. When used for practice bomb, it takes the M108.

BOMB CONSTRUCTION:

Three piece sheet steel construction with hemispherical nose piece and conical tail cone welded to a tubular body. The bomb has two suspension lugs on bands or single lug on band near center of gravity. The tail assembly consists of four sheet steel vanes welded to tail cone, which in turn is welded to the body.

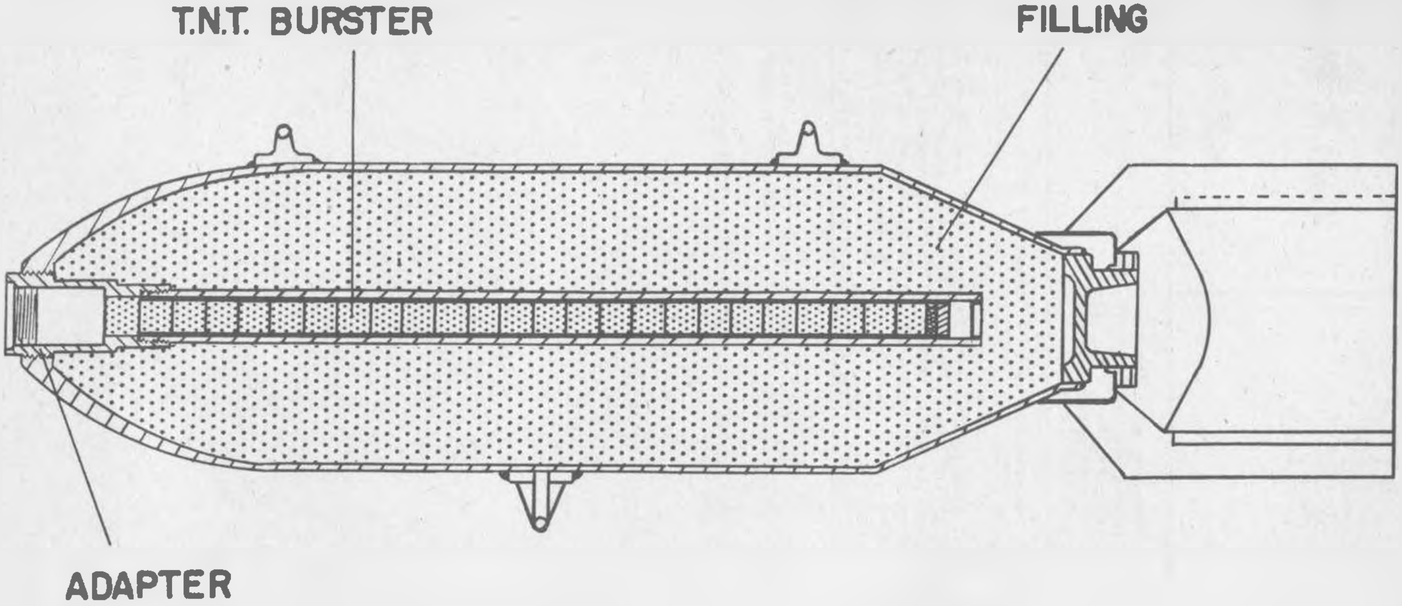
COLOR & MARKINGS:

Grey overall with bright red disc four inches in diameter in middle of body.

REMARKS:

This bomb is similar to the AN-M47A2, except that it is equipped with a filler cap. Both bombs are prone to leak and should be examined frequently. Refer to page 127 .

There is also a 100 lb. Mk I which is almost identical with the old Army M47, both of which are obsolete.



MK. 42 100 LB. CHEMICAL BOMB

DATA:	U. S. NAVY BOMB
OVERALL LENGTH . . . . 39.43 in. BODY LENGTH . . . . 27.70 in. BODY DIAMETER . . . . 8.0 in. WALL THICKNESS . . . . 0.17 in. TAIL LENGTH . . . . 9.46 in. TAIL WIDTH . . . . 11.0 in. TAIL WEIGHT	**100 LB. CHEMICAL** Mk 42 (Service)

WEIGHTS:

Type of Filling . . . . . Mustard
Weight of Filling . . . . 43 lbs.
Total Weight . . . . . 86.5 lbs.
Chg / Wt. Ratio 50%

FUZING:

AN-Mk 219

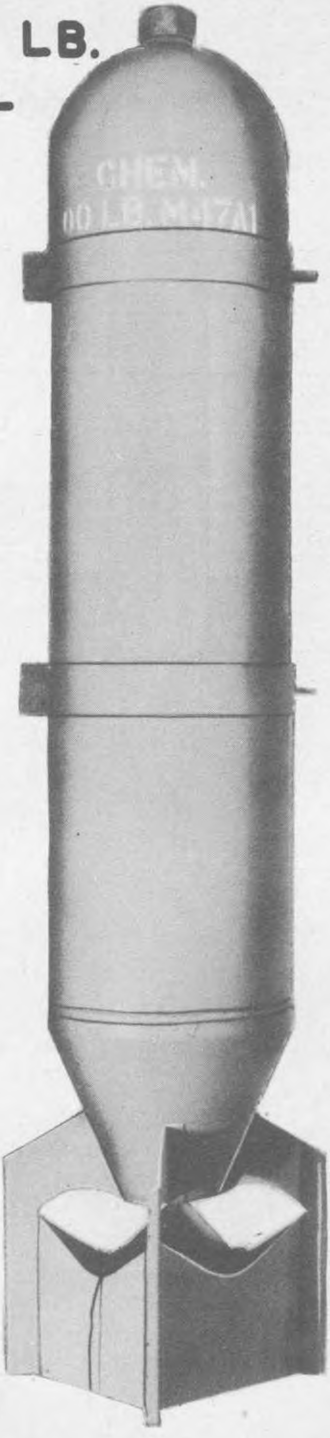
BOMB CONSTRUCTION:

Steel tube, swagged aft. An adapter screws into the nose and is threaded to receive the fuze. A burster tube containing TNT running the length of the bomb screws into the after end of the adapter. The after end of the body is closed by a male base plate, which is threaded for the tail assembly to be fitted. The bomb is filled through the nose. Suspension is by two lugs 7" on either side of the center of gravity or a single lug 180° removed and at the center of gravity. The bomb has a box type, four fin tail, secured by a locking nut.

COLOR & MARKINGS:

Olive drab overall with two green bands 1/2 inch wide and 1/2 inch apart aft of the nose.

M47A1 100 LB. CHEMICAL



DATA: AN-M47A2

OVERALL LENGTH	48.9 in.
BODY LENGTH	39.0 in.
BODY DIAMETER	8.1 in.
WALL THICKNESS	0.06 in.
TAIL LENGTH	12.9 in.
TAIL WIDTH	10.9 in.
TAIL WEIGHT	

ARMY-NAVY BOMBS

100 LB. INCEND.

AN-M47A2
AN-M47A3
and early mods
(Service)

WEIGHTS:

Type of Filling . . . Mustard Gas, white phosphorous, or gasoline gel incendiary IM or NP
Weight of Filling
Total Weight SEE REMARKS
Chg / Wt. Ratio

FUZING:

AN-M126A1, M126,M108,AN-M147

BODY CONSTRUCTION:

Sheet steel tube with longitudinal seam weld; nose and hemispherical and base plate at rear end welded to the tube. Several bursters may be used interchangeably and run the length of the bomb. The M12 burster is a tube containing magnesium powder and black powder. M13 burster is a double walled tube containing TNT in the inner tube and white phosphorous in the outer tube. A special burster consisting of M13 burster with TNT in inner tube and sodium in outer tube has been developed for use in igniting oil slicks on water as well as against land targets.

TAIL CONSTRUCTION:

Four vanes welded to truncated cone with box-type interior struts.

SUSPENSION:

Horizontal suspension by two eyebolts formed by holes in each half of the two suspension bands, the halves then being crimped together to form a complete band. The bands are secured to bomb body by tightening the bolts on the underside of the body. One of the bands can be loosened and slipped to the center of gravity if single suspension is desired.

Two clusters are now standardized to provide single suspension for 4 to 6 bombs. The M24 (T19) cluster adapter holds six AN-M47's; and the M22 (T9) has a capacity of four AN-M47's.

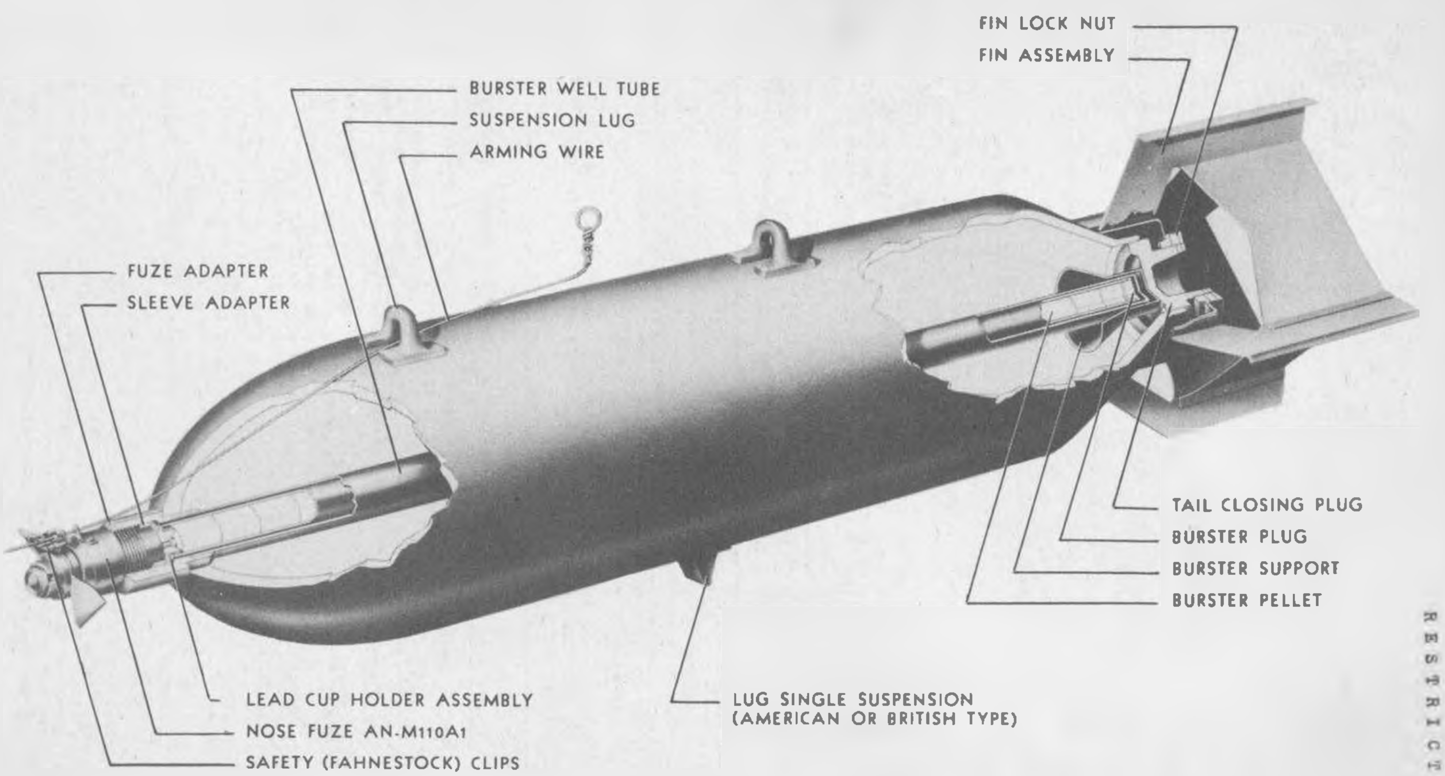
REMARKS:

AN-M47A2 Incendiary:	40 lbs. gelled gasoline, either IM or NP, with total weight of 68.6 lbs.
M47A1 Incendiary:	Like AN-M47A2, with interior coating of acid-proof paint instead of oil.
AN-M47A2 Smoke:	Main filling is 100 lbs. white phosphorous, with M7 burster containing black powder and total weight 126.5 lbs.
M47A1 Smoke:	Like AN-M47A2 Smoke, with charge of 103 lbs. WP and total weight 129.5 lbs.
AN-M47A2 Gas:	68 lbs. of H (Mustard), equipped with M4 TNT burster. Inside of body is coated with oil. Total weight, 94.5 lbs.
M47A1 Gas:	Interior coated with acid-proof black paint instead of oil.
M47 Chemical:	Original design with wall thickness of only 1/32 inches.
Skymarker CHB Mk 1:	This marker consists of the M47A1 body, the central tube having been taken out and bakelite discs placed in the nose and tail. Electric detonators break the discs and air acting on the liquid filler causes a trail of smoke as the bomb falls.

AN-M47A3 is identical with AN-M47A2 except that the tail assembly is 3 inches longer.

The Navy is procuring at the present time M47A2 bombs loaded with PWP. PWP consists of 75% WP and 25% plasticizer; it is more effective than WP since it gives longer burning, reduces pillaring effect, and increases the anti-personnel effect. The increased smoke efficiency is due to the larger particles of controlled size which result from the use of PWP. The bomb contains 75 lbs. of PWP and requires an M20 burster, which contains 3/4 inch diameter tetryl pellets.

115 LB. CHEMICAL BOMB M70



DATA:	M70
OVERALL LENGTH	48.7 in.
BODY LENGTH	40.4 in.
BODY DIAMETER	8.1 in.
WALL THICKNESS	0.224 in.
TAIL LENGTH	12.9 in.
TAIL WIDTH	10.9 in.
TAIL WEIGHT	3.5 lbs.

U. S. ARMY BOMB

115 LB. CHEMICAL

M70
(Service)

WEIGHTS:

Type of Filling	Mustard (H)
Weight of Filling	57.1 lbs.
Total Weight	122.5 lbs.
Chg / Wt. Ratio	46.6%

FUZING:

AN-M110A1

BOMB CONSTRUCTION:

The bomb is made from a seamless steel tubing, with an ogival nose threaded to receive the nose fuze. A burster well tube runs the entire length of the body, fitting into a positioning cup at the rear. The tail assembly consists of four fins welded to a sleeve, which is secured by a locking nut threading into the tail closing block. The fins are supported by box-type struts.

SUSPENSION:

The bomb is carried horizontally by dual lugs 7 inches on either side of the center of gravity, or a single lug 180° removed at the center of gravity.

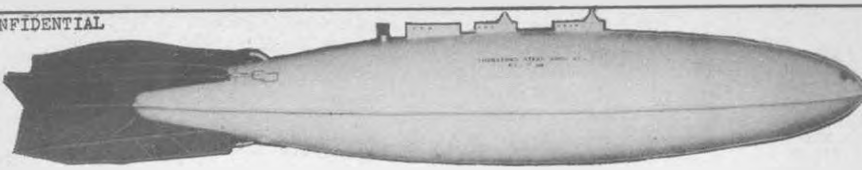
A cluster of four M70's is formed by using the M22 (T9) cluster adapter.

REMARKS:

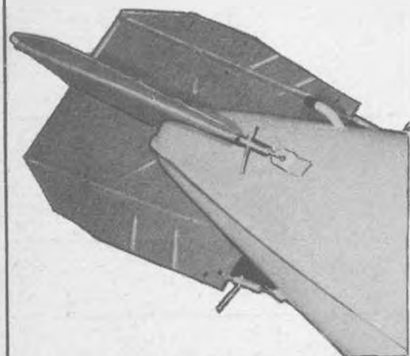
On impact the fuze functions instantaneously, setting off the burster charge which explodes the bomb and scatters the main filling.

The M70 can be filled with white phosphorous (WP), IM or NP incendiary mix.

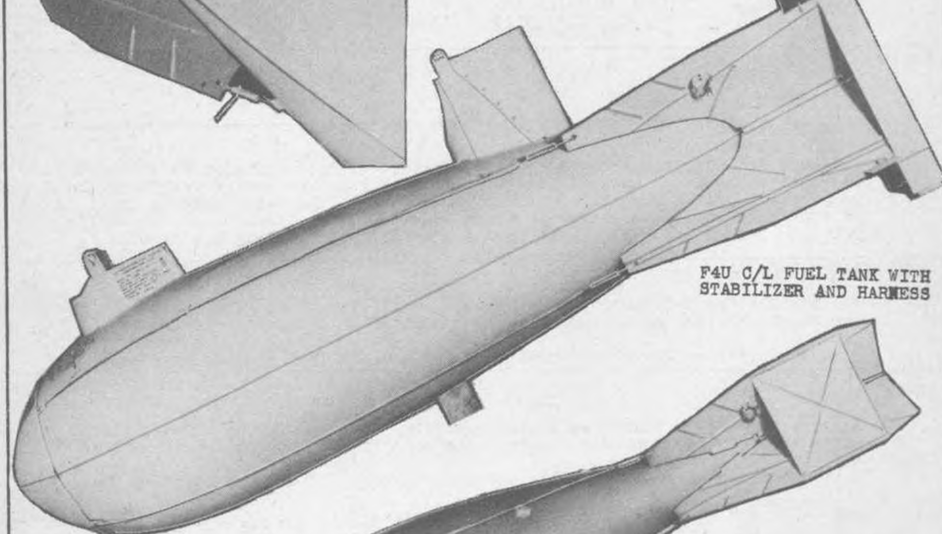
For Color and Markings, see Introduction, page 10D.



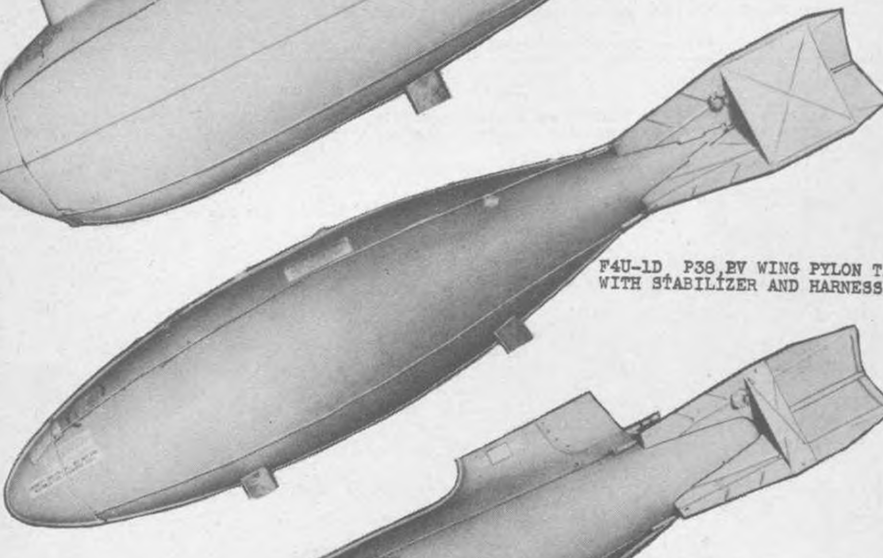
UNIVERSAL OR INTERCHANGEABLE FUEL TANK WITH STABILIZER ATTACHED.



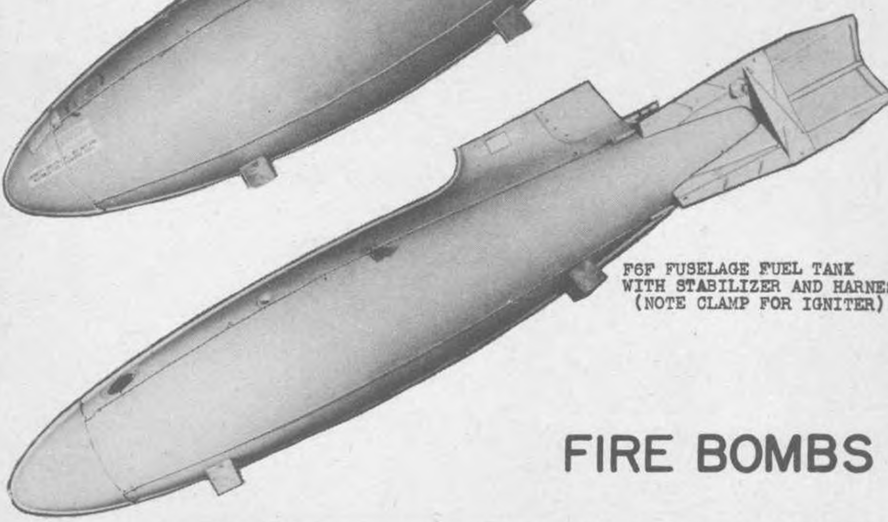
CLOSE UP OF STABILIZER ON THE UNIVERSAL TANK



F4U C/L FUEL TANK WITH STABILIZER AND HARNESS



F4U-1D P38,BV WING PYLON TANK WITH STABILIZER AND HARNESS



F6F FUSELAGE FUEL TANK WITH STABILIZER AND HARNESS (NOTE CLAMP FOR IGNITER)

FIRE BOMBS

CONFIDENTIAL

U. S. ARMY-NAVY

FIRE BOMBS

Aircraft Jettisonable Fuel Tanks

GENERAL:

The 'Fire Bomb' consists of a jettisonable fuel tank filled with gasoline gel (gasoline-Napalm mix). These bombs have been effective against personnel, wooden piers, inflammable stores, etc., with each bomb covering an area approximately 100 feet by 300 feet.

Standard Navy or Army auxiliary fuel tanks are being used at the present; however, an effort is being made to improve the dropping characteristics by adding a tail fin assembly.

JETTISONABLE FUEL TANKS AND STABILIZERS:

Various types of jettisonable fuel tanks are available for conversion into fire bombs. A 150 gallon Universal or Interchangeable tank is now in production.

Stabilizers have been designed to give the fire bomb a more stable flight when dropped from a higher altitude.

The stabilizers are attached to the present tanks by a harness consisting of four cables which run along the longitudinal axis of the tank and are attached to a ring fitted around the nose. The Universal tank has clips welded to the aft end, obviating the necessity of the nose ring and cable harness.

FILLER:

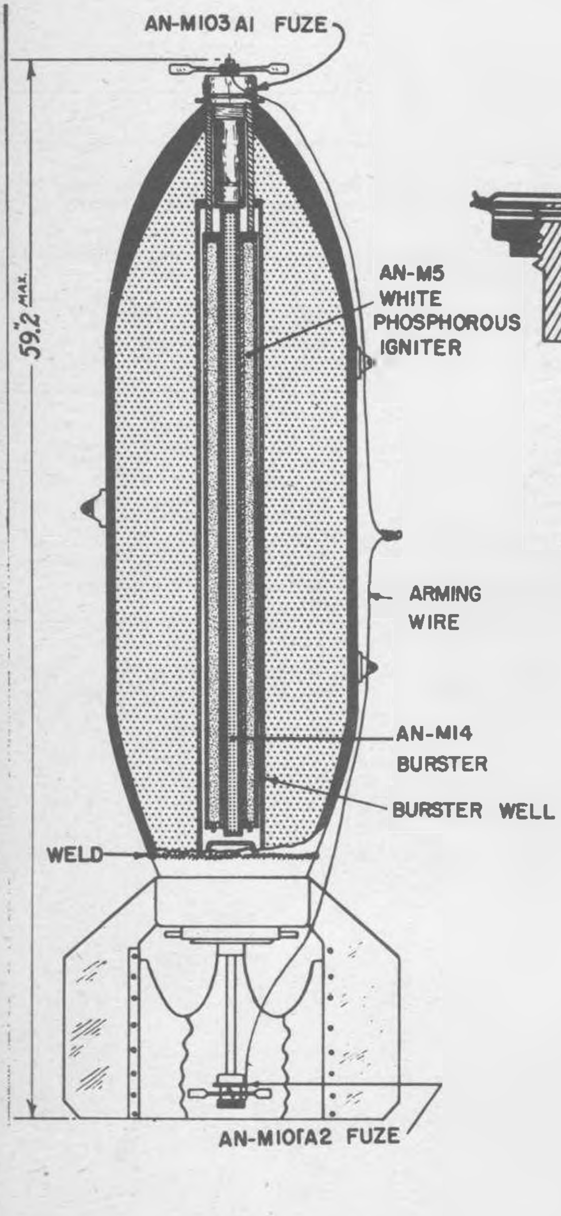
The filler is a gasoline-napalm mix. Napalm consists of a mixture of basic aluminum soaps of fatty acids and napthenic acid which in itself is inert and is used only to gel the gasoline to the proper consistency. Either 100 octane or 80 octane gasoline can be used with 6 percent Napalm by weight added for the mixture. Another powder, Marinco, consisting of 50 percent magnesium carbonate and 50 percent calcium carbonate, is added (7 percent of Napalm by weight) to prevent clogging in the outlet hose.

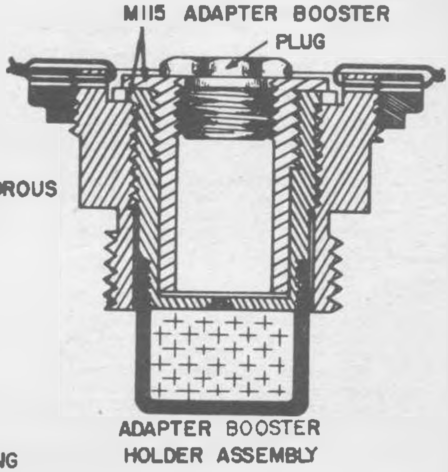
The Navy has developed an incendiary mixer, the Mk 1 Mod 0, which mixes the gasoline and the Napalm in the correct proportions.

IGNITERS:

The stabilizers are provided with a clamp for attaching an igniter which is in addition to the fuel tank cap igniter. See page 217 for igniters M13, M14, M15 and M16.

AN-M76 500 LB. INCENDIARY





U. S. ARMY-NAVY BOMB

500 LB. INCEND.

AN-M76
(Service)

DATA: AN-M76 (Service)

OVERALL LENGTH	59.2 in.
BODY LENGTH	45.3 in.
BODY DIAMETER	14.0 in.
WALL THICKNESS	0.3 in.
TAIL LENGTH	13.9 in.
TAIL WIDTH	14.8 in.
TAIL WEIGHT	12.3 lbs.

WEIGHTS:

Type of Filling	Oil gel PT1
Weight of Filling	180 lbs.
Total Weight	475 lbs.
Chg / Wt. Ratio	38 %

FUZING:

Nose: AN-M103A1, AN-M103, M103, M135, M135A1, M136, M136A1, M139, M139A1, AN-M139A1, M140, M140A1, AN-M140A1, M163, M164, M165,M166, T82

Tail: AN-M101A2, AN-M101A1, M161

BOMB CONSTRUCTION:

The body is of one piece cast steel construction with a base plate welded to body, and a burster tube 3.5 inches in diameter, 35.75 inches long running through the center of bomb welded to the nose and to the base plate. The M115 adapter booster screws into the base plate. The bomb tail is a cast steel sleeve with four sheet steel fins and internal box type struts. Suspension is accomplished by two suspension lugs welded on body seven inches on each side of center of gravity and by a single lug, 180° removed at the center of gravity.

OPERATION:

On impact, the fuzes function and detonate the 1.25 lb. tetrytol burster in the burster tube and initiate the 9 lb. white phosphorus igniter which, in turn, ignites the main filling. The bomb has a dispersal area of about 300 x 600 feet.

REMARKS:

Attention is drawn to the fact that white phosphorus is present in the igniter, and proper precautions should be taken in disposing of these bombs. The incendiary mixture, PT1, consisting essentially of paste of magnesium, gasoline, and a thickener, liberates heat at about 4 times that given off by the usual incendiary mixture IM.

For COLOR AND MARKINGS, see

INTRODUCTION, Page 100

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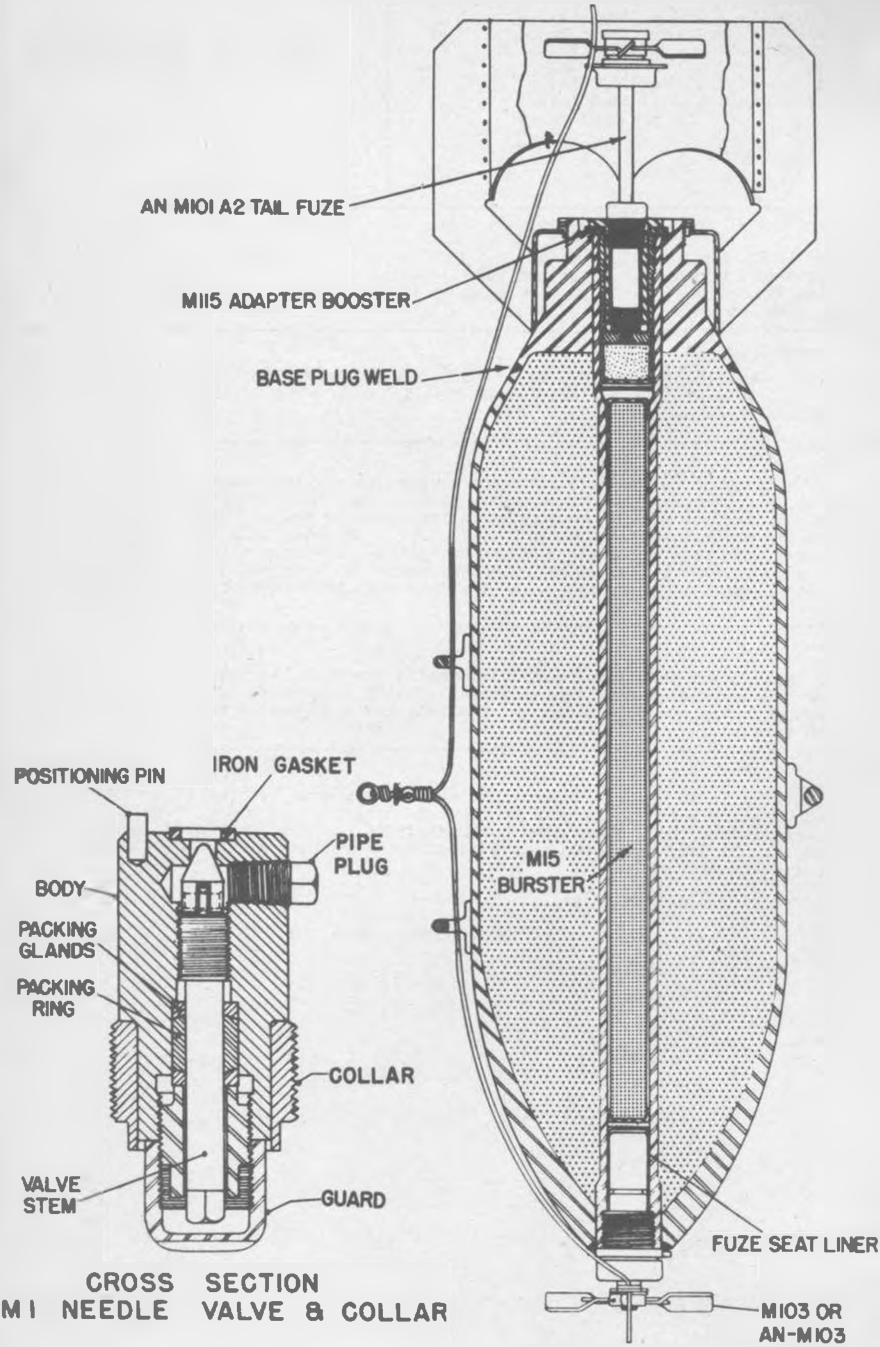


CROSS SECTION
M1 NEEDLE VALVE & COLLAR

AN-M78 500 LB. CHEMICAL BOMB

DATA: AN-M78 (Service)

OVERALL LENGTH	59.25 in.
BODY LENGTH	46.7 in.
BODY DIAMETER	14.0 in.
WALL THICKNESS	0.3 in.
TAIL LENGTH	13.9 in.
TAIL WIDTH	18.9 in.
TAIL WEIGHT	12.3 lbs.

U. S. ARMY BOMB

500 LB. CHEMICAL

AN-M78
(Service)

WEIGHTS:

Type of Filling	Hydrocyanic acid	Phosgene	Cyanogen Chloride
Weight of Filling	100 lbs. (AC)	250 lbs. (CG)	165 lbs. (CK)
Total Weight	383 lbs. (AC)	488 lbs. (CG)	448 lbs. (CK)
Chg / Wt. Ratio	26.1%	42.0%	36.8%

FUZING:

Regular Missions:

Nose: AN-M103A1, AN-M103, M103, M127 (Army only, with M117 adapter booster; M128 (Navy only), M135, M135A1, M136, M136A1, M139, M139A1, AN-M139A1, M140, M140A1, AN-M140A1, M163, M164, M165

Tail: AN-M101A2, AN-M101A1, M161

VT Missions:

Nose: T50E4, T90, T92, M166, T82

Tail: AN-M101A2 (to ensure detonation in event of VT fuze failure)

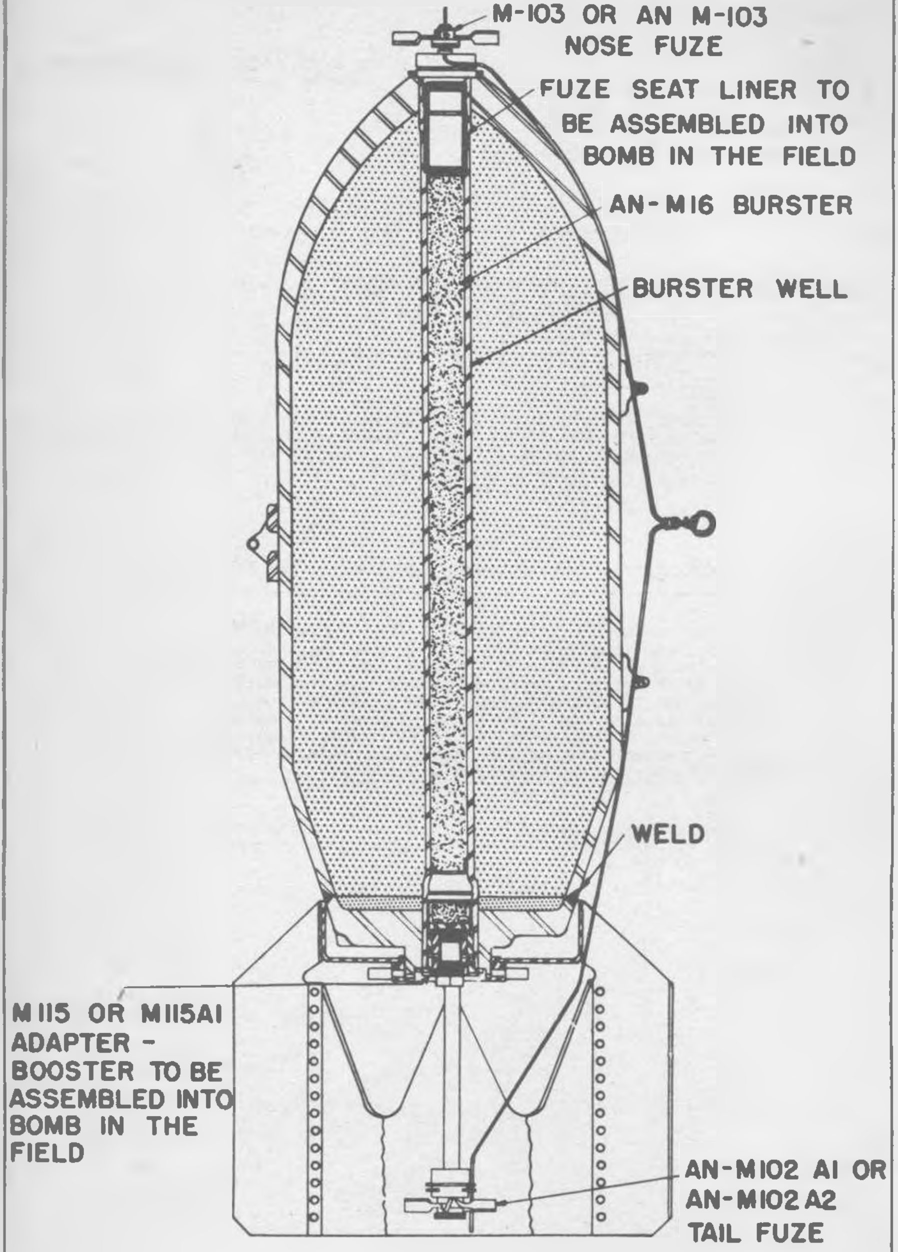
BOMB CONSTRUCTION:

In construction, the AN-M78 resembles the 500 lb. G.P. AN-M64. The body is one piece cast steel with a M15 burster well running the entire length of the bomb. The burster is threaded internally at the nose to receive the nose fuze and at the rear to receive the M115 adapter booster. The base plug consists of a special forging welded to the case containing the M1 needle valve. The tail is a standard box type fin assembly secured to the bomb by a locking nut which threads on to the base plug. Suspension is by two lugs 7 inches on either side of the center of gravity or by a single suspension lug 180° removed at the center of gravity.

REMARKS:

The M117 adapter booster is used in conjunction with the M127 nose fuze. This nose fuze is required for aerial bursts with persistent gas agents.

For Color and Markings, See Introduction, page 100.



U. S. 1000 LB. CHEMICAL BOMB AN-M79

DATA: AN-M79

OVERALL LENGTH	69.5 in.
BODY LENGTH	53.6 in.
BODY DIAMETER	18.6 in.
WALL THICKNESS	0.38 in.
TAIL LENGTH	18.5 in.
TAIL WIDTH	25.4 in.
TAIL WEIGHT	21.5 lbs.

ARMY-NAVY BOMB

1000 LB. CHEMICAL

AN-M79
(Service)

WEIGHTS:

Type of Filling	Hydrocyanic Acid (AC)	Phosgene (CG)
Weight of Filling	185 lbs.	404 lbs.
Total Weight	707 lbs.	926 lbs.
Chg / Wt. Ratio	26.0%	44.0%

FUZING:

Regular Missions

Nose: AN-M103A1, AN-M103, M103, M127 (Army only with M117 adapter-booster), M128 (Navy only), M135, M135A1, M136, M136A1, M139, M139A1, AN-M139A1 M140, M140A1, AN-M140A1, M163, M164, M165.

Tail: AN-M102A2, AN-M102A1, M162.

VT Missions

Nose: T50E4, T90, T92, M166 (T51E1), T82

BOMB CONSTRUCTION:

Resembles the AN-M65 1000 lb. G.P. bomb, taking the same tail assembly, arming wires and fuzes. The body is one piece cast steel and has a steel burster well 2.5" in diameter axially through it and expanded in both the nose and base plate before welding; eliminating any possibility of decomposition of chemical fillers due to the presence of crevices. The base plate differs from that of the standard G.P. bomb in that it is a special forging welded to the case and containing the M1 needle valve. It also has a 1.25" filling hole closed by a soft iron gasket, a hard steel gasket plug and a threaded closing plug. The M16 booster is used in the burster well and consists of a waterproof fiber tube filled with 4.45 lbs. tetrytol. The standard 1000 lb. G.P. tail assembly consists of 4 fins welded to a sleeve which is held on to the base plate by a locking nut. Horizontal suspension is accomplished by dual lugs 7" on either side of the center of gravity or by a single lug 180° removed at the center of gravity.

OPERATION:

On impact with the ground the tetrytol booster breaks the bomb case into a few large pieces without causing the chemical agent to "flash". The initial cloud formed by the burst of this bomb when filled with (CG) covers an area of 100 yards in diameter within approximately 8 to 10 seconds.

REMARKS:

Attempts to disassemble the bomb or any of its components are to be avoided except for the fuzes which may be removed provided it is necessary to return the bomb to storage. Release of the filler is dangerous and should not be undertaken except under exceptional circumstances. In handling any damaged chemical bombs or when conducting surveillance tests by means of the M1 needle valve, personnel should be equipped with rubber gloves and a gas mask.

M115A1 adapter booster can also be used in place of M115.

For Color and Markings, see Introduction, page 100.

SECTION III

BOMB FUZES

CONFIDENTIAL

FUZES

Bomb fuzes designed by the U. S. forces can be classified in three ways: by their position in a bomb; by their method of arming; and by their firing action.

In current production the primary fuzes are of AN standardized types, the fuzes used against land targets being of Army design, and fuzes used against naval targets being of Navy design. In addition to the AN types, both the Army and the Navy have their own fuzes designed prior to standardization. Most of these are obsolescent, but may still be found in the field. Between the two services the following types of fuzes can be found: nose, athwartships and tail fuzes using one of the following six methods of arming:

(1) arming vane
(2) arming vane with reduction gear
(3) arming pin
(4) arming pin with pyrotechnic delay
(5) arming pin with mechanical delay
(6) a combination of any two of the above

and functioning in one of the following ways: instantaneous, selective instantaneous or short delay, short delay, long delay, hydrostatically, or with aerial burst.

Nomenclature:

When under development, Army fuzes carry temporary designations which are later dropped when the fuzes are standardized. Experimental fuzes controlled by the Army Ordnance Department are indicated by the letter "T" (e.g., T75); modifications incorporated in the basic design carry the letter "E" (T51E1). Items in the developmental stage designed by the Chemical Warfare Service, such as fire bomb igniters, are indicated by the letter "E" rather than "T", and subsequent revisions in "E" designs carry the letter "R" (e.g., E9R17).

If the developmental fuze is standardized for Army use by the Ordnance Technical Committee, the "T" or "E" designation is dropped and an "M" number is assigned. Standardized fuzes carry the designation "M" followed by a three digit number beginning with 1 (M100, M103, etc.). When a modification on a standard item is under development, the change will be given an "E" or "R" designation (e.g., M111E8); if the fuze thus modified is adopted as standard, it will take a designation in sequence in the "A" series, "A" indicating an alteration in the basic design.

In undertaking the development of a new fuze, the Navy Bureau of Ordnance assigns a Mark number which will designate the fuze in the experimental stage as well as in service use. No system of "T" and "E" designations is employed. The Mark is followed by a three digit Arabic number, beginning with 2 (e.g., Mk 234). Modifications are indicated by the abbreviation "Mod" followed by the proper Arabic number. Fuzes manufactured before the spring of 1943 were numbered by Roman numerals and used only two digit numbers.

When adopted as standard by the Joint Aircraft Committee, the prefix "AN" is placed before the M or Mk. designation. Once adopted, the services are obligated to use the standard item where it is applicable. The service which developed the item and whose type of designation is used has the engineering responsibility for the fuze, and no changes may be made therein which affect installation or tactical interchangeability.

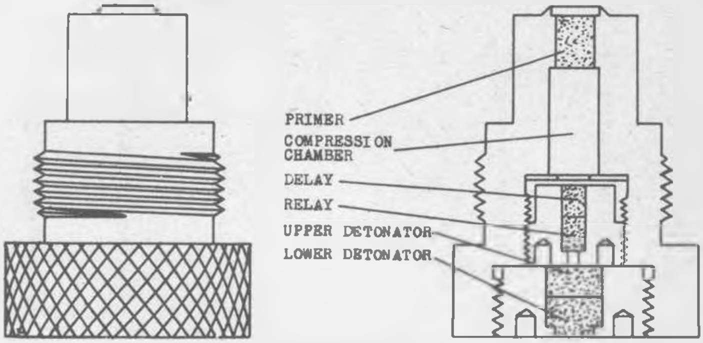
Explosive Train:

Typical firing trains employed in both Army and Navy fuzes use pointed strikers with sensitive primers for instantaneous action and blunt firing pins and percussion primers for delay action. The simple instantaneous explosive train in nose fuzes consists of a sensitive primer mixture of lead azide and lead styphnate, and upper detonator of lead azide, and a lower detonator of tetryl.

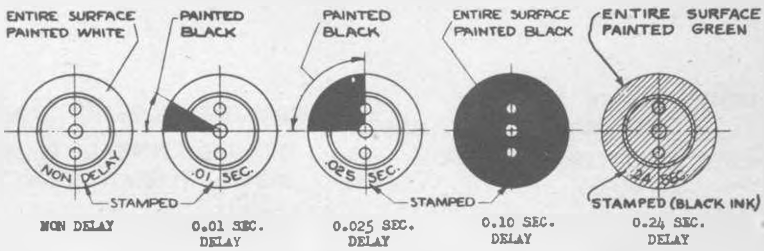
For a short delay, the blunt firing pin initiates a mercury fulminate percussion primer, which sends a flash through a chamber of compression to ignite a pressed black powder delay. This on completion of burning flashes a relay pellet of lead azide and lead styphnate which detonates the lower detonator of tetryl.

The explosive train, including the booster, is usually incorporated in all Navy fuzes and Army nose fuzes, but in Army tail fuzes the explosive train does not include the booster, and may have the remainder of its explosives contained in an interchangeable primer detonator to allow optional selection of short delays. Three such primer detonator assemblies are now in use - the M14 used in the AN-M100A1 and A2 series fuzes; the M16 used in M112 and M115 series fuzes; and the M16A1 used in M112A1 and M115 series fuzes. Another primer detonator assembly, the M19, is used in the chemical long delay fuzes for safety in shipment since it is not assembled to the fuze until shortly before the fuze is assembled to the bomb.

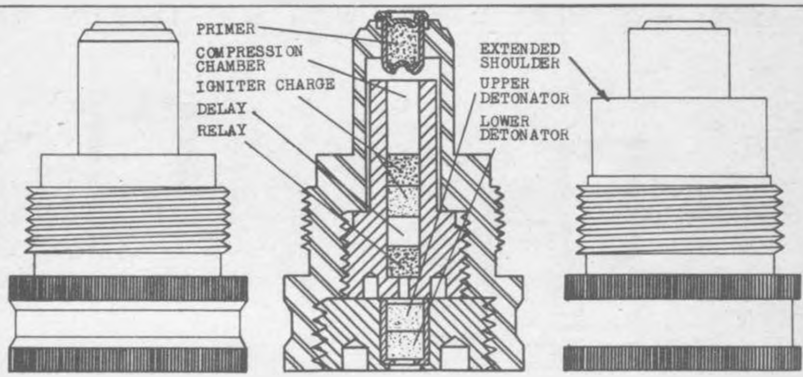
PRIMER DETONATORS



M 14 PRIMER DETONATOR



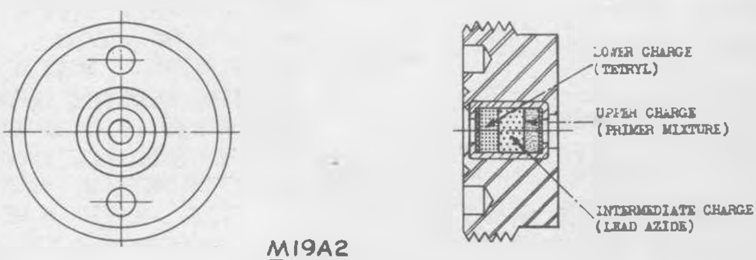
METHOD OF MARKING FOR VARIOUS DELAYS



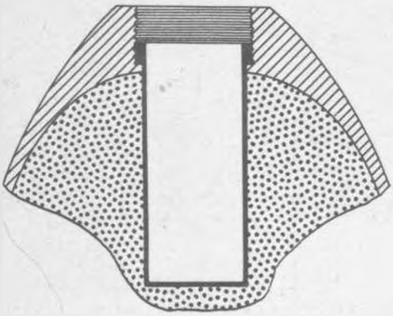
M 16 PRIMER DETONATOR

M 16 and M 16A1 Primer Detonators have the same internal construction.

M16-A1 PRIMER DETONATOR



M19A2 DETONATOR

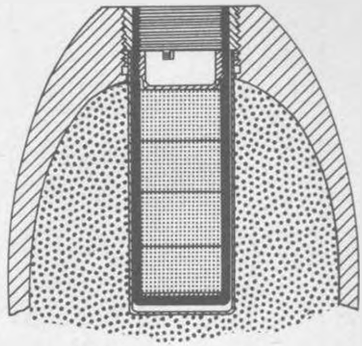


INSIDE THREAD DIAMETER (BOMB NOSE) 2."0

FUZE SEAT LINER INSIDE DIAMETER 1."64

DEPTH OF FUZE SEAT LINER 5."0

NOSE FUZE SEAT LINER



ADAPTER BOOSTER DIMENSIONS

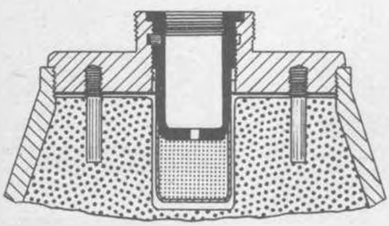
OUTSIDE THREAD DIAMETER 2."0

INSIDE THREAD DIAMETER 1."5

LENGTH 5."0

DEPTH FOR FUZE 1."3

NOSE FUZE SEAT LINER WITH M117 ADAPTER BOOSTER



ADAPTER BOOSTER DIMENSIONS

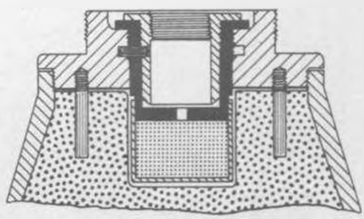
INSIDE THREAD DIAMETER 1."5

DEPTH 2."9

LENGTH (EXTERNAL-UNDER FLANGE) 4."4

ADAPTER BOOSTER INSIDE DIAMETER 1."35

TAIL, WITH M 102 A1 ADAPTER BOOSTER



ADAPTER BOOSTER DIMENSIONS

INSIDE THREAD DIAMETER (WITH INNER SLEEVE) 1."5

INSIDE THREAD DIAMETER (WITHOUT INNER SLEEVE) 2."0

DEPTH (WITH SLEEVE) 2."9

DEPTH (WITHOUT SLEEVE) 2."7

ADAPTER BOOSTER INSIDE DIAMETER (WITH SLEEVE) 1."35

ADAPTER BOOSTER INSIDE DIAMETER (WITHOUT SLEEVE) 1."90

TAIL, WITH M 115 A1 ADAPTER BOOSTER

ARMY BOMBS NOSE FUZE SEAT LINER, NOSE AND TAIL ADAPTER BOOSTERS

Army tail fuzes contain the primer detonator, but the booster charge is housed in an adapter booster which is considered an integral part of the bomb base plug and should not be removed. The adapter booster also serves to seat the fuze.

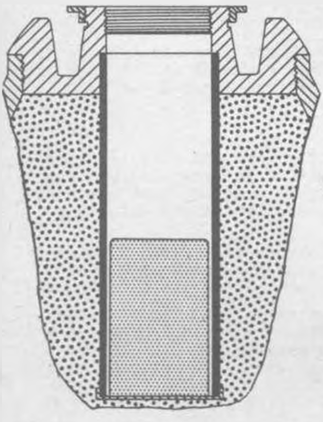
Four adapter boosters are found in use in the base plugs of Army bombs; the M102, M102A1, M115, and the M115A1. Since the inside thread diameter of the M102 and M102A1 is 1.5 in., bombs fitted with these adapter boosters receive Army designed tail fuzes only, all of which have an outside thread diameter of 1.5 in.

In AN G.P. bombs the adapter booster is modified to permit the insertion of Navy hydrostatic tail fuzes (AN-Mk230-4-5-6) whose outside thread diameter is 2.0 in., typical of all Navy designed fuzes. The M115 and M115A1 adapter boosters which are used in AN G.P. bombs incorporate an inner sleeve or ring, which gives the adapter booster an inside thread diameter of 1.5 in., permitting Army type fuzing only. When this sleeve is removed the inside thread diameter of the adapter booster becomes 2.0 in., and the Navy hydrostatic tail fuzes may be inserted.

The A1 modification on both the M102 and M115 consists of the addition of two base plate locking pins and an adapter booster locking pin to prevent the removal of the base plate and adapter booster when anti-withdrawal tail fuzes are employed. See drawing on opposite page.

The nose fuze pockets of AN and other Army designed bombs have an inside thread diameter of 2.0 in. and are designed to take the AN-M103 (and variations) No adapter booster is used since the AN-M103 has its booster built into the fuze body and the fuze is threaded directly into the fuze seat liner. The M111 (and variations, particularly the M127), however, has an outside thread diameter of 1.5 in. and must be used in conjunction with an adapter booster when desired for employment in AN and other Army bombs. This adapter booster, the M117, with an inside thread diameter of 1.5 in. to receive the smaller fuzes and an outside thread diameter of 2.0 in. to fit the fuze seat liner, converts the nose fuze pockets of G.P., S.A.P., L.C., 260 lb. frag, 90 lb. frag., 500 lb. incendiary, and 500, 1000, and 2000 lb. chemical bombs for use with the M127.

The function of the Army adapter booster is performed in Navy bombs by the fuze seat liner and the auxiliary booster. The fuze seat liner is an integral part of the bomb, and the auxiliary booster is shipped into position as shown in the drawings below. The Mk 1 Auxiliary Booster is used in the fuze seat liners of all Navy G.P., A.P., and depth bombs. One extra Mk 1 Auxiliary Booster is required to adapt the standard Navy nose fuze seat liner for the AN-Mk219 fuze. The Auxiliary Booster Mk2, which is designed primarily for insertion in rocket heads, can be adapted for Navy G.P. and depth bombs fuzed with the AN-Mk230 by fitting a .25 in. wooden disc spacer on the bottom of the fuze seat liner and placing two Mk 2 Auxiliary Boosters above the spacer. When it is desired to use the AN-Mk219 fuze in Army bombs, the Auxiliary Booster Mk 4 is inserted in the fuze seat liner.

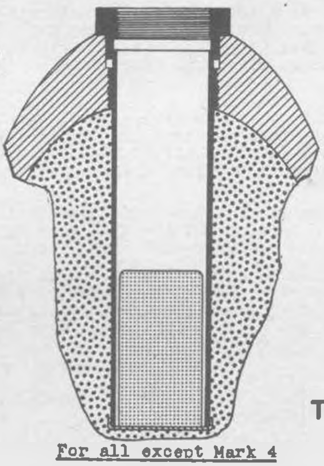


TAIL FUZE SEAT LINER

For all except Mark 53 and Mark 54 Depth Bombs

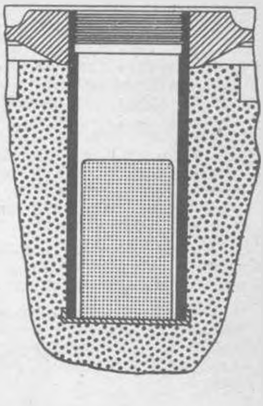
Inside Thread Dia..2.0"
Liner Inside Dia...1.9"
Liner Depth........7.0"

NOSE FUZE SEAT LINER



For all except Mark 4

Inside Thread Dia..2.0"
Liner Inside Dia...1.9"
Liner Depth........8.0"



TAIL FUZE SEAT LINER

For Mark 54 Depth Bomb and Mark 53 Depth Bomb

Inside Thread Dia..2.0"
Liner Inside Dia...1.9"
Liner Depth........5.7"

NAVY BOMBS NOSE AND TAIL FUZE SEAT LINERS

Fuze Extension M1:

The fuze extension, M1, may be used in any bomb adapted for the AN-M103 nose fuze. It comes in 6, 9, 12, 18, 24, 30 and 36 inch sizes, and consists of a burster support and a burster assembly. The burster support is a steel tube 2.375 inches outside diameter which has a male thread at one end and a female thread at the other. The former screws into the adapter in the nose of the bomb; the latter receives the AN-M103 nose fuze. The burster assembly consists of an asphalt-impregnated, chipboard tube which has a recessed metal cap crimped to one end and a plain metal cap cemented to the other. The tube is filled with cast tetrytol. A shakeproof lock washer is supplied with each assembly.

To assemble the extension, proceed as follows:

(1) Remove fuze hole plug of the bomb and inspect.

(2) Place the lock washer on the booster support and screw the support into the nose fuze adapter. Be sure it is tight enough for the lock washer to take hold.

(3) Insert the burster, crimped end first, into the support and push it in as far as possible. Do not use force. If the burster binds, inspect to see whether the support or the burster is at fault and discard the faulty item.

Arming Wires:

The Navy is now procuring four standard arming wires for all bombs now in naval use, replacing the varied types previously in service. They will fit any bomb up to and including 2000 lbs., and by adding an arming wire extension which is part of the new system can be used in bombs up to 4000 lbs.

The new wires come straight and are packed in hermetically sealed metal tubes, protecting them from corrosion. Depending on type, the tubes contain from 50 to 100 wires, including their clips and extra clips. The wires are cut when installed to fit the bomb.

Mk 1 Arming Wire

The Mk 1 arming wire is a single strand bronze wire, 57" long and .064" in diameter, joined to a swivel and loop. This assembly can be used on all bombs expended with a single fuze up to and including 2000 lb. bombs. BuOrd recommends using two of these Mk 1 assemblies to rig out the athwartships hydrostatic fuzes of depth bombs. One hundred Mk 1 arming wires together with 300 safety clips are packed in an airtight metal tube, (includes an extra clip for each wire).

Mk 1 Arming Wire Extension

The Mk 1 arming wire extension is a flexible steel cable 16" long and ".0625 in diameter. It incorporates a swivel loop arrangement and a brass spring clip. The Mk 1 arming wire extension may be used with two Mk 1 arming wires to install arming for the 4000 lb. light case bomb. In addition, it is used to lengthen wires on fragmentation or incendiary clusters. One hundred of these extension wires are packed in an air-tight metal tube.

Mk 2 Arming Wire

The Mk 2 arming wire is a double strand bronze wire of the same type, diameter and length as the Mk 1 arming wire. It is used on all bombs expended with a nose and tail fuze up to and including 2000 lb. bombs. Fifty Mk 2 wires together with 300 safety clips are packed in an air-tight metal tube.

Mk 3 Arming Wire

The Mk 3 arming wire is a single strand steel wire 57" long and ".033 in diameter. The Mk 3 arming wire can be used anywhere the ".036 diameter Navy-type wire was used, and in addition can be used in all M111A2 jump-out pin type fuzes in which a stronger wire is needed. One hundred Mk 3 arming wires together with 100 safety clips are packed in an air-tight metal tube.

The new standard assemblies do not replace special assemblies on any clusters either fragmentation or incendiary but the Mk 1 wire extension is used with such clusters so that their wires which are too short for proper fitting can be connected.

Arming wires are subjected to considerable wear from vibration. For that reason, tubes are supplied to protect a wire at its point of maximum wear. Use of these tubes on all bombs equipped with arming wire brackets is mandatory. All old AN-type arming wires on hand and pre-cut to length for a bomb should be returned to the Army.

General Arrangement of Fuzes:

The fuzes under consideration in this book have been arranged according to two general plans. First, they have been grouped in strict numerical order in the fuze chart below. Second, in the detailed discussion of fuzes which follows, the arrangement is by "family", i.e., fuzes bearing similar construction characteristics are considered as a unit (M100 series, T75, M160 series). The overall order is numerical with the initially numbered fuze of a series or family determining the place of that series in the general pattern of discussion.

Fuze Chart:

The fuze chart has been designed as a quick reference guide to American fuzes. The following abbreviations have been used under. Arming Data: V.R. for vane revolutions; and M.A.A. indicating Minimum Altitude to Arm at 200 m.p.h.

U.S. NAVY DESIGNED FUZES

Fuze Designation			Functioning	Arming Data			Addit.component
Model No.	Posit.	Type	Times*	V.R.	Air Trav.(ft)	M.A.A.	part
AN-Mk 219	Nose	Mechanical Impact	Inst.	170	1100 2000-2500 (flat nose)		Adapter ring, Mk I Aux Booster with all DB's, Mk 12 500#GP, Mk 13 1000#GP. Adap. ring & Mk 4 booster with all "M", "AN-M" G.P.'s.
Mk 221	Nose	Mech. Impact	0.01	165	850-1100		None
Mk 223	Tail	Mech. Impact	0.01	150	850-1100		None
AN-Mk 224 and Mods	Athw.	Hydrostatic	25,50,75 100,125 ft. depth	Armed at 12 to 25 ft. depth			Spacer ring required with 650, 700# DB's.
Mk 227-0	Nose	Mech. Impact	Inst.		1500-3000		None
AN-Mk 228 and Mods	Tail	Mech. Impact	0.08	140-160	1100	200	None
Mk 229 & Mods	Tail	Hydrostatic	25,50,75, 100,125 ft. of water	110	500	60	None
AN-Mk 230 and Mods	Tail	Hydrostatic	25,50,75 100,125 ft. of water	110	300-400	60	None
Mk 231-0	Tail	Hydrostatic	25 ft. water	40-45		60	None
Mk 232 and Mods	Nose	Impact, Elec Firing	Inst. or Elec. Impul.	8			None
Mk 233 and Mods	Nose	Elec. Firing	Elec. Impul.				None
AN-Mk 234 and Mods	Athw.	Hydrostatic	25,50,75 100,125 ft. of water	Completely armed at 12 to 25 ft. depth			Spacer ring required with 650, 700 lb. DB's.
Mk 237-0 Mk 238-0	Tail	Long Delay	2,10,30 hrs.	150			None
Mk 239-0	Nose	Mech. Impact	0.01	165	850-1100		None
Mk 240	Tail	Hydrostatic	25 ft. water	40-45		60	None
Mk 243-0 Mk 244-0	Nose	Mech. Impact	0.025	130	500		None

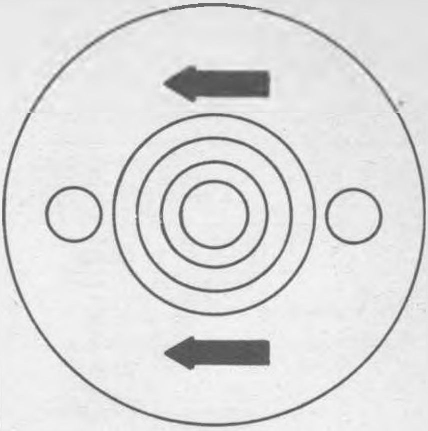
* Seconds unless otherwise indicated.

U.S. ARMY DESIGNED FUZES

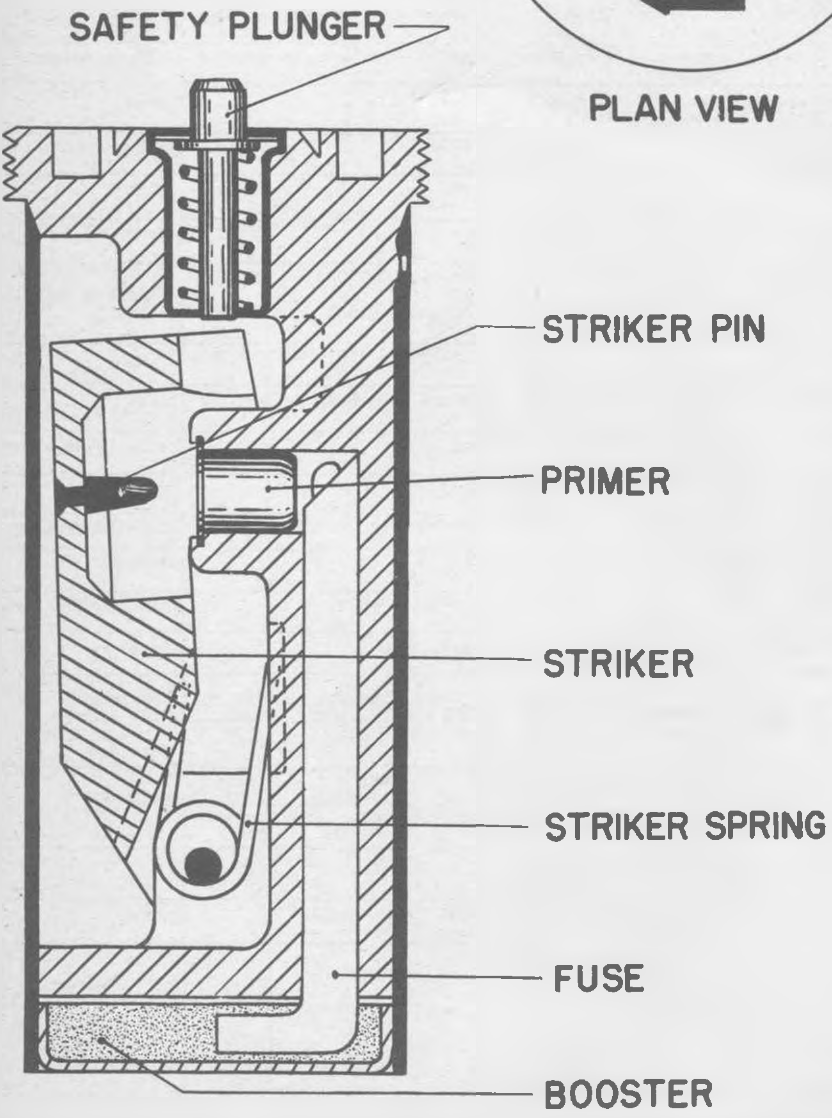
Fuze Designation			Functioning	Arming Data			Addit. component
Model No.	Posit.	Type	Times	V.R.	Air Trav.(ft)	M.A.A.	part
AN-M100A1 AN-M101A1 AN-M102A1	Tail	Mechanical Impact	Non-delay 0.01 0.025 0.1 0.024	720			M14 Primer Det. M102A1 Adapter Booster with Navy G.P.'s
AN-M100A2				150-170	445-485	40-50	
AN-M101A2					555	60-70	
AN-M102A2					465-665	85	
AN-M103 AN-M103A1	Nose	Mechanical Impact	Inst. 0.1	Inst: 330 0.1: 220	Inst: 760-1600 0.1: 510-1080	450 210	None
AN-M104	Nose	Mechanical Impact	Inst.	2.5 sec. pyrotechnic delay			None
M105	Nose	Mechanical Impact	Inst. 0.1	450-460			None
M106	Tail	Mechanical Impact	45-60	Armed when dropped			None
M106A1			8-11				
M106A2			3-5				
M108	Nose	Mechanical Impact	Inst.	Armed when dropped			None
M109	Nose	Mechanical Impact	Inst.	2.5 sec. pyrotechnic delay			None
M110	Nose	Mechanical Impact	Inst.	570			None
AN-M110A1				260		60	
M111	Nose	Mech. Time Aerial Burst, Impact	13-93	570		450	None
M111A1			5-92	570		450	
M111A2			5-92 Impact-Inst.	260		185	
M112 M113 M114	Tail	Mechanical Impact Pyro. Delay	4-5 8-11	18-21	100		M16 Primer Det.
M112A1 M113A1 M114A1			4-5 8-11 8-15				M16A1 Primer Det.
M115	Tail	Mechanical Impact Pyro. Delay	4-5	150-170	485	40-50	M16,M16A1 Primer D M102 Adapt.Boost. with Navy G.P.'s
M116			8-11		555	60-70	
M117			8-15		665	85	
AN-M120	Nose	Mechanical Impact	Inst.	2.5 sec. Mechanical delay			
AN-M120A1				1.9 sec. Mechanical delay			
M123	Tail	Chem.Time Anti-With-drawal	1,2,6,12 24,36,72, 144 hrs.	75-190	370	180	M19 Primer Det.
M124						215	
M125						310	
M123A1 M124A1 M125A1				4-6			M19A1 Primer Det.
AN-M126A1	Nose	Mechanical Impact	Inst.	260		60	None
M127	Nose	Mech.Time, Aerial Burst, Impact	5-92 Inst.	260		185	None
AN-M128	Nose	Same as M111A2	Same as M111A2	260		185	None
M129	Athw.	Impact Air Burst	Inst. Air Burst	2.5 secs.			None
M130	Athw.	Mech.Time	10,20,30 minutes	3.5			None
M131	Athw.	Anti-Dis.		5 seconds after impact			None

Fuze Designation Model No.	Posit.	Type	Functioning Times	Arming Data V.R.	Air Trav.(ft)	M.A.A.	Addit.component part
M132 M133 M134	Tail	Chem.Time Anti-With-drawal	10 min.	63-84	300 370 300-450		M19 Primer Det.
M135 M135A1 M136 M136A1	Nose	Mech.Time Air Burst	5-92,Inst. 10-92,Inst. 5-30,Inst. 10-30,Inst.	260	750		None
M138	Nose	Same as M111A2	Same as M111A2	260		185	None
M139 AN-M139A1 M140 AN-M140A1	Nose	Mechanical Impact	Inst: 0.01 Inst. .025	Inst: 330 Delay: 220	765-1600 510-1080	450 210	None
M142 M142A1	Nose	All-Ways Action	Inst.	Armed when dropped			None
M143	Tail	Bouchon Grenade	Air Burst	Armed when bomb is dropped			M18 Grenades
M144	Nose	Same as AN-M111A2	1.6-30.6 Inst.	6-9			None
AN-M145	Nose	Same as AN-M111A2	Same as AN-M111A2	260		185	None
AN-M146	Nose	Same as AN-M111A2	Same as AN-M111A2	260		185	None
AN-M147	Nose	Same as AN-M111A2	Same as AN-M111A2	260		185	None
M148	Nose	Mechanical Impact	Inst. .1	Inst. 330 Delay 220	765-1600 510-1080	450 210	Japanese type Gaine
M149	Nose	Blast Press. Mech. Imp.		12-13			None
M150	Nose	All-Ways Action	Inst.	Armed when bomb is dropped			None
M151	Tail	Mech. Imp. Pyro Del.	8-15	12			M16A1 Primer Det.
M152 M153	Tail	Same as AN-M111A2	Same as AN-M111A2	260		185	None
M154		All-Ways Action	Inst.	Armed when bomb is dropped			M13-M14 Igniter
M155	Nose	Same as AN-M111A2	Same as AN-M111A2	6-9			None
M157		All-Ways Action	Inst.	18-30	150-220		M15,M16 Igniters
M158 M159	Nose	Mechanical Impact	Inst.	440	1000		None
M160 M161 M162	Tail	Mechanical Impact	Non-delay 0.01, 0.025 0.1, 0.24	720	1780-1950 1910-2230 1710-2680	650 805 1130	M14 Primer Det. M102 Adapter Booster with Navy G.P.'s
M163 M164 M165	Nose	Mechanical Impact	Inst., 0.1 Inst., 0.01 Inst. .025		Inst: 1710-3625 Delay: 1140-2420	Inst: 1775 Delay: 915	None
M166	Nose	Air Burst VT type	Automatic Air Burst		3600		
M170	Nose	Mechanical Impact	Inst.	1.5 secs.	Mechanical Delay		None

M1 BOMB FUZE



PLAN VIEW



RESTRICTED

U. S. ARMY NOSE FUZE

M1

INERTIA TYPE WITH DELAY

Data

BOMBS USED IN . . . . . 6 lb. Incendiary, AN-M69

FUNCTIONING . . . . . 3 to 5 seconds delay after impact.

ARMED CONDITION . . . . When safety plunger is out

FUZES USED WITH . . . . None

ARMING TIME . . . . . Instantaneous

MAX. BODY DIAMETER. . . 1.125 in.

OVERALL LENGTH . . . . 2.5 in.

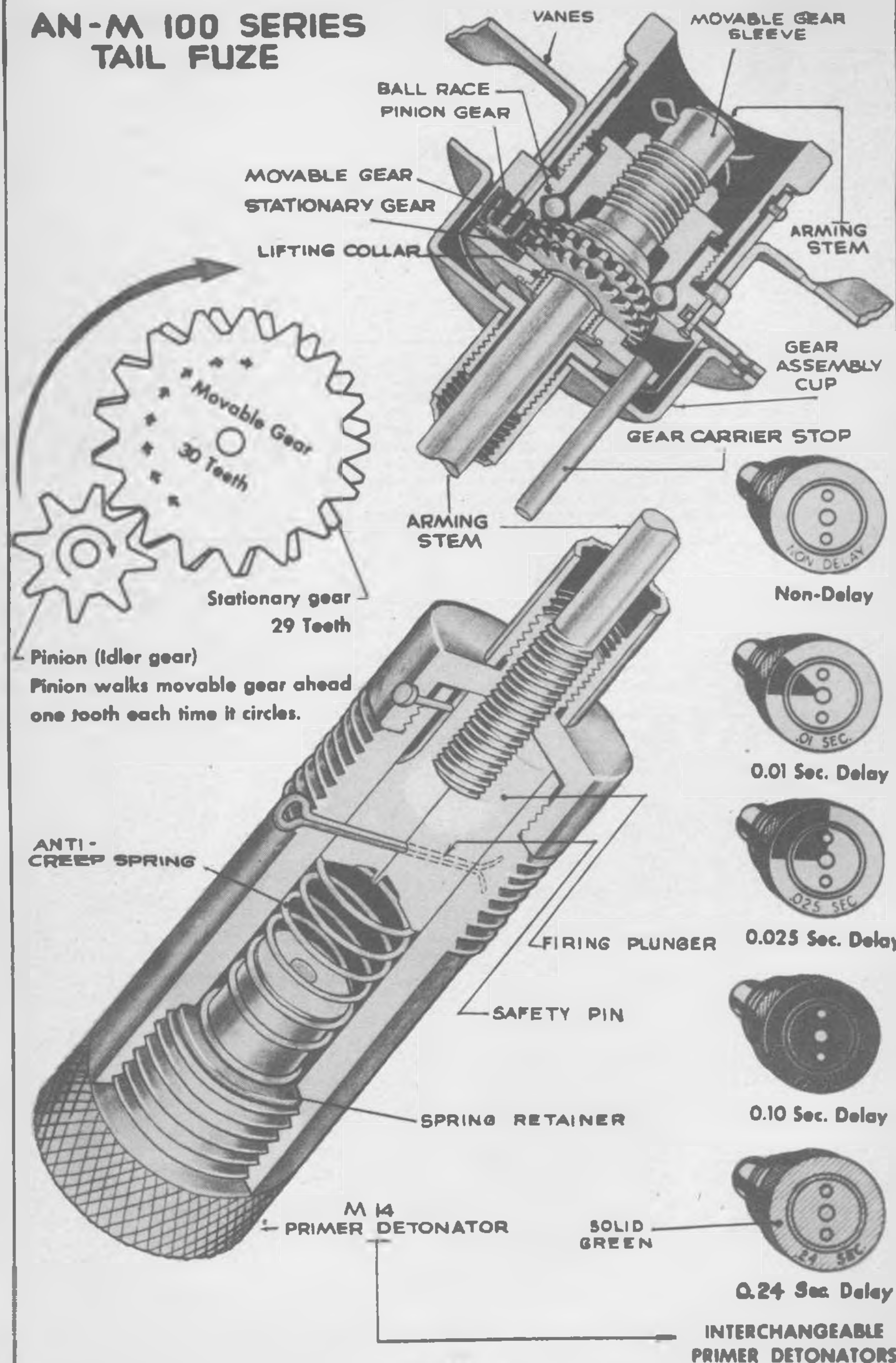
MATERIAL . . . . Die cast aluminum and steel.

GENERAL: The M 1 fuze is screwed into the side of the nose of the AN-M69 bomb. When assembled, the two arrows on the top of the fuze case must be parallel to the longitudinal center-line and point aft. This is necessary in order that the fuze will fire on nose impact. The fuze consists of five main parts, namely a die cast aluminum fuze base, a striker of the same material, a primer cap, a lead coated spitter fuze (60% black powder - 40% collodion) and a booster charge consisting of 1.2 grams of black powder. The booster cup is a transparent nitro-cellulose composition. The entire fuze assembly is contained in a cover of steel tubing. A safety plunger prevents the striker from detonating the primer cap while the bomb is clustered.

OPERATION: Upon release from the cluster, the spring operated fuze safety plunger in each bomb moves outward thereby arming the fuze. Upon impact, the momentum of the striker carries it forward and causes the striker pin to detonate the primer cap which in turn ignites the lead coated spitter fuze. The latter requires from three to five seconds to burn. The spitter fuze ignites the booster charge of black powder contained in a celluloid cup in the end of the fuze case. This ignites the igniter-ejector charge of black powder and oiled magnesium powder in the nose cup of the bomb.

REMARKS: See AN-M69 bomb, page 108, showing the M 1 fuze assembled in the bomb.

AN-M 100 SERIES TAIL FUZE



RESTRICTED

US. ARMY NAVY-FUZE

AN-M100A2
AN-M101A2
AN-M102A2

(Service)

MECHANICAL IMPACT

M 100	AN-M 100A1
M 101	AN-M 101A1
M 102	AN-M 102A1

(Obsolete)

Data

BOMBS USED IN:

AN-M 100A2 . . . . . . AN-M30, 100 lb. G.P.
AN-M57, 250 lb. G.P.
AN-M88 220 lb. Frag.
M81, 260 lb. Frag.

AN-M 101A2 . . . . . AN-M43, 500 lb. G.P.
AN-M64, 500 lb. G.P.
AN-M58, 500 lb. S.A.P.
AN-M76, 500 lb. Incend.
AN-M78 500 lb. Chem.
M32, 600 lb. G.P.

AN-M 102A2 . . . . . . AN-M44, 1000 lb. G.P.
AN-M65, 1000 lb. G.P.
AN-M59, 1000 lb. S.A.P.
AN-M79, 1000 lb. Chem.
M33, 1100 lb. G.P.
AN-M34, 2000 lb. G.P.
AN-M66, 2000 lb. G.P.
M103, 2000 lb. S.A.P.
AN-56, 4000 lb. L.C.

FUNCTIONING . . . . M 14 interchangeable primer detonator with delays of .01, .025, .1, or .24 second or non-delay.

ARMED CONDITION . . . . When gear carrier stop protrudes less than 1 inch below vane cup.

FUZES USED WITH . . . . AN-M 103 normally, M139, AN-M139, M140, AN-M140A1 M163, M164, M165, M135, M135A1, M136, M136A1. M166, Mk243, T50E1 T50E4, T82, T91. T92.

ARMING DATA:

	Vane Revs.	Air Travel	Min. Vert. Drop
AN-M100A2	150-170	445-485 ft.	40-50 ft.
AN-M101A2	150-170	555 ft.	60-70 ft.
AN-M102A2	150-170	465-665 ft.	85 ft.

VANE SPAN. . . . . 5 in. (4 vanes)

MAX. BODY DIAMETER. . . 1.5 in.

OVERALL LENGTH . . . . AN-M 100A2 9.6 in.; AN-M 101A2 12.6 in.; AN-M 102A2 16.6 in.

MATERIAL . . . . Cadmium plated steel with brass striker block, primer detonator holder and other small parts.

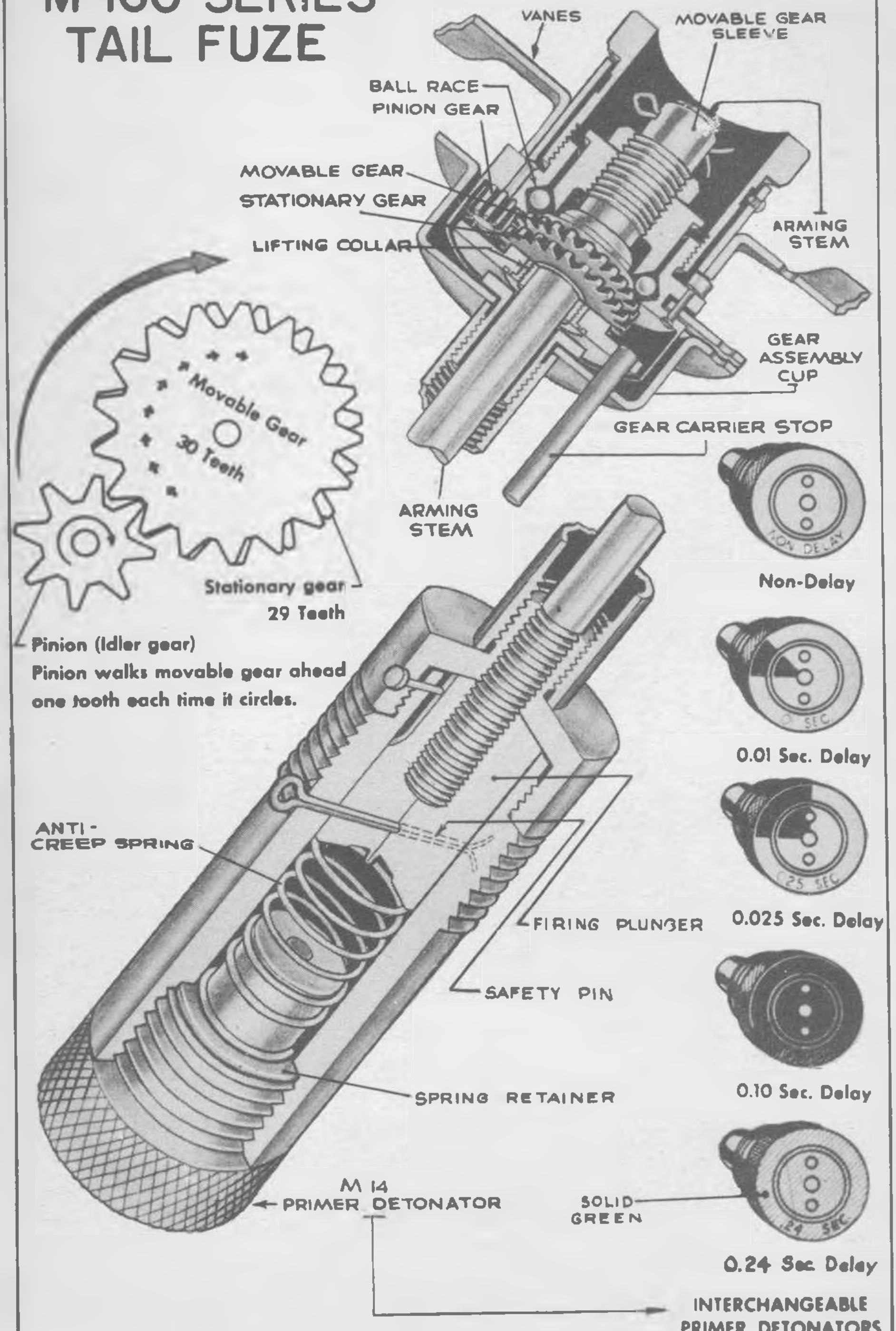
GENERAL: These three fuzes are identical except for length of arming stem. Larger bombs require a longer arming stem so that vanes can catch the air slip from the bomb.

OPERATION: As the vanes rotate, the pinion gear which is attached to the vane assembly revolves around the stationary gear. Since the movable gear has 30 teeth and stationary gear 29 teeth, the movable gear is rotated clockwise one tooth per revolution of the pinion gear. The arming stem is secured by a cotter pin to the movable gear sleeve and hence unthreads from the firing plunger as the movable gear is rotated. In unthreading, the arming stem lifts the movable gear, and since the stationary gear is held by a collar threading into the lower extension of the movable gear sleeve, the stationary gear is lifted also. After 150-170 revolutions of the vanes, the double-threaded arming stem will have unthreaded from the firing plunger and the fuze will be armed. Further air travel will unthread the arming stem from the fuze body and the entire assembly will fly off. On impact, the firing plunger will overcome the creep spring and the striker will function the primer detonator.

EARLY DESIGNS: The M 100, M 101, and M 102 fuzes had a fixed delay of .1 sec., and had 24 single threads on the arming stem. Had eight broad vanes with less pitch and required approximately 720 vane revolutions to arm. AN-M 100A1, AN-M 101A1, and AN-M 102A1 incorporated interchangeable M 14 primer detonator. The A2 modification then reduced the number of vanes to four, and the number of threads to 16 double threads, thus decreasing the arming time to 150-170 vane revolutions.

REMARKS: When these fuzes are used in the 260 lb. Frag. 500 lb. Incendiary, 500 lb., 1000 lb., 2000 lb. chem. and 4000 lb. L.C. the M 14 primer detonator should have non-delay functioning. On G.P. and S.A.P. bombs the length of the short delay will be governed by the tactical use. The .24 second delay primer detonator was developed for these fuzes for use in connection with the Mk 243 nose fuze. Fuzes equipped with this primer detonator will function at a depth of 25 ft. and are more accurate than the AN-Mk230, especially on high velocity impact.

M-160 SERIES TAIL FUZE



RESTRICTED

U. S. ARMY FUZE

M160, M161, M162

Mechanical Impact
AN-M100A2C
AN-M101A2C

BOMBS USED IN:

M160	AN-M30 100 lb. G.P. AN-M57 250 lb. G.P. AN-M88 220 lb. Frag. M81 260 lb. Frag.
M161	AN-M64 (AN-M43) 500 lb. G.P. AN-M58 500 lb. S.A.P. AN-M76 500 lb. Incend. AN-M78 500 lb. Chem. M32 600 lb. G.P.
M162	AN-M65 (AN-M44) 1000 lb. G.P. AN-M59 1000 lb. S.A.P. AN-M79 1000 lb. Chem. M33 1100 lb. G.P. AN-M66 (A1, A2) 2000 lb. G.P. M103 2000 lb. S.A.P. AN-M56 4000 lb. L.C.

FUNCTIONING . . . M14 interchangeable primer detonator with delays of .01, .025, .1 and .24 seconds and non-delay.

ARMED CONDITION. . When gear carrier stop protrudes less than 1" below vane cup.

FUZES USED WITH. . M163, M164, M165 normally, AN-M103A1, AN-M103, M139, M139A1, AN-M139A1, M140, M140A1, AN-M140A1, Mk 243

ARMING DATA:

	Vane Revolutions	Air Travel (Ft.)	Min. Vert. Drop @ 200 mph
M160	720	1780-1950	650
M161	720	1910-2230	805
M162	720	1710-2680	1130

VANE SPAN . . . . 5" (four vanes)

MAX. BODY DIA. . . 1.5"

OVERALL LENGTH . . M160 9.6"; M161 12.6"; M162 16.6"

MATERIAL . . . . . Cadmium plated steel with brass striker block, primer detonator holder and other small parts.

GENERAL: The M160, M161 and M162 mechanical impact tail fuzes are similar to the AN-M100A2, AN-M101A2, and AN-M102A2 respectively except for the arming stem which has finer threads (28 single threads to the inch against 20 double threads in the AN-M100 series) and a longer engagement with the firing plunger (.75 in. against .50 in.). The M160 series fuzes are distinguished externally from the AN-M100 group by a yellow band 3" long painted around the arming stem case.

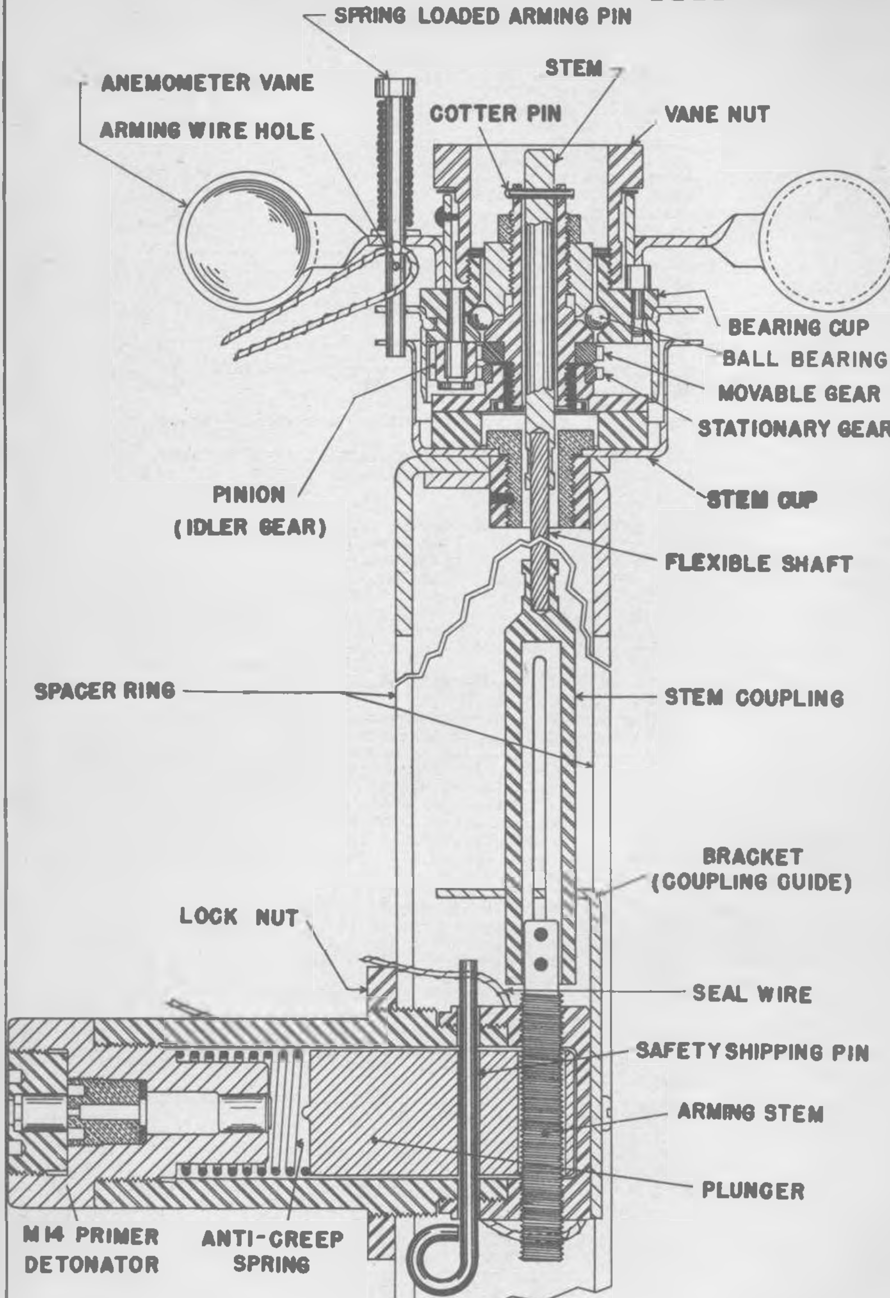
The slower arming is desired in order to prevent the premature explosion of bombs within the range of releasing aircraft. This has been caused in the past by bombs bumping each other after being dropped in clusters or in salvo at high altitudes by very heavy bombers. In addition, the bomb bays of the B-29's are subjected to considerable air turbulence, distorting the fall of the bombs, thereby increasing the hazard described above, and dictating the need for slower arming.

OPERATION: The operation is similar to the AN-M100 series fuzes except for the incorporation of a longer arming time in the M160 series; see page 151.

REMARKS: These fuzes are not procured by the Navy.

When these fuzes are used in the M81 260 lb. Frag, the AN-M88 220 lb. Frag., AN-M76 500 lb. Incend., the AN-M78 500 lb. and AN-M79 1000 lb. Chem. and the AN-M56 4000 lb. L.C. bombs, the M14 primer detonator should have non-delay functioning.

The first of the slower arming tail fuzes produced have been designated as the AN-M100A2C series. A limited quantity of AN-M100A2C and AN-M101A2C are being issued. These have the same number of threads per inch as the M160 series, but have the shorter engagement of the AN-M100 series fuzes. The yellow band is painted on as in the M160 series fuzes.



T 75 TAIL FUZE

CONFIDENTIAL

U. S. ARMY FUZE

T75, T75E2

MECHANICAL IMPACT

BOMBS USED IN:
- T75 . . . . VB-1 1000 lb. "Azon"
- T75E2 . . . . VB-3 1000 lb. "Razon"

FUNCTIONING . . . . . . M14 interchangeable primer detonator with delays of .01, .025, .1 or .24 sec. or non-delay

ARMED CONDITION . . . . No visible signs of arming

FUZES USED WITH AN-M103A1, AN-M103, M139, AN-M139A1, M140, AN-M140A1

ARMING DATA . . . . . . 1200 vane revolutions

VANE SPAN . . . . 1.5 in.

MATERIAL . . . . Cadmium plated steel with brass striker block, primer detonator holder, and other small parts.

GENERAL: The T75 is an AN-M100A1 series tail fuze modified to fit the VB-1 and VB-3. An anemometer arming system has been installed, and a spacer ring fits around the upper section of the fuze to provide space and support for the fuze.

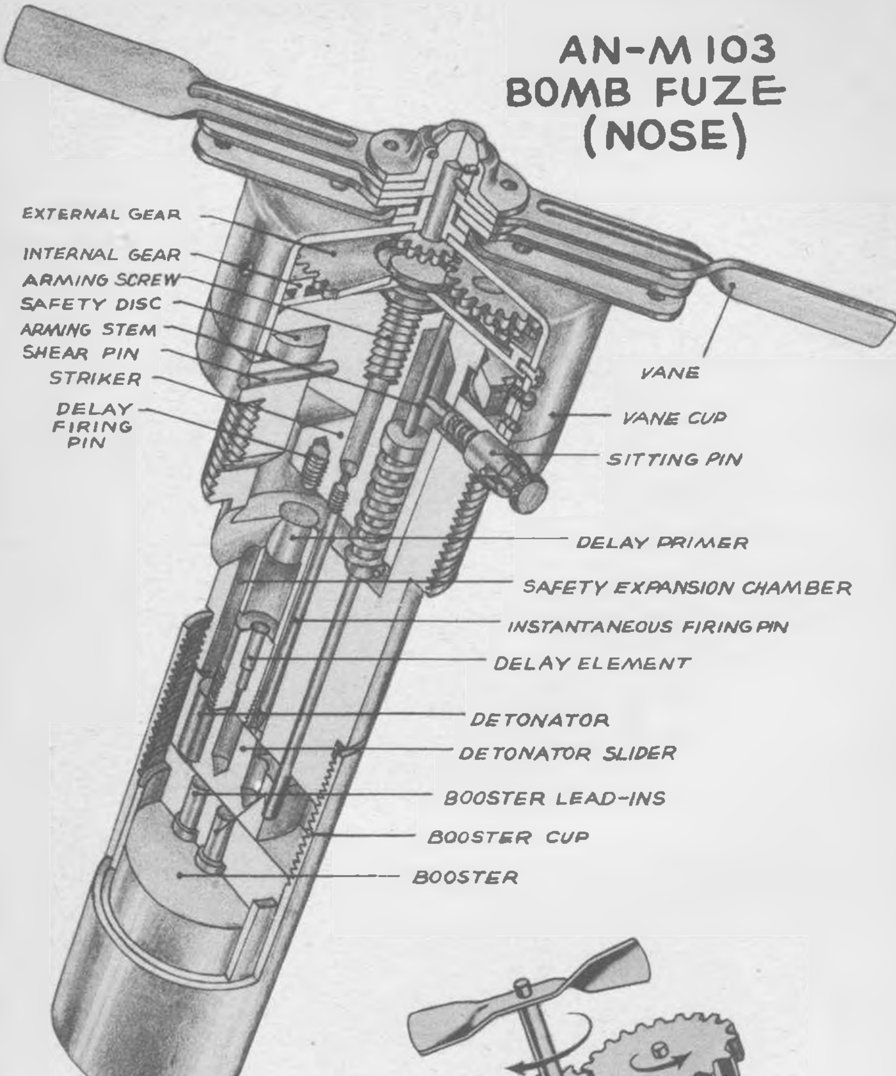
OPERATION: The arming wire is withdrawn upon release of the bomb from the plane permitting the spring loaded arming pin to fly out and freeing the anemometer vanes for rotation. Rigidly attached to the vane assembly through a gear reduction system, the flexible shaft revolves with the vanes and turns a stem coupling which fits loosely to it. An arming stem riding in a slot in the coupling is threaded out of the firing plunger as the coupling revolves, arming the fuze.

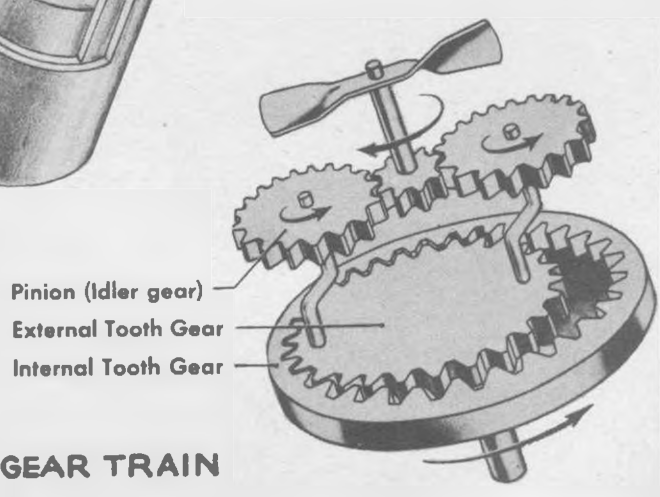
Upon impact, the plunger rides forward on its creep spring, hitting the M14 primer detonator, initiating the explosive train.

REMARKS: The T75E2 replaces the T75. This fuze is similar to the T75 except that it has a bracket which is designed for mounting a micro-switch, the flexible shaft is .25 in. longer, and the fuze is attached to the spacer ring in a slightly different manner.

The micro-switch is located opposite the end of the arming stem and is in contact with the arming stem. This switch is wired into the ignition circuit of the guide flare, and is closed by the arming stem as it turns out, after about 350 feet of air travel, thus providing an additional safeguard against accidental ignition of the flare.

AN-M103 BOMB FUZE (NOSE)





GEAR TRAIN

RESTRICTED

ARMY-NAVY NOSE FUZE

AN-M103

(Obsolescent)

MECHANICAL IMPACT

(M 103 is Obsolete fuze)

Data

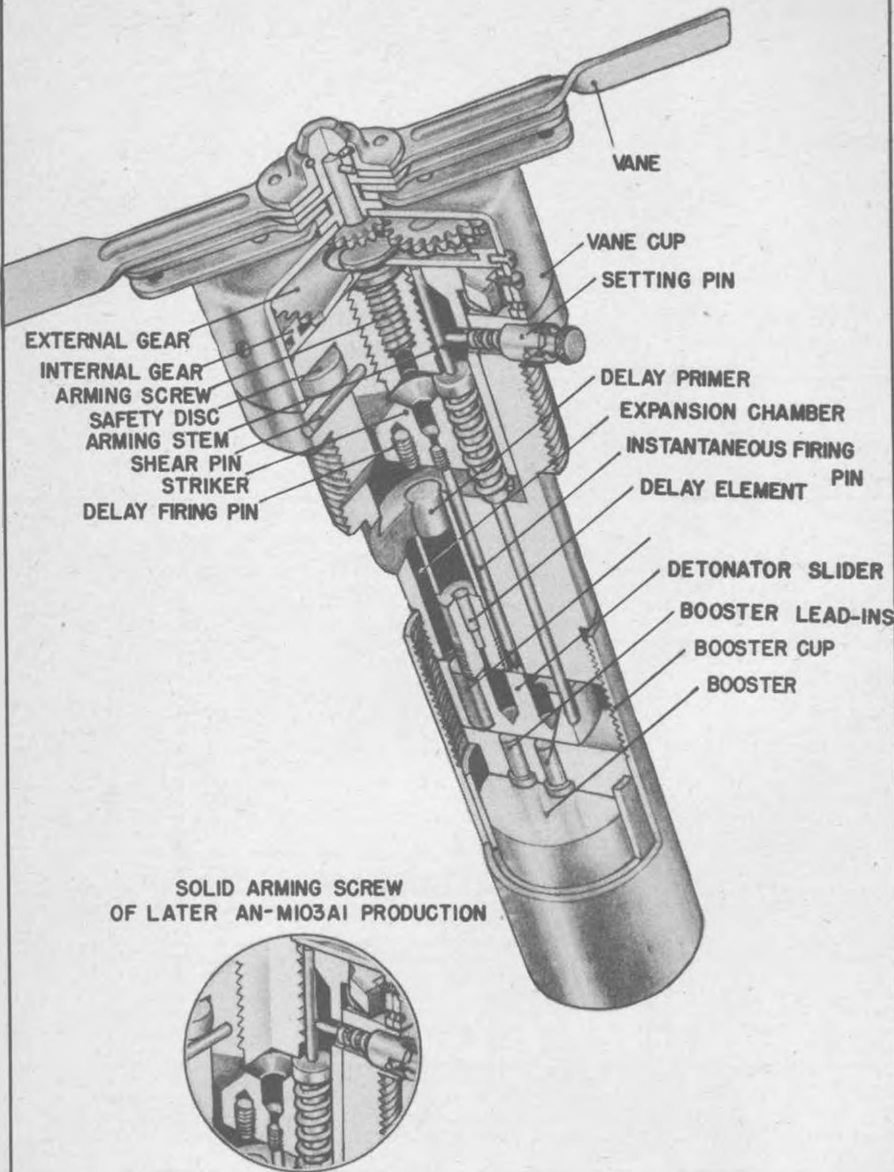
BOMBS USED IN	All G.P. bombs except Mk 4 Mod 4. The depth bombs for land targets, chemical, frag. and incendiary bombs May be used in S.A.P. for frag effect, but result not too consistent.
FUNCTIONING	Instantaneous or .1 sec. delay alternative settings.
ARMED CONDITION	When safety discs are out.
FUZES USED WITH	AN-M 100 Series normally.
ARMING TIME	Instantaneous setting, 330 vane revolutions. .1 sec. delay setting, 220 vane revolutions.
VANE SPAN	6" (2 vanes)
MAX. BODY DIAMETER . .	2.7"
OVERALL LENGTH	7" (with booster)
MATERIAL	Cadmium plated steel with some brass parts.

GENERAL: The AN-M 103 is the standard nose fuze in service. When shipped the fuze is set for delay action. One auxiliary booster is required when this fuze is used in Navy bombs. When used in light case,frag., chem., and incendiary bombs and aircraft depth bombs, the fuze should be set for instantaneous action to prevent breaking up of the bomb case before detonation occurs.

OPERATION: When bomb is dropped, arming wire is pulled and vanes rotate. The two pinion gears are rotated counter-clockwise, their off-center hubs walking the external-tooth gear backwards around the teeth of the internal-tooth gear, which is thus cranked in a counter-clockwise direction. The outboard edge of the internal-tooth gear is grooved and rides screws projecting through from the vane cup, maintaining an even position. The arming screw, being positively attached to the base of the internal-tooth gear, is gradually unthreaded from the striker. As it unthreads it lifts the entire vane assembly, including the vane cup. After 220 revolutions of the vanes, the vane cup will clear the safety discs, which spring free, leaving the striker secured only by the shear wire and setting pin. The spring-loaded arming stem will rise as the vane assembly rises, being retained only by the base of the internal tooth gear. If the setting is for delay action, however, the setting pin will be depressed into the deep slot and will protrude into the channel of the arming stem to engage the collar on the arming stem after it has risen only sufficiently to clear the step in the detonator slider, lining the detonator up with the delay firing train. On impact the force of inertia will cause the striker body to shear the shear pin and setting pin and the delay firing pin will impinge on the delay primer, setting off the flash which ignites the delay pellet, relay, primer, detonator, booster lead-in, and booster in succession. The instantaneous firing pin will merely protrude into the empty channel positioned to receive it. If set for instantaneous action, the setting pin will be in the shallow slot and will not protrude into the arming stem channel. After an additional 110 revolutions of the vanes (330 total), the vane cup will have been lifted high enough to have the arming stem moved out of the slider cavity, allowing the slider to line the primer detonator beneath the instantaneous firing pin. The slider is motivated by two springs and is locked in the armed position by a spring loaded detent. On impact the firing pin will impinge directly on the primer, setting off the detonator, booster lead-in, and booster in succession. Even though an instantaneous setting is used, the delay striker will impinge on the delay primer, setting off the delay pellet. It is thus possible that the fuze would function on delay, even though set for instantaneous action, if it failed to function instantaneously.

EARLY DESIGN: The M 103 fuze had 32 single threads per inch on the arming screw instead of 28 double threads per inch on the AN-M 103, resulting in an arming time of 850 vane revolutions for instantaneous firing and 525 vane revolutions when set for delay action. The M 103 had larger and weaker vane construction.

REMARKS: (1) Especially large vanes have been designed for the AN-M 103 for use with flat nosed depth bombs, as the regular vanes have difficulty in arming.
(2) The AN-M 103 can be used for dive bombing, but not for masthead bombing.



AN-M103A1 NOSE IMPACT FUZE

RESTRICTED

ARMY-NAVY NOSE FUZE

AN-M103A1

(Service)

Mechanical Impact

Data

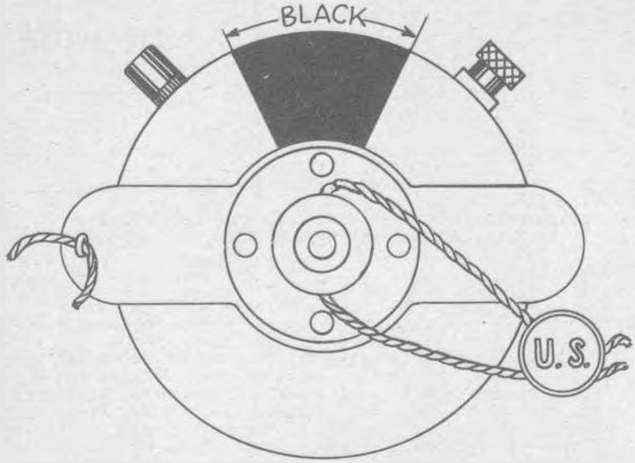
BOMBS USED IN.	All G.P. bombs except the Mk 4 Mod 4 or in depth bombs for land targets, chemical, frag. and incendiary bombs. May be used in S.A.P. for frag effect, but results not too consistent.
FUNCTIONING	Instantaneous or .1 sec. delay alternative settings
ARMED CONDITION . . .	When safety discs are out.
FUZES USED WITH . . .	AN-M100 Series normally.
ARMING TIME	Instantaneous setting, 330 vane revolutions. .1 sec. delay setting, 220 vane revolutions.
VANE SPAN	6" (2 vanes)
MAX. BODY DIAMETER . .	2.7"
OVERALL LENGTH	7" (with booster)
MATERIAL	Cadmium plated steel with some brass parts.

GENERAL: The AN-M103 is being replaced by the AN-M103A1 which differs in that the striker block has been drilled and tapped to accommodate an arming screw of a greater diameter. The hole for the arming screw joins that of the arming stem. In this way it is possible for the collar on the arming stem, under pressure of the arming stem spring, to bear against the base of the widened arming screw. In the earlier production of the AN-M103A1, a threaded sleeve was fitted and staked to the original arming screw of the AN-M103 to form the new widened arming screw. In the later productions, the widened arming screw is a single solid piece. In other respects the AN-M103 and AN-M103A1 are similar.

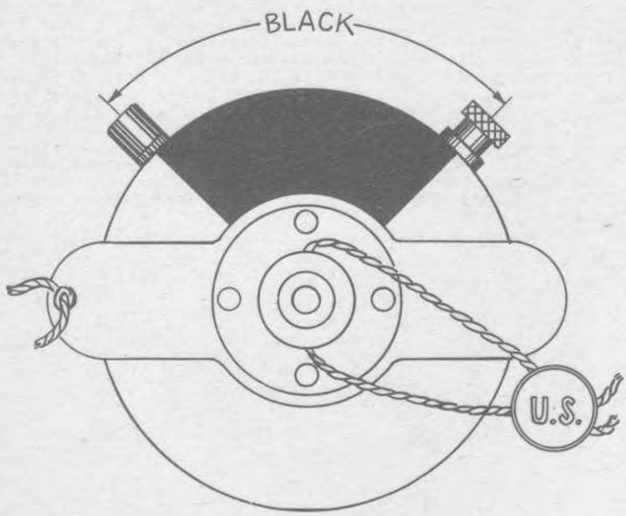
The purpose of modifying the AN-M103 as described above is to eliminate the possibility of accidental detonation in crash landings, and thus make it safe for carrier usage. In some cases during crash landings, upon initial impact, the vane cup and head of the AN-M103 were sheared off, allowing the arming stem to jump out, and the slider to align itself below the firing pin. On subsequent nose impact the fuze fired. The AN-M103A1 increases the safety primarily because the arming stem cannot jump out on accidental shearing of the vane cup assembly, as the arming screw overlaps the arming stem collar.

OPERATION: The operation of the AN-M103A1 is the same as that of the AN-M103 except that in the former, the arming stem, in addition to bearing against the internal gear, has its collar bearing against the arming screw. As the arming screw moves out, the arming stem follows it until the arming stem collar bears against the setting pin for delay action, or top of cavity for instantaneous action. In the event of a crash landing, if the vane cup and head of fuze shear off, the arming stem is held in place by the arming screw; hence, the slider cannot move over and the fuze will not fire.

REMARKS: Air Travel to arm the AN-M103A1 is the same as the AN-M103. This may be explained by the fact that the AN-M103 has 28 double threads per inch on the arming screw while the AN-M103A1 has 14 single threads per inch.



AN-M139A1 FUZE



AN-M140A1 FUZE

RESTRICTED

U. S. ARMY NOSE FUZES

AN-M139A1
AN-M140A1

M139
M140

MECHANICAL IMPACT

Data

BOMBS USED IN.	All bombs receiving AN-M103A1. See page 159 .
FUNCTIONING.	M139, AN-M139A1 instantaneous or .01 second delay alternative settings. M140, AN-M140A1 instantaneous or .025 second delay alternative settings
ARMED CONDITION . . .	When safety discs are out.
FUZES USED WITH . . .	AN-M100A2 Series
ARMING TIME	Instantaneous setting, 330 vane revolutions. .01 or .025 delay settings, 220 vane revolutions.
VANE SPAN	6 in. (2 vanes)
MAX. BODY DIAMETER . .	2.7 in.
OVERALL LENGTH	7 in. (with booster)
MATERIAL	Cadmium plated steel with some brass parts.

GENERAL: The M139 and the M140 are identical in construction to the standard AN-M103 with the exception that the amount of the delay element has been changed to decrease the functioning delay time from .1 second (AN-M103) to .01 (M139) or .025 (M140). All fuzes have the alternative instantaneous setting.

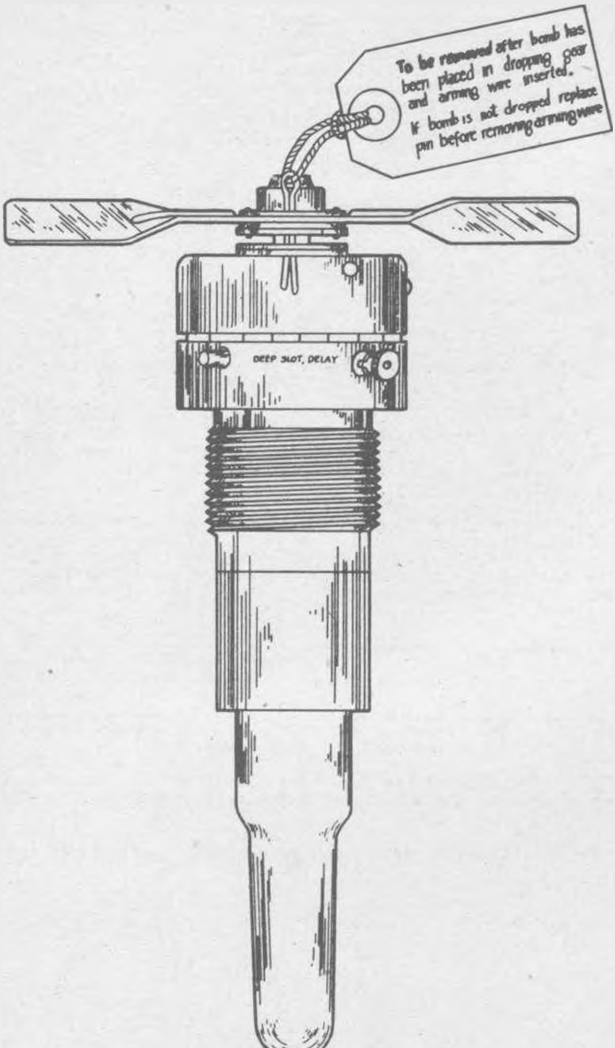
In order to distinguish these fuzes from the AN-M103, the vane cups have segments painted on them. One eighth of the vane cup of the M139, and one quarter of the vane cup of the M140 is painted black. These markings correspond with those on the M14 primer detonator. The M139A1 and the M140A1 are the same as the M139 and M140 respectively, except that they incorporate the widened arming screw found in the AN-M103A1.

OPERATION: M139, M140: Same as AN-M103, see page 157 .
AN-M139A1, AN-M140A1: Same as AN-M103A1, see page 159 .

REMARKS: The AN-M139A1 and AN-M140A1 are current production and replace the M139 and M140 respectively.

All of these fuzes were developed as companion fuzes for the AN-M100A2 series which uses the M14 primer detonators with delays of .01 second or .025 second.

These fuzes are not procured for naval use.



M148 NOSE FUZE

RESTRICTED

U. S. ARMY NOSE FUZE

M148

MECHANICAL IMPACT

Data

BOMBS USED IN.	Japanese Navy Bombs for U. S. usage.
FUNCTIONING.	Instantaneous or .1 sec. delay alternative settings
ARMED CONDITION. . . .	When safety discs are out
FUZES USED WITH. . . .	None
ARMING TIME	Instantaneous setting:- 330 vane revolutions. .1 sec. delay setting:- 220 vane revolutions.
VANE SPAN	6 in. (2 vanes)
MAX. BODY DIAMETER . .	2.7 in.
OVERALL LENGTH	9.3 in.
MATERIAL	Cadmium plated steel with some brass parts.

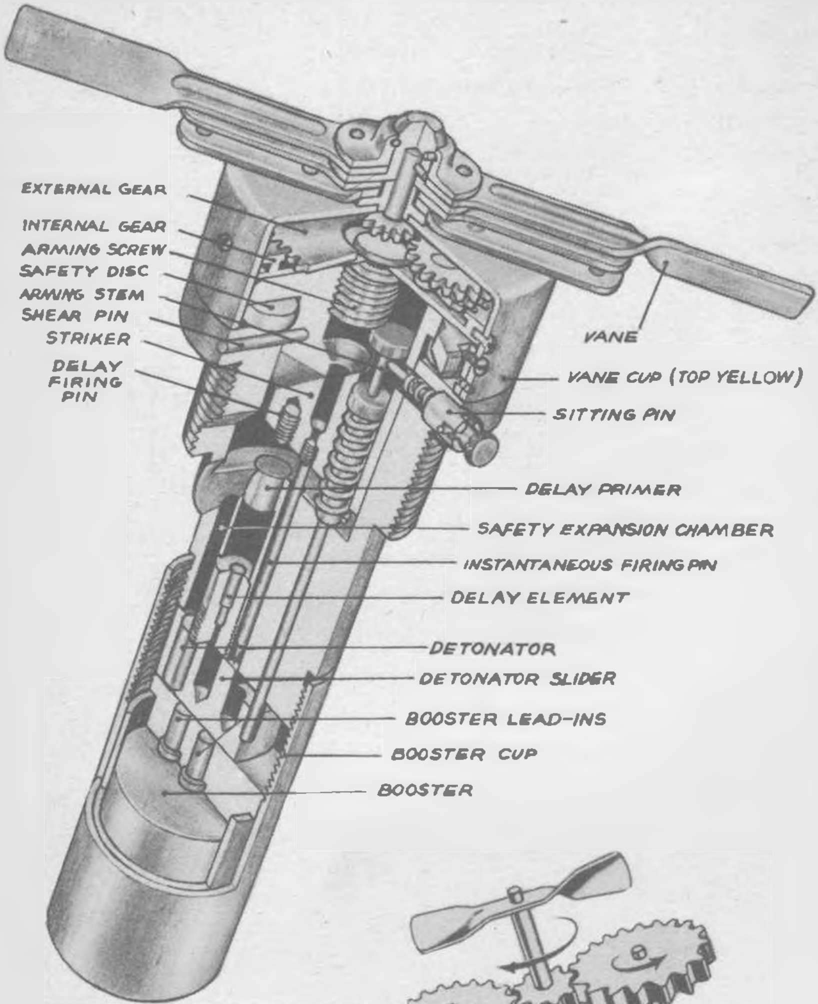
GENERAL: The M148 is the same as the AN-M103 nose bomb fuze except that the booster cup has been modified so as to have the contour of the standard Japanese Navy type gaine. The shape of the Japanese Navy gaine had to be retained in order that it would fit into the cavity in the nose of the bombs. In addition the threads on the fuze body have been modified to fit all Japanese Navy bombs. (Use 1.84 in. -10 Whitworth thread)

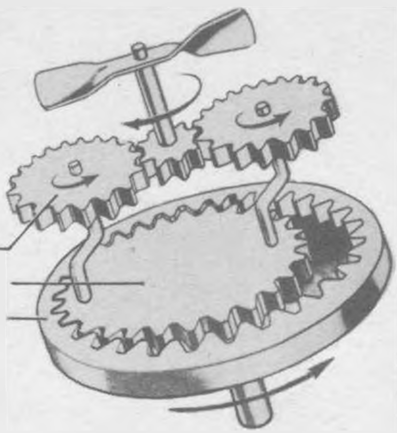
OPERATION: Same as the AN-M103 nose bomb fuze. (See page 157)

REMARKS: The M148 fuze was developed for usage in Japanese bombs which were recovered intact from captured bomb dumps.

This fuze is not procured by the Navy.

M163 SERIES NOSE IMPACT FUZE





GEAR TRAIN

RESTRICTED

RESTRICTED

U. S. ARMY FUZE

M163,M164,M165

Mechanical Impact

DATA:

BOMBS USED IN . . .	All G.P. bombs except Mk 4 Mod 4 AN-Mk 17 325 lb. Depth AN-Mk 54 350 lb. Depth M82 90 lb. Frag. M81 260 lb. Frag. AN-M88 220 lb. Frag. AN-M76 500 lb. Incend. AN-M78 500 lb. Chem. AN-M79 1000 lb. Chem. AN-M58 500 lb. S.A.P. AN-M59 1000 lb. S.A.P.

FUNCTIONING:

M163	Instantaneous; .1 second delay
M164	Instantaneous; .01 second delay
M165	Instantaneous; .025 second delay

FUZES USED WITH:

M160, M161, or M162 normally; AN-M100A2 series

ARMING DATA:

	Instantaneous Setting	Delay Settings
Vane Revolutions		
Air Travel	1710-3625 ft.	1140-2420 ft.
Min. Vert. Drop @ 200 mph . . .	1775 ft.	915 ft.

VANE SPAN	6" (2 vanes)
MAX. BODY DIA. . .	2.7"
MATERIAL	Cadmium plated steel with some brass parts.

GENERAL:

The M163, M164, and M165 mechanical impact nose fuzes correspond to the AN-M103A1, AN-M139A1, and the AN-M140A1 respectively except for the arming screw of the M163 series which has 32 single threads per inch as against 14 single threads to the inch in the earlier fuzes. Although the length of the M163 arming screw is reduced to .5 in., the crash proof feature is retained in the new series by the addition of a second shoulder higher up on the arming stem which bears against the bottom of the arming screw.

This series of fuzes is designed as a companion group for the M160, M161 and M162 and serves to eliminate the same difficulties discussed on page 154 with reference to the M160 series.

To distinguish the new series from their prototypes, the following markings are employed: the top of the M163 vane cup is painted completely yellow, and in the M164 and M165 the vane cup is painted yellow except for the black sections indicating the delays.

OPERATION: The operation is similar to that of the AN-M103A1 series except for incorporation of a longer arming time in the M163 series; see page 159.

REMARKS: These fuzes are not being procured by the Navy.

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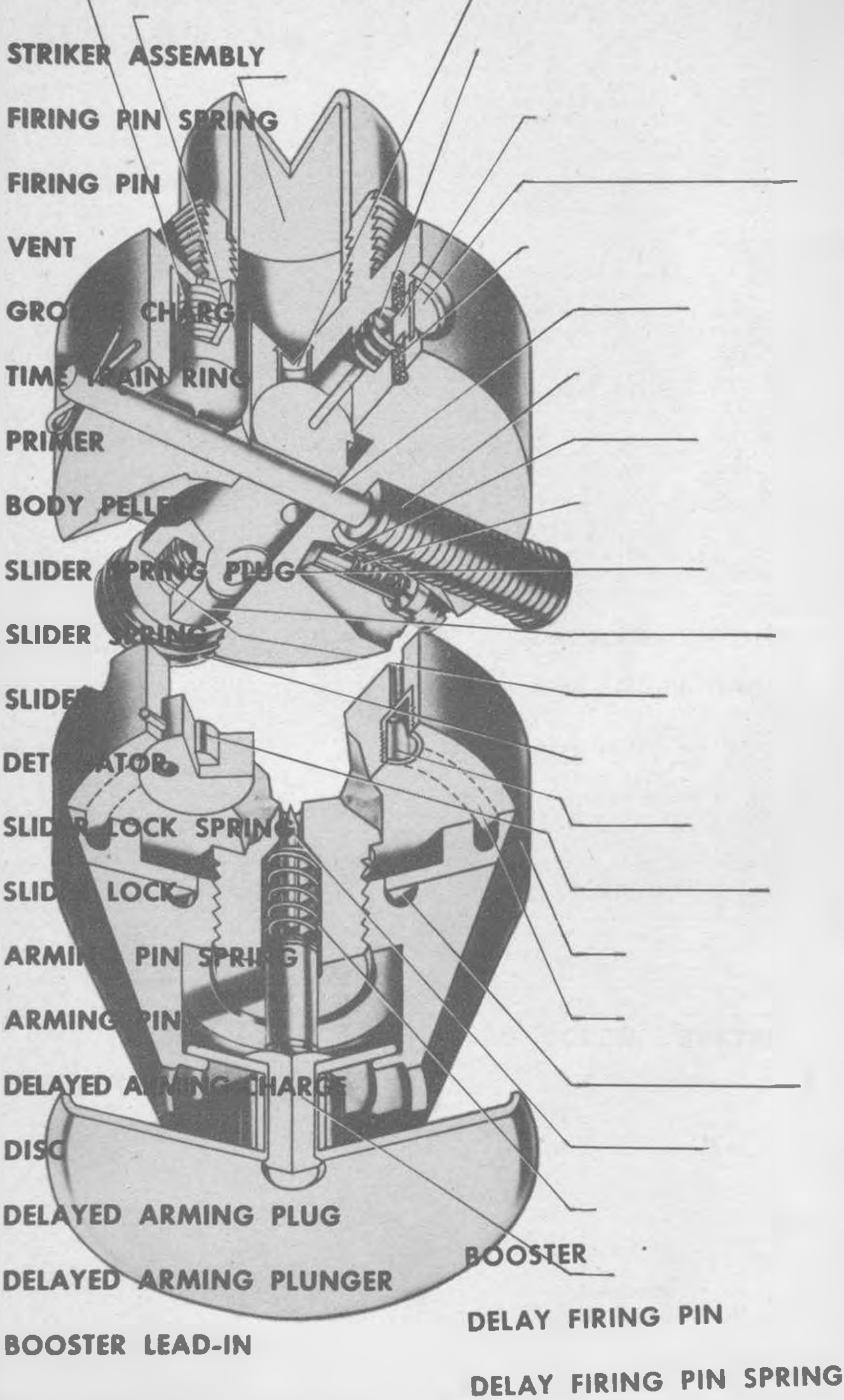
AN-M104 NOSE IMPACT FUZE



AN-M104, M109

MECHANICAL IMPACT

(AN-M 104 replaced by AN-M 120A1)
(M 109 replaced by AN-M 110A1)

AN-M104 (Obsolescent)
M103 (Obsolete)

Data

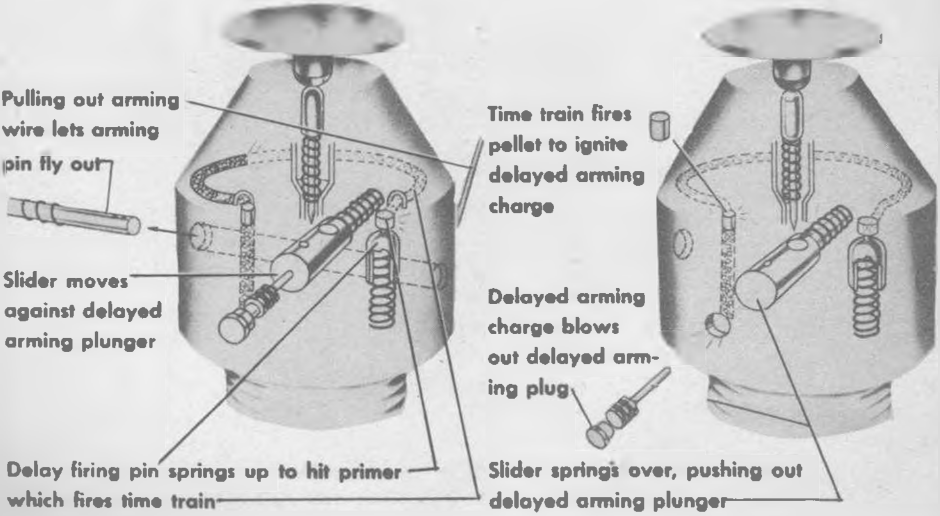
BOMBS USED IN	AN-M 104: 23 lb. AN-M 40 Frag. M 109: 20 lb. AN-M 41 Frag.
FUNCTIONING	Instantaneous
ARMED CONDITION . . .	When delayed arming disc is out.
FUZES USED WITH	None
ARMING TIME	2.5 (±0.25) seconds (pyrotechnic)
MAX. BODY DIAMETER . .	2.2"
OVERALL LENGTH	4.4" (with booster)
MATERIAL	Aluminum alloy body, cadmium plated firing pin and striker, brass delay train cup.

GENERAL: These fuzes are identical except for three minor differences: The M 109 has an additional spring beneath the striker head, a smaller striker disc, and the arming wire is removed from the arming pin when it is released from the plane (AN-M 104 arming wire removed when parachute opens).

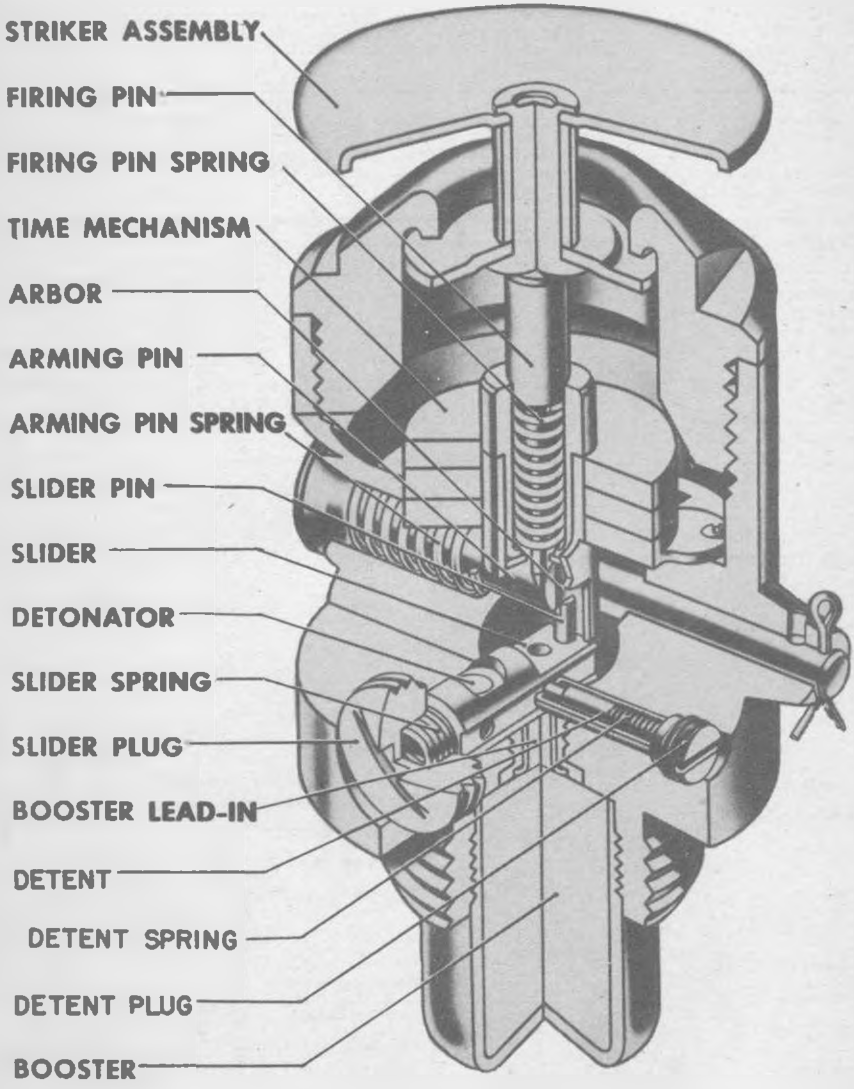
OPERATION: When the bomb is dropped and the parachute opens, the arming wire is pulled from the arming pin and the spring loaded arming pin flies free. Ejection of the arming pin allows the spring-loaded delay firing pin to spring up against the delay primer, starting the pyrotechnic delay train, and permits the spring loaded slider to move against the delayed arming plunger. After 2.5 seconds the 326° pyrotechnic delay train has burned around completely and the body pellet of black powder is ignited. The body pellet ignites the delayed arming charge which blows out the delayed arming plug and disc, thereby freeing the delayed arming plunger. The plunger is pushed out by the spring loaded slider as it moves over and lines up under the firing pin. The firing pin is retained only by the weak firing pin spring and on impact, the firing pin impinges on the primer in the slider.

REMARKS: Since the fuze has a mushroom striker head and a sensitive firing pin, it is a semi-always acting fuze and very sensitive if touched at any angle. If the mushroom head is flush with the fuze body and the delayed arming disc is out, then it is assumed that the fuze is in a fired condition and care should be taken not to lift the mushroom striker head away from the fuze body.

AN-M 104 has been replaced by the AN-M 120A1, and the M 109 has been replaced by the AN-M 110A1.



AN-M120A1 NOSE IMPACT FUZE



RESTRICTED

ARMY-NAVY NOSE FUZE

AN-M120A1
M170

MECHANICAL IMPACT
with
MECHANICAL ARMING DELAY

BOMBS USED IN:	
AN-M120A1.	AN-M40A1, AN-M40, M72A1 para-frag; M71A1 and M73A1 practice; M86 120 lb frag.
M170	AN-M40A1, AN-M40, M72A1 para-frag; M71A1 and M73A1 practice
FUNCTIONING	Instantaneous
ARMED CONDITION . . .	When arming pin is out.
FUZES USED WITH . . .	None
ARMING TIME:	
AN-M120A1	1.9 (± .15) secs. mechanical delay
M170	1.5 (± .15) secs. mechanical delay
MAX. BODY DIAMETER . .	2.2"
OVERALL LENGTH	4.4"
MATERIAL	Aluminum alloy body, cadmium plated striker and striker head.

GENERAL: The M170 duplicates the AN-M120A1 in all respects except for the arming time which is shortened to 1.5 (± .15) seconds in the M170.

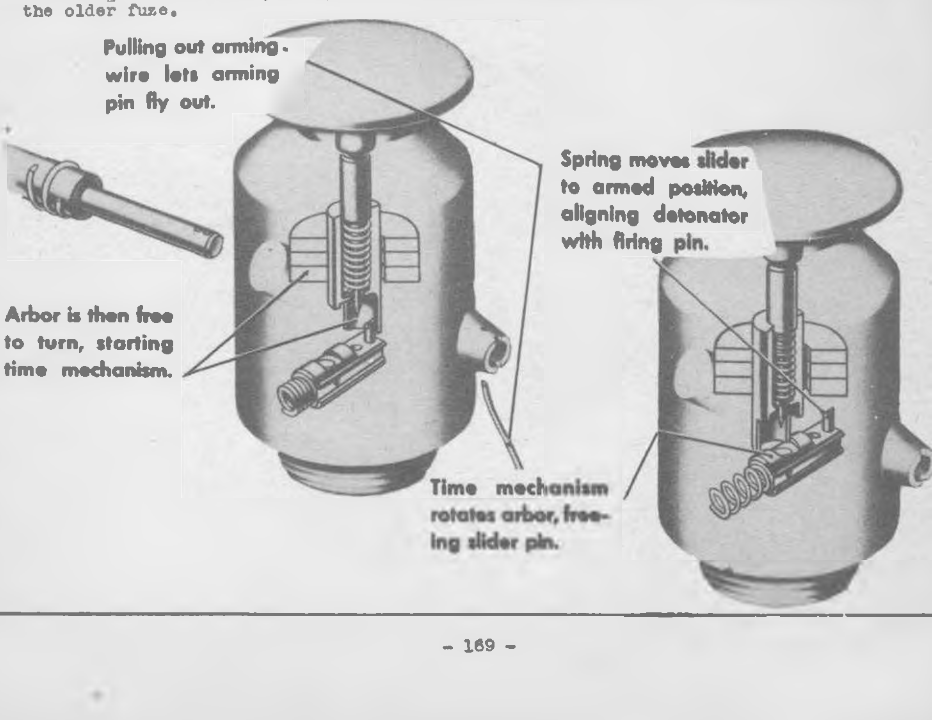
OPERATION: As the parachute opens, the arming wire is withdrawn from the arming pin, which is then ejected by the arming pin spring. Ejection of the arming pin frees the arbor, a semi-circular projection on the timing shaft, to be rotated by the clockwork mechanism. A regulator controls the oscillation of the clockwork governor, and is properly adjusted at the factory. The slider pin rides against the inside of the arbor under pressure of the slider spring. After the arbor has been rotated a full 160°, it clears the slider pin, allowing the slider to be forced across the fuze by the slider spring, lining up the detonator with the firing pin. A spring-loaded detent locks the slider in position. On impact, the striker head is forced in, driving the firing pin into the primer detonator and detonating the bomb.

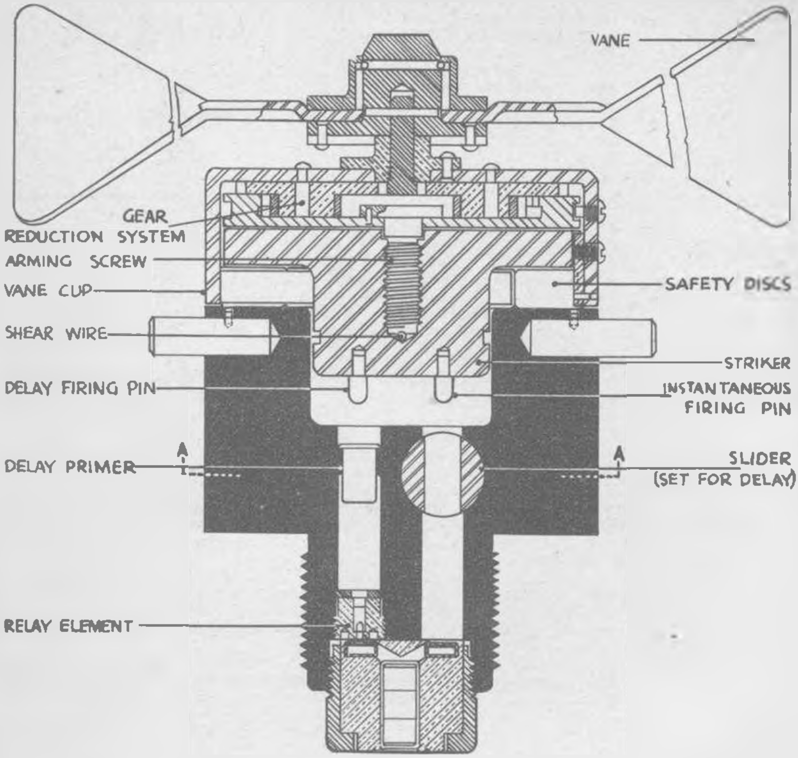
REMARKS: The M120 and AN-M120 did not have the clockwork regulator, and had an arming time of 2.5 (± .25) seconds; hence, attacks had to be made at higher levels. External appearance of all designs is the same.

This fuze is replacing the AN-M104 in the parachute fragmentation bomb.

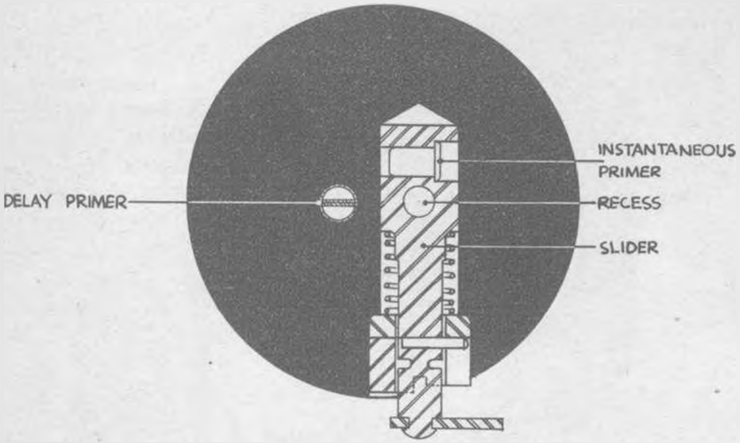
The AN-M120 was a replacement for the AN-M104 in the parachute fragmentation bombs.

The M170 is designed to supplant the AN-M120A1 in all bombs receiving the AN-M120A1, except for the M86 para-frag, which will continue to use the older fuze.





SECTION A-A



M-105 NOSE FUZE

U. S. ARMY NOSE FUZE

M105

MECHANICAL IMPACT

(Obsolete)

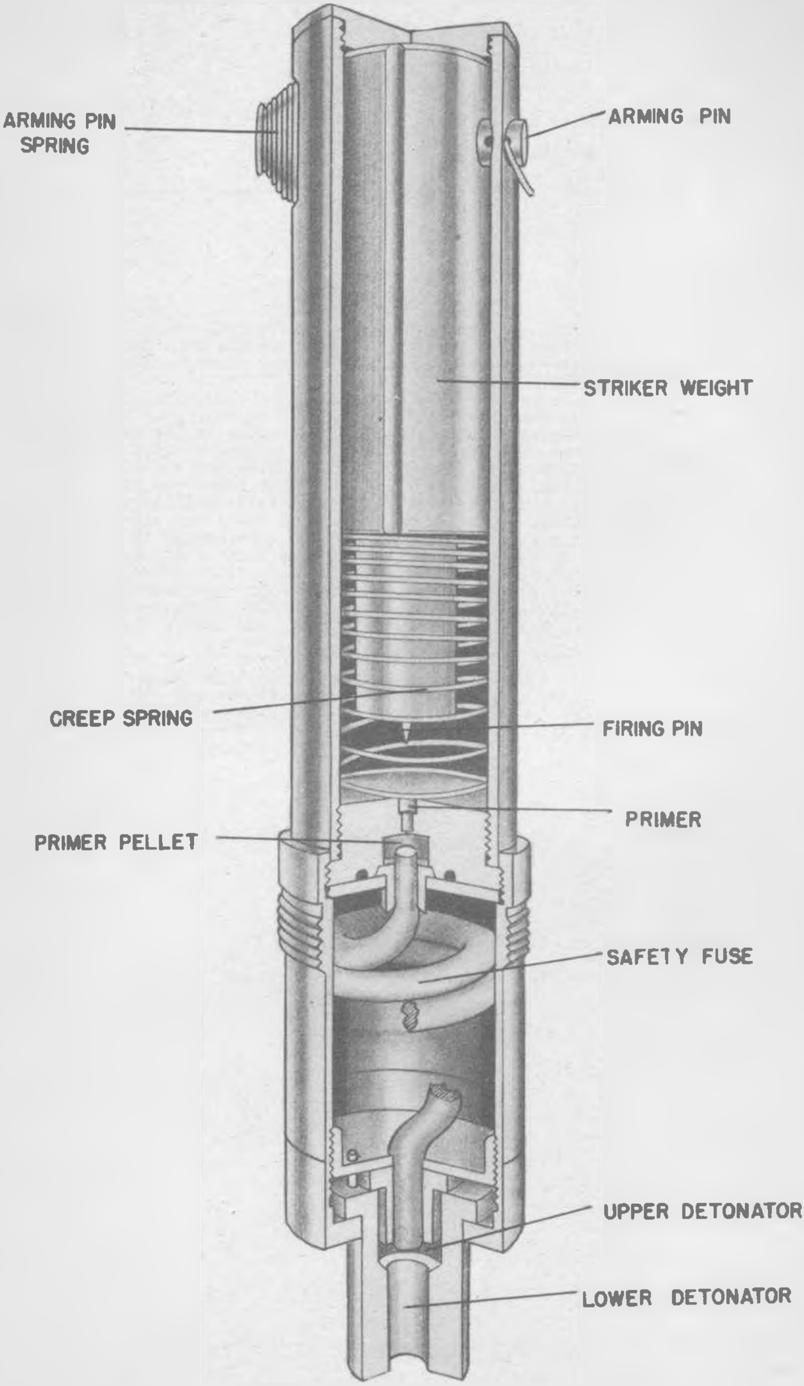
Data

BOMBS USED IN	Modified Mark H.E. bombs
FUNCTIONING	Instantaneous or .1 sec. delay alternative settings.
ARMED CONDITION	When safety discs are out.
FUZES USED WITH	M 106
ARMING TIME	450-460 vane revolutions
VANE SPAN	6"
MAX. BODY DIAMETER . .	2.7"
OVERALL LENGTH	4.3"
MATERIAL	Body, striker assembly, and safety discs are of cadmium plated steel. Gear train and arming vane hub is of brass. Detonator cup may be of brass or plated steel.

OPERATION: Upon release from the plane an arming wire is pulled to allow the vanes to rotate in the air stream. The reduction gear carries this rotation to the arming screw, which unthreads from the striker to lift the vane cap. After 450-460 vane revolutions, the cap will be lifted high enough to allow the spring loaded safety discs to be expelled from beneath the striker head. Additional rotation will cause the arming screw to thread out of the striker, allowing the arming mechanism to pull away from the bomb. Upon impact, the striker block is forced down, cutting the shear wire and forcing the two strikers against the firing assembly. If the setting pin is in the deep slot, the fuze is set for delay action and the striker point over the instantaneous channel merely protrudes into the empty recess with no effect; the delay cap being fired, setting off the delay and relay element, detonator, and bomb filler. If setting pin is in shallow slot, fuze is set for instantaneous action, and the instantaneous firing pin sets off the primer cap, detonator, and main filler, before the delay can function.

REMARKS: No. 4 primer caps are used to initiate both trains of explosive. The delay channel and detonator assembly are as follows: delay train of 0.32 grains of black powder, the relay charge of 1.47 grains of lead azide.

M 106 TAIL FUZE



R E S T R I C T E D

U. S. ARMY TAIL FUZE

M106A2

MECHANICAL IMPACT
PYROTECHNIC DELAY

Early Designs:
M 106
M 106A1
M 106 Long
(Obsolete)

Data

BOMBS USED IN . . . . . G.P.H.E. bombs

FUNCTIONING . . . . . 3-5 sec. (pyrotechnic)

ARMED CONDITION . . . . When arming pin is out.

FUZES USED WITH . . . . AN-M 103 or M 105, as an insurance fuze.

ARMING TIME . . . . . . Instantaneous

MAX. BODY DIAMETER . . 1.5"

OVERALL LENGTH . . . . 9.4"

MATERIAL . . . . . . Cadmium-plated steel except percussion cap housing, which is brass.

GENERAL: This fuze is dangerous to handle if the arming pin is out because it has a heavy striker and a weak creep spring. This fuze should never be used for horizontal, glide or dive bombing if there are any fuzes of the AN-M 100 series available. It should never be used for skip or masthead bombing if there are any fuzes of the M 112A1 or M 115 series available.

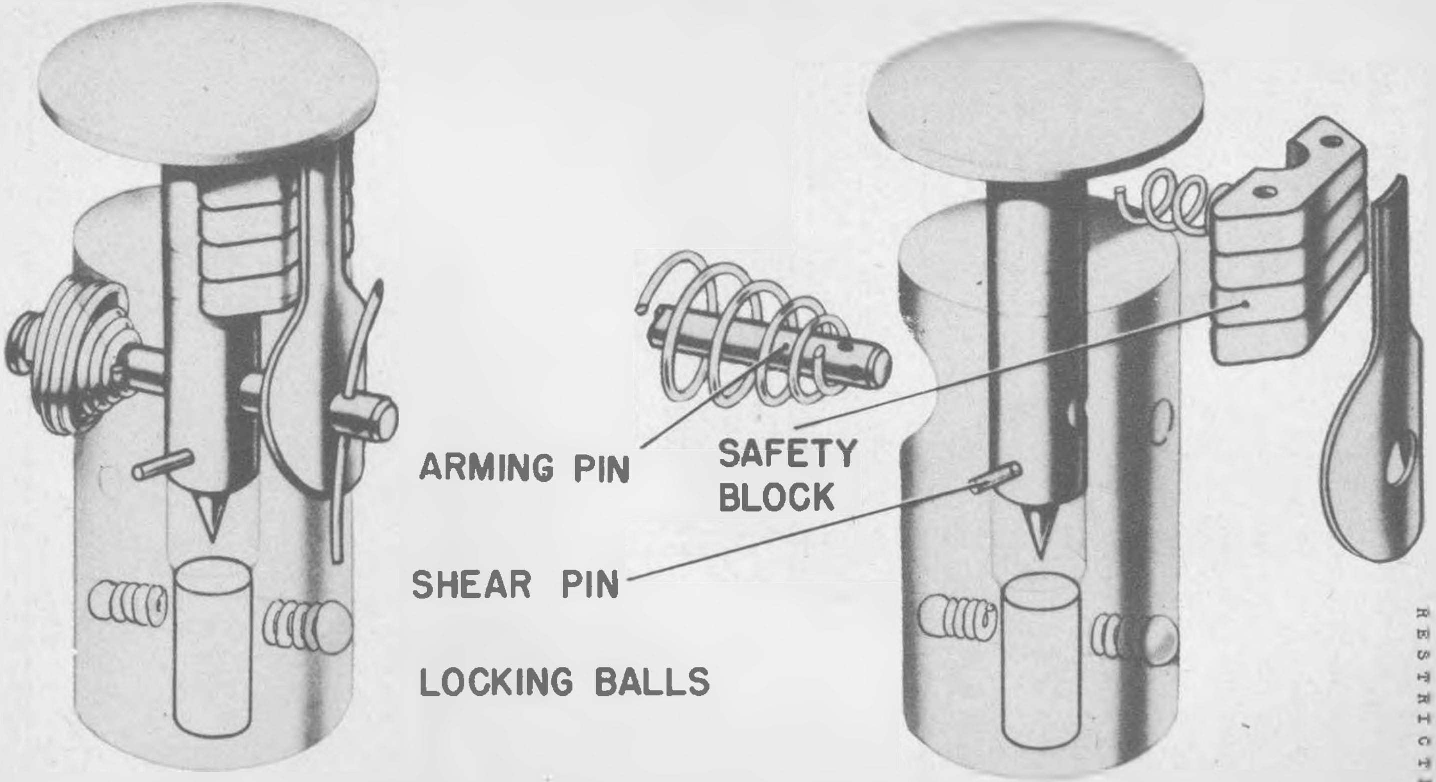
OPERATION: Upon withdrawal of the arming wire from the arming pin, the arming pin is ejected by its spring. The only thing preventing the heavy striker from impinging on the primer at this point is the weak creep spring. Upon impact, the striker block overcomes the creep spring, the firing pin impinging on the primer. The flame from the primer ignites the primer pellet, which in turn ignites the short length of safety fuze which is coiled in the fuze body. The opposite end of the safety fuze is primed with the detonator pellet of black powder which insures the functioning of the upper detonator and lower detonator when the safety fuze has burned its entire length.

EARLY DESIGNS: (1) The original M 106 had a longer coil of safety fuze, with a functioning time of 45-60 seconds.
(2) The M 106A1 had a reduced funtioning time of 8-11 seconds, for masthead bombing.
(3) M 106 long was used in the Modified Mark series 2000 lb. G.P. bomb, having an overall length of 31.3 inches.

REMARKS: If any of these fuzes are found in storage or elsewhere in an unarmed condition, they should be carefully checked to ascertain that the wire clip preventing the arming pin from being ejected by its spring is in good condition and not rusted or weak. Should this clip or wire rust through and give way, the arming pin would pop out, leaving the fuze in a dangerous armed condition.

BUREAU OF ORDNANCE HAS DECREED THAT ALL OF THESE FUZES ENCOUNTERED IN NAVAL ACTIVITIES BE DISPOSED OF BY DUMPING IN DEEP WATER.

M108 NOSE FUZE



RESTRICTED

U. S. ARMY NOSE FUZE

M 108

MECHANICAL IMPACT

(Obsolete)

Data

BOMBS USED IN: . . . . . M 75 Target Identification.

FUNCTIONING . . . . . Instantaneous

ARMED CONDITION . . . . When safety block is gone.

FUZES USED WITH . . . . None

ARMING TIME . . . . . Instantaneous

MAX. BODY DIAMETER . . 1.3"

OVERALL LENGTH . . . . . 2.6"

MATERIAL . . . . Brass fuze body with cadmium or zinc plated steel striker.

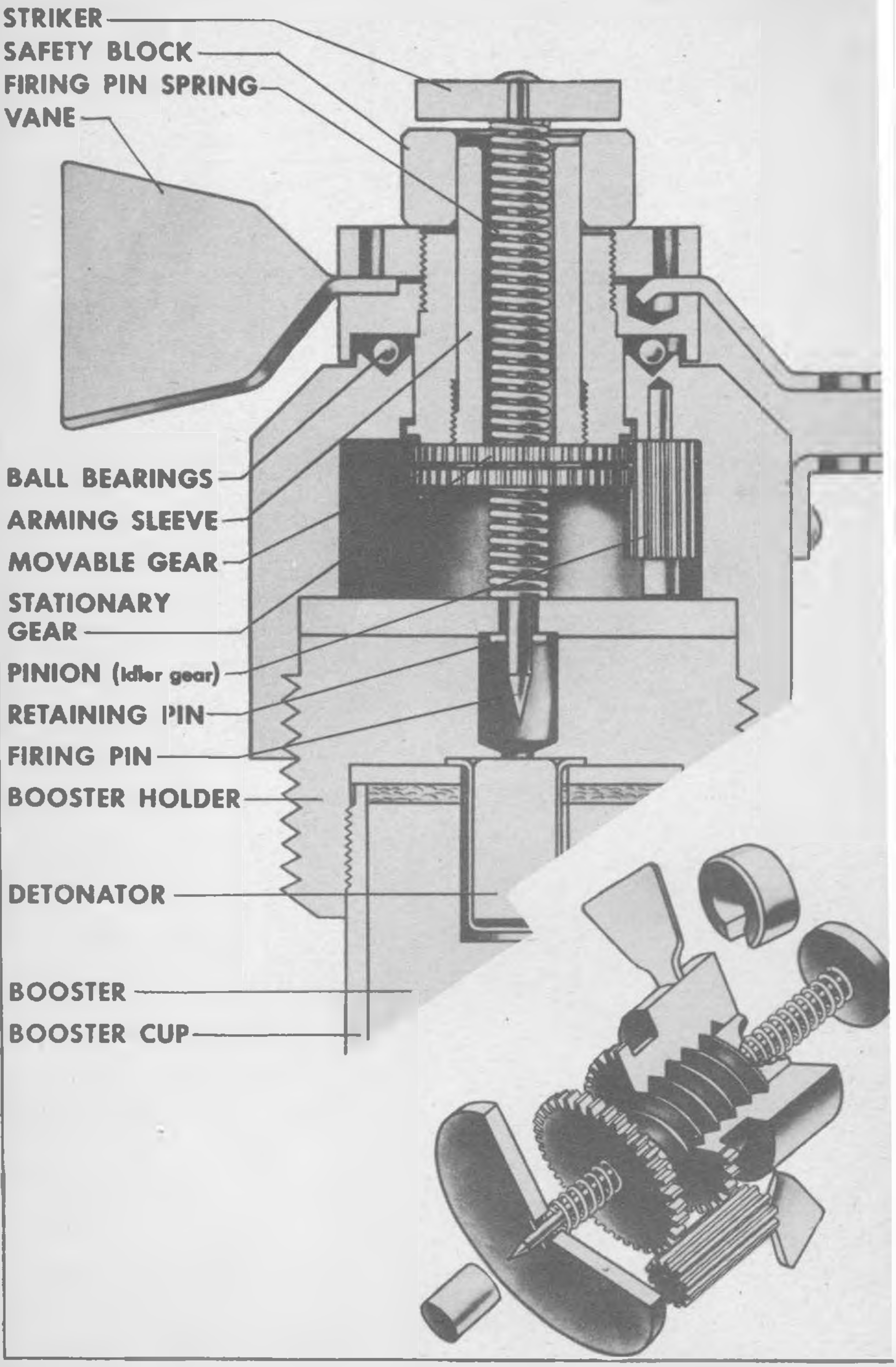
GENERAL: This fuze is not threaded into the bomb nose, but is pushed down and held there by two spring loaded retaining balls which protrude from the side of the fuze. The fuze requires an adapter ring having an annular groove to receive the retaining balls.

OPERATION: When the arming wire is withdrawn from the arming pin as the bomb is dropped, the arming pin is ejected from the fuze by the action of the arming pin spring. The safety block holder then falls free of the fuze, and the safety block is ejected clear of the fuze and striker by its spring. On impact, the striker is driven into the fuze body, cutting the shear wire and impinging on the primer, setting off the upper detonator, and lower detonator successively.

EARLY DESIGN: The early M 108 did not have a safety block inserted between the striker head and fuze body, and was quite dangerous as a drop of only a few inches on a hard surface was enough to function the fuze. The M 108 Modified is shipped with the safety block as shown in drawing.

REMARKS: This fuze was designed for use in the M 47 100 lb. Incendiary. It is being replaced by the AN-M 126A1 in all bombs except the M 75 Target Identification bomb.

AN-M110A1 NOSE IMPACT FUZE



AN-M110A1
AN-M126A1

(Service)
M110 (Obsolete)
M126 (Obsolescen.)

MECHANICAL IMPACT

Data

BOMBS USED IN:
AN-M110A1 . . . . . . 20 lb. AN-M41A1 Hi-Level Frag.
115 lb. M70 Chemical bomb
AN-M126A1 . . . . . . 100 lb. AN-M47A2 Chemical bomb.

FUNCTIONING . . . . . . Instantaneous

ARMED CONDITION . . . . When safety block is gone.

FUZES USED WITH . . . . None

ARMING TIME . . . . . . 260 vane revolutions

VANE SPAN . . . . 3.0"

MAX. BODY DIAMETER . . 1.7"

OVERALL LENGTH . . . . AN-M110A1, 3-5/8" with booster.
AN-M126A1, 3-1/16" with booster housing.

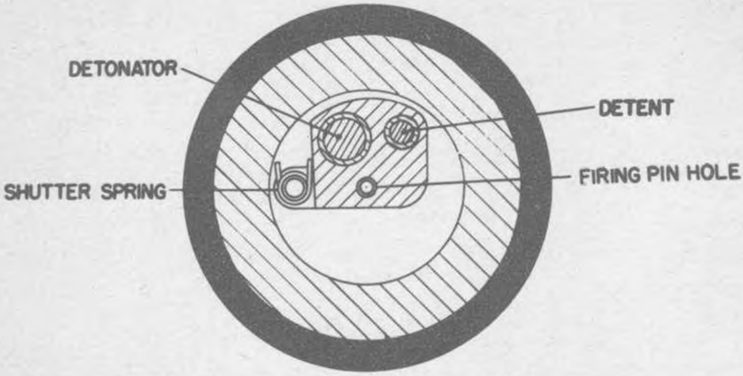
MATERIAL . . . . Aluminum body with steel safety blocks and striker.

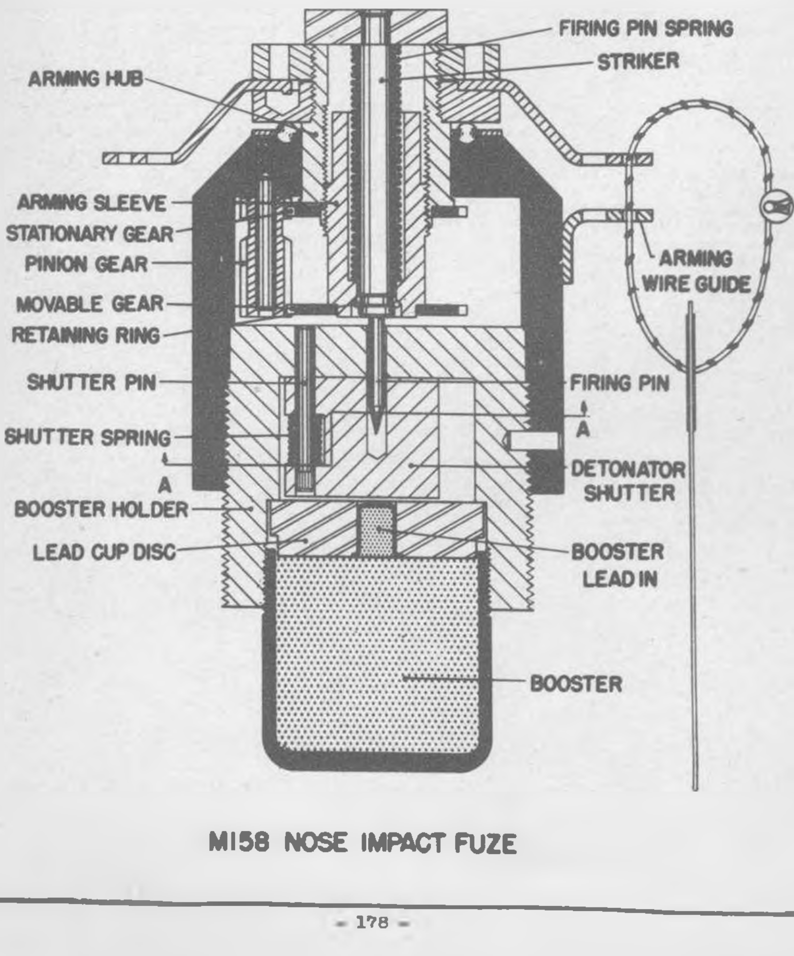
GENERAL: These two fuzes are identical in both construction and operation. The only difference is that the booster is eliminated from the AN-M126A1. Instead of the booster, a steel cylinder, the same dimensions as the booster, is screwed into the base of the fuze body. This steel cylinder contains an enlarged firing train consisting of primer, upper detonator and lower detonator, which is seated against the tetryl burster of the chemical bombs.

OPERATION: When the bomb is dropped and arming wire pulled, vanes rotate. The vanes are positively attached to the upper part of the stationary gear, which can rotate but cannot move in a vertical plane because of a collar which rides in a groove in the fuze body. As the vanes and stationary gear rotate about the ball race, the movable gear, which is threaded up inside the stationary gear also rotates. Both gears mesh with an idler gear, and since the movable gear has one more tooth than the stationary gear, for each rotation the movable gear lags one tooth, thus unscrewing downward from the stationary gear. As the sleeve of the movable gear moves down, it releases the safety block, allowing the block to be expelled by centrifugal force. The sleeve is moved down far enough in 260 rotations of the vanes to arm the fuze. On impact the striker is driven down, overcoming the resistance of the firing pin spring and the firing pin initiates the explosive action instantaneously.

REMARKS: The original designs, M110 and M126, had more teeth on the gears, and consequently required 570 vane revolutions to arm. They also had three safety blocks, each 120° segments, and the arming sleeve fitted in a groove in the blocks in the unarmed position, preventing them from falling out. The original designs also had larger vanes.

If the striker head is flush with the fuze body, the fuze is in a fired condition. In such condition, the striker should not be pulled away from the fuze, as the firing pin is sensitive and withdrawal might create sufficient friction to ignite the primer.





M158 NOSE IMPACT FUZE

RESTRICTED

BOMBS USED IN:
- M 158 . . . . AN-M41A1 20 lb. Frag.; M 70 115 lb. Chemical
- M 159 . . . . AN-M47A2 100 lb. Chem.

FUNCTIONING . . . . Instantaneous
ARMED CONDITION . . . . . When striker protrudes .25 in. beyond vane nut (See Remarks).
FUZES USED WITH . . . . . None
ARMING DATA . . . . . . 440 vane revolutions; 1000' of air travel.
VANE SPAN . . . . 3.0 in.
MAX. BODY DIAMETER . . . 1.752 in.
OVERALL LENGTH:
- M 158 . . . . 3.69 in.
- M 159 . . . . 3.22 in.

MATERIAL . . . . Aluminum body with steel safety blocks and striker.

U. S. ARMY NOSE FUZES

M158 M159

(T70) (T70E1)

MECHANICAL IMPACT NOSE FUZE

GENERAL: These fuzes are similar to the AN-M110A1 and AN-M126A1. They differ in that the M 158 and M 159 have a spring actuated detonator shutter which rotates into position after withdrawal of the firing pin and is locked in place by a spring-loaded detent. In addition the arming sleeve, striker, and firing pin move upward instead of downward, and the vanes rotate freely after arming. There is no safety block in the newer series and, the striker assembly which is of heavier construction, has a retaining ring instead of a retaining pin.

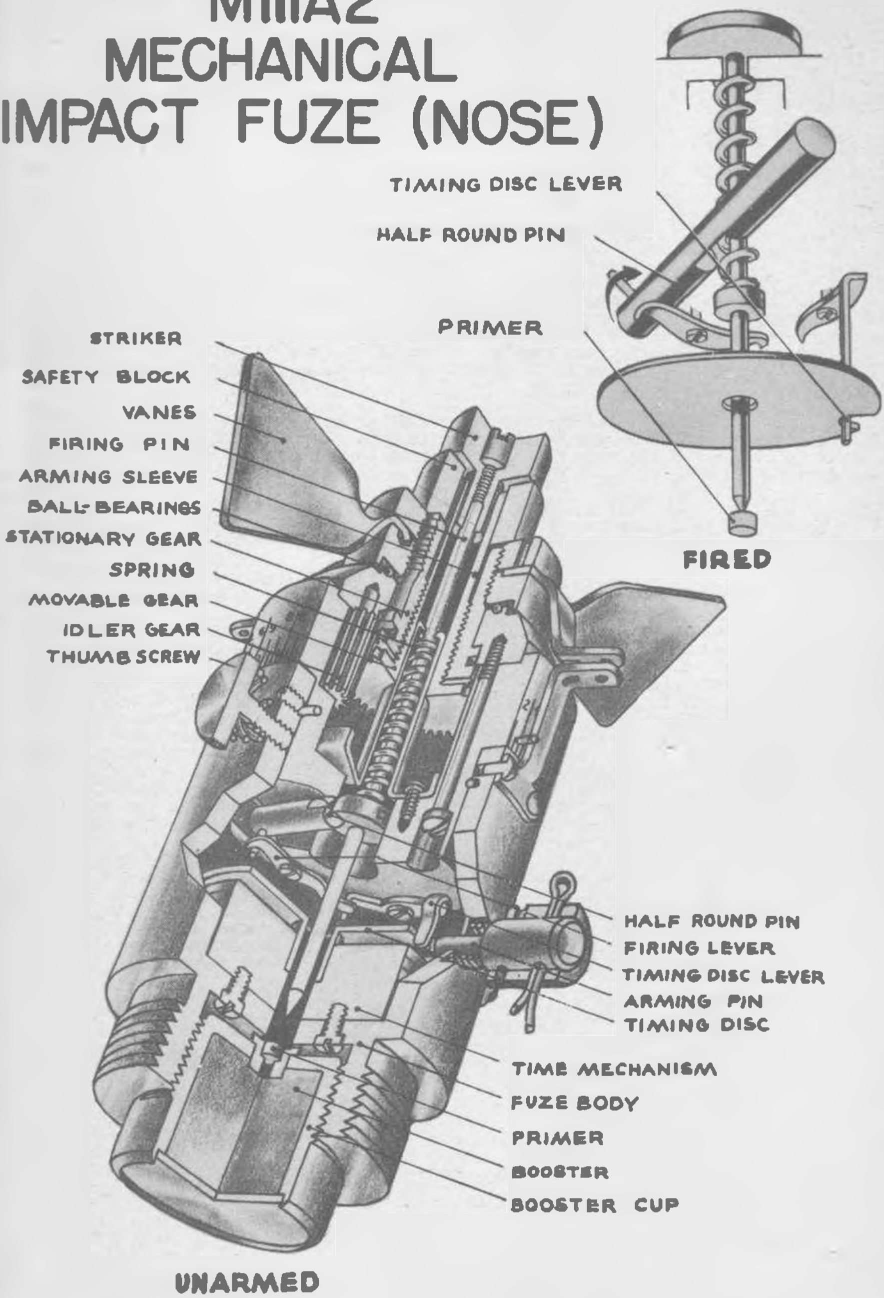
These two fuzes are similar in appearance, except that the M 158 incorporates a booster and booster lead in, whereas the M 159 incorporates a detonator holder. The M 159 also has two arming wire guides to facilitate positioning of the arming wire.

The M 158 differs from AN-M110A1 in that the body and booster holder are held together by a locking pin, has the detonator in the shutter, a booster lead in mounted in the lead cup disc, and a booster below the lead cup disc.

OPERATION: When the bomb is dropped and the arming wire pulled, the vanes rotate. The arming vane, nut, outer ball race, arming hub and stationary gear rotate as a unit, but cannot move in a vertical plane because of a collar on the arming hub. The movable and stationary gears mesh with the pinion gear (idler gear) and since the movable gear has one more tooth than the stationary gear, for each rotation the movable gear lags one tooth, thus screwing upward (right hand threads) and toward the stationary gear. As the movable gear moves up, it lifts the striker and withdraws the firing pin from the hole in the detonator shutter. (Retaining ring in striker groove and under arming sleeve bevel enables simultaneous movement upward). After approximately 440 revolutions of the vanes, the firing pin is completely withdrawn from the detonator shutter and the detonator shutter is swung into position lining up the detonator with the firing pin, thus arming the fuze. The detonator shutter is locked in position by a spring-loaded detent housed in the shutter which slips into a recess in the booster holder. The vanes continue to rotate, and when the movable gear reaches the cut-out portion in the pinion gear the vanes rotate freely. On impact, the striker with its firing pin are forced down, compressing the firing pin spring and piercing the detonator. The detonator sets off the booster lead in and booster successively.

REMARKS: In the armed condition, the striker will protrude about .25 in. beyond the vane nut, but any fuze in which the gap between the underside of the striker and the face of the vane nut exceeds .125 in. should be treated as armed.

MIIIA2 MECHANICAL IMPACT FUZE (NOSE)



RESTRICTED

U. S. ARMY NOSE FUZES

M111A2, M127, M138

(Service)

CLOCKWORK AERIAL BURST

Data

BOMBS USED IN:
- M 111A2 . . . . . . AN-M26 Parachute Flare; AN-M46 Photoflash Bomb; Fragmentation Cluster Adapters M15 and M16
- M 127 . . . . . . Incendiary Cluster Adapter M10A1
- M 138 . . . . . . Incendiary Cluster Adapter E6R2

FUNCTIONING . . . . . Aerial Burst, 5-92 sec., or impact instantaneous
ARMED CONDITION . . . When safety block and arming pin are both out.
FUZES USED WITH . . . None
ARMING TIME . . . . Approximately 260 revolutions
VANE SPAN . . . . . 3 in.
MAX. BODY DIAMETER. . 1.63 in.
OVERALL LENGTH . . . M 111A2 - 4.5 in.; M 127, M 138 - 4.95 in.
MATERIAL . . . . . Aluminum alloy body with zinc or cadmium plated steel striker.

GENERAL: The M 127 fuze is found by assembling the booster and detonator assembly from an AN-M 110A1 fuze to a M 111A2 fuze body. The result is a mechanical time fuze with an 18 gram tetryl booster instead of a black powder booster such as in the M 111A2. The M 138 fuze is the same as the M 127 except that the M 138 has only 7 grams of tetryl, the balance of the space being taken up by an inert clay pellet. (M 127 booster was too powerful for E6R2 cluster adapter and damaged the bombs in the cluster, hence reduction of tetryl).

OPERATION: The desired time interval is set on the graduated scale and the locking screw tightened. Upon release of the cluster or Flare from the plane, the arming wire is withdrawn from the fuze, the vanes are free to rotate and the arming pin jumps out. The arming vane, nut, outer ball race, arming hub and stationary gear rotate as a unit. As the vanes and stationary gear rotate on the ball race, the idler gear is rotated, thus rotating the movable gear and the arming sleeve to which it is attached. The arming sleeve is threaded into the arming hub and extends inside the safety block. Since the movable gear has one more tooth than the stationary gear, it lags one tooth on every rotation and gradually unscrews downward. After approximately 260 vane revolutions, the arming sleeve has unthreaded far enough to be withdrawn from the safety block, which is then thrown clear by centrifugal force. The timing disc, meanwhile, has been rotated by the spring-driven clockwork. After the predetermined time has elapsed, the slot in the timing disc will be positioned opposite the timing disc lever. Through a series of levers, pressure forces this timing disc lever into the slot thus freeing the firing lever. Since the half round pin is no longer retained by the firing lever, it is free to rotate under the pressure of the spring-loaded firing pin, a collar on the firing pin bearing on one side of the notch in the half round pin. As the half round pin rotates, the firing pin is released and impinges on the primer, firing the booster.

If the timing mechanism should fail, the fuze would still detonate on impact, because the striker would be forced down and would shear any obstruction between it and the primer.

EARLY DESIGNS: Original M 111 had setting range of from 15-93 sec., and because of greater number of teeth on gears required 570 vane revolutions to arm.

M 111A1 reduced minimum setting time on the scale from 15 to 5 seconds, however could not be set for less than 8 seconds, since if set for less, the clockwork functioned before the fuze was armed, and the firing pin spring pulled the striker down tightly against the safety blocks stopping the rotation of the vanes, thus preventing aerial burst. Both of these early designs had three 120° section safety blocks with a groove which received the arming sleeve of the movable gear. They also had weaker gears with more teeth and larger, weaker vanes.

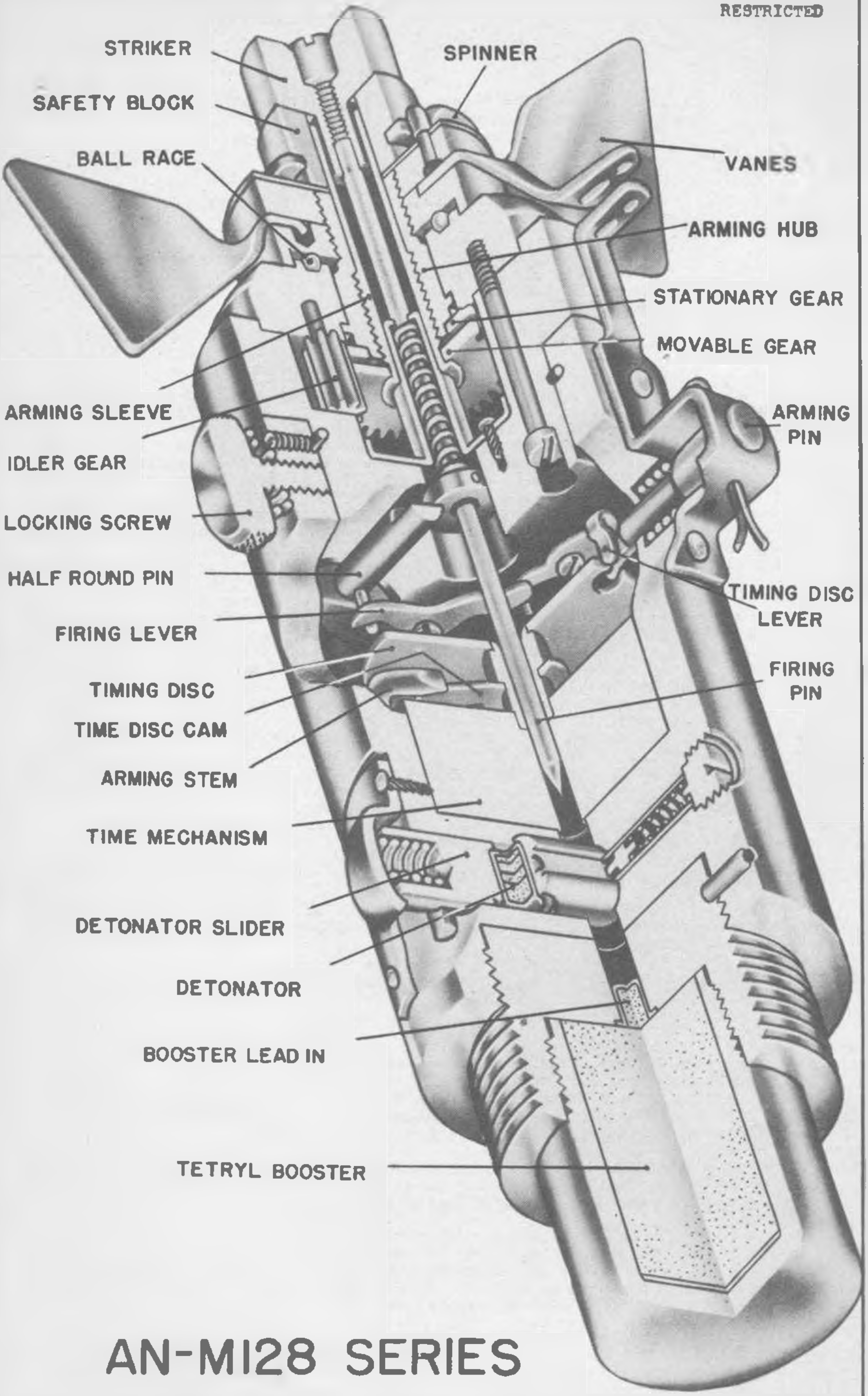
REMARKS: M 111A2 booster contains 70 grains of black powder.

Neither the M 127 nor the M 138 should be assembled to their respective clusters, until the cluster has been locked in place in the bomb rack.

The M 127 is being replaced by the M 128; the M 138 is being replaced by the M 145; the M 111A2 is being replaced by the M 146. (See page 183)

These fuzes are equipped with a spinner device (See page 182) to force the safety block to rotate with the arming vane and insure positive ejection of the safety block after the arming sleeve has withdrawn. (Only later lots of M 111A2 are equipped with spinner device).

In order to insure correct rotation of the arming vane of the M111A2 when used in the M26 cluster, the fuze has been modified by replacing the standard vane by an anemometer type vane. When so altered, the fuze will be known as the T77. This change will be made in the field with kits supplied by the Army.



AN-M128 SERIES MECHANICAL TIME FUZE (NOSE)

AN-M128, AN-M145
AN-M146, AN-M147

(Service)

CLOCKWORK AERIAL BURST

Data

BOMBS USED IN:	
AN-M128.	Cluster, Aimable Incendiary AN-M17A1
AN-M145.	Cluster Adapter, Aimable Incendiary E6R2
AN-M146.	Flares and photoflash, and butterfly bomb cluster M28 and M29,M89,90,98 T.I.B
AN-M147.	M84 Target Identification bomb; AN-M47A2,A 3 Incend.
FUNCTIONING.	Aerial Burst, 5-92 sec.; or impact instantaneous if slider aligned.
ARMED CONDITION. . . .	When safety collar and arming pin are both out, and detonator is aligned under firing pin.
FUZES USED WITH. . . .	None for M128, M146 and M147; M152 or M153 used with M145.
ARMING TIME	Approximately 260 vane revolutions.
VANE SPAN	3 in.
MAX. BODY DIAMETER . .	1.93 in.
OVERALL LENGTH	AN-M128,AN-M145 - 6.2 in; AN-M146 - 5.67 in; AN-M147 - 5.72 in.
MATERIAL	Aluminum alloy body with zinc or cadmium plated steel striker.

GENERAL: These fuzes modify the M111A2 by the addition of a detonator slider held out of line until the fuze is partially armed by a crank-shaped arming stem. The four fuzes in the series are identical except for the boosters employed; the AN-M128 has the booster of the M127 (tetryl); the AN-M145 uses that of the M138 (tetryl-clay pellet); the AN-M146 employs that of the M111A2 (black powder); and the AN-M147 uses the AN-M126A1 primer detonator instead of a booster.

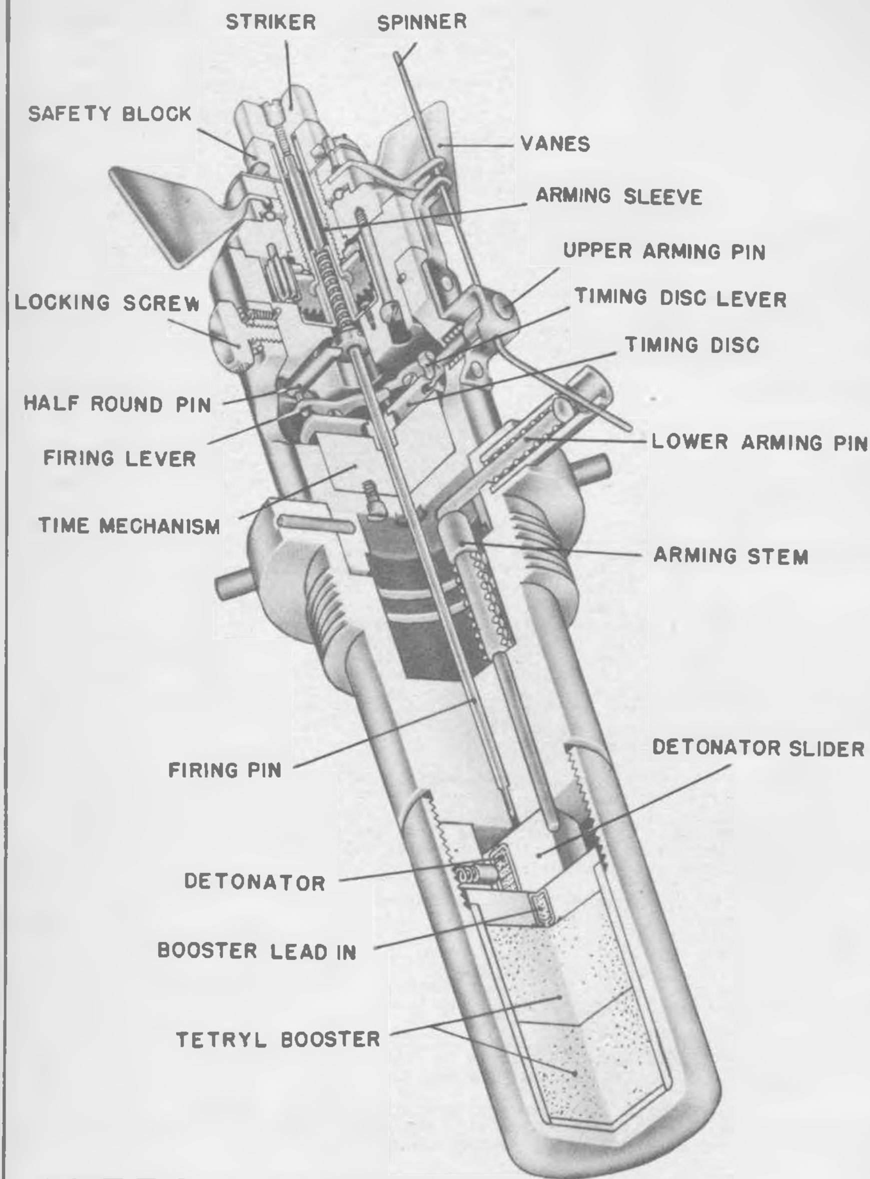
OPERATION: The desired time interval is set on the graduated scale and the locking screw tightened. Upon release of the cluster from the plane, the arming wire is withdrawn from the fuze, the vanes are free to rotate and the arming pin jumps out. The arming vane, nut, outer ball race, arming hub and stationary gear rotate as a unit. As the vanes and stationary gear rotate on the ball race, the idler gear is rotated, thus rotating the movable gear and the arming sleeve to which it is attached. The arming sleeve is threaded into the arming hub and extends inside the safety block. Since the movable gear has one more tooth than the stationary gear, it lags one tooth on every rotation and gradually unscrews downward. After approximately 260 vane revolutions, the arming sleeve has unthreaded far enough to be withdrawn from the safety block, which is then thrown clear by centrifugal force.

The timing disc, meanwhile, has been rotated by the spring driven clockwork. After approximately four seconds of rotation, the release arm located below the timing disc (and turning with it), frees the crank-shaped end of the arming stem. The lower end of the arming stem then presents its cut-away section to the detonator slider which will then align itself below the firing pin and become locked in place there by a spring loaded detent.

When the detonator is aligned, the timing disc continues to turn. After the predetermined time has elapsed, the slot in the timing disc will be positioned opposite the timing disc lever. Through a series of levers, pressure forces this timing disc lever into the slot thus freeing the firing lever. This in turn frees the half round cocking pin which is forced to rotate under pressure of the spring loaded firing pin. As the half round cocking pin rotates, the firing pin is released and impinges on the primer, firing the booster.

REMARKS: The AN-M128 replaces the M127; AN-M145 replaces the M138; AN-M146 replaces the M111A2.

These fuzes are equipped with a spinner device (see opposite page) to force the safety block to rotate with the arming vane - this assures positive ejection of the safety block after the arming sleeve has withdrawn.



M135A1, M136A1
MECHANICAL TIME FUZE (NOSE)

RESTRICTED

U. S. ARMY NOSE FUZE

M135, M136
M135A1, M136A1

CLOCKWORK AERIAL BURST

Data

BOMBS USED IN.	All G.P. Bombs and AN-M56 4000 lb. L.C. May be found in 90 lb. 260 lb. Frag., 500 lb. and 1000 lb Chemical.
FUNCTIONING	M135 - Aerial Burst, with time range of 5 - 92 secs. M136 - Aerial Burst, with time range of 5 - 30.6 secs. Both will function on impact.
ARMED CONDITION . . .	When safety block, arming pin, and lower arming pin are out.
FUZES USED WITH . . .	None normally, unless N-M100A2 series is used (with non-delay M14 primer detona or) for insurance purposes.
ARMING TIME	Approximately 260 revolutions.
VANE SPAN	3.6 in.
MAX. BODY DIAMETER . .	2.7 in.
OVERALL LENGTH	9.1 in.
MATERIAL	Upper part of body is aluminum alloy; lower part cadmium plated steel.

GENERAL:

These fuzes are a combination of the M111A2 mechanical time fuze and the AN-M103 nose fuze, in which the former fuze has been assembled to a modified body and booster portion of the AN-M103 fuze. The setting pin of the AN-M103 has been removed and in its place the spring loaded lower arming pin has been inserted. The lower arming pin holds the detonator carrier out of line with the firing train until the arming wire is pulled.

The M135 incorporates a time setting which can be adjusted to the nearest .1 second, and the fuze will fire accurately within plus or minus one (1) second; time calibrations are made for every 1/2 second, with a 10 division vernier scale located on the non-rotating part of the fuze for setting to the nearest .1 of a second.

The M136 incorporates a time setting which can be adjusted to a .2 of a second, and the fuze will fire accurately within plus or minus .3 seconds. The greater accuracy of the M136 is achieved by an improved clockwork mechanism. This fuze was developed to provide greater accuracy, presupposing that a method can be devised for accurately measuring the altitude of release.

OPERATION:

Prior to loading the fuzed bomb into the plane, the time setting is made and the time set screw tightened. The arming wire is withdrawn as the bomb is dropped and the vanes start to rotate. The arming pin is ejected and the time mechanism starts to operate, the lower arming pin being simultaneously ejected, allowing the spring loaded detonator carrier to move over into the armed position. After approximately 750 feet of air travel, the safety block is released from the fuze (see Operation of M111A2, page 181 for details on functioning). After the set time has expired, the firing pin will be freed and its spring will force it into the primer and detonate the bomb.

The bomb may detonate if it strikes a target prior to complete functioning of the time mechanism, provided the arming wire has been withdrawn, in which case the firing pin would shear the rather delicate levers obstructing it.

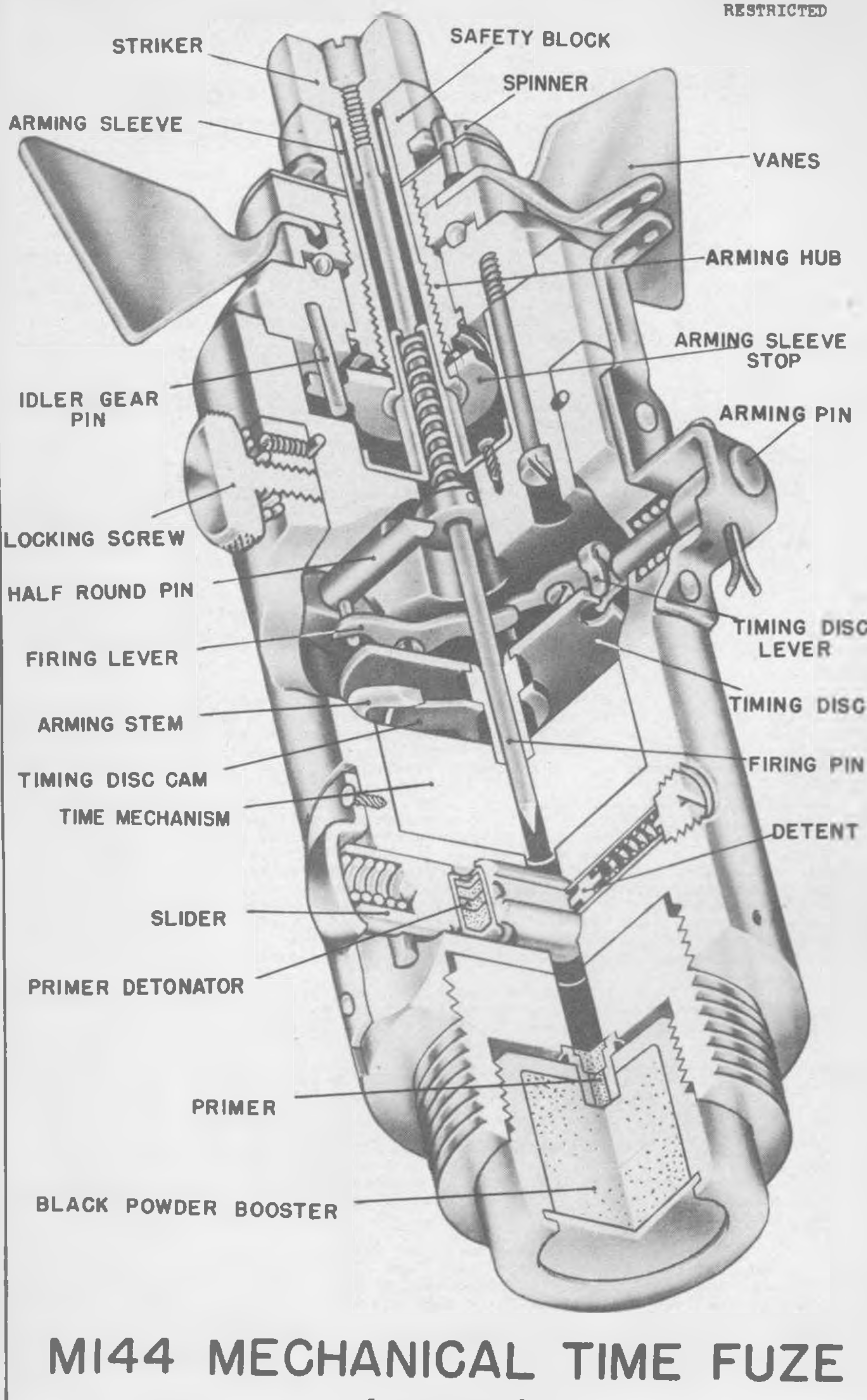
REMARKS:

Effective use of these fuzes in G.P. bombs presupposes that a method can be devised for accurately measuring the altitude of release.

The round knurled locking screw has been replaced in current production with a wing nut type, and replacement wing nuts are being sent to the field. This change was made so that ordnance personnel can get a good grip on the nut and eliminate the possibility that the setting might slip, and cause either premature or late functioning.

The M135A1 and the M136A1 fuzes are the same as the M135 and the M136 except that they incorporate a lower time limit of 10 seconds instead of 5 seconds. The minimum setting time was increased to prevent any possibility of damage to the plane by the bomb fragments. The M135A1 and the M136A1 will replace the M135 and the M136 respectively when available. It is recommended that a minimum setting of 10 seconds be used for all M135 and M136 fuzes now in the field.

These fuzes are not procured for Naval use.



M144 MECHANICAL TIME FUZE (NOSE)

RESTRICTED

U. S. ARMY FUZE

M144

CLOCKWORK AERIAL BURST

Data

BOMBS USED IN.	M89, M90, M98 250 lb. Target Identification bombs
FUNCTIONING.	Aerial Burst, 1.6 - 30.6 secs., or impact instantaneous if slider aligned.
ARMED CONDITION. . . .	When safety collar and arming pin are both out, and detonator is aligned under firing pin.
FUZES USED WITH. . . .	None
ARMING TIME.	Approx. 6-9 vane revolutions.
VANE SPAN.	3 in.
MAX. BODY DIAMETER . .	1.93 in.
OVERALL LENGTH	5.67 in.
MATERIAL	Aluminum alloy body with zinc or cadmium plated steel striker.

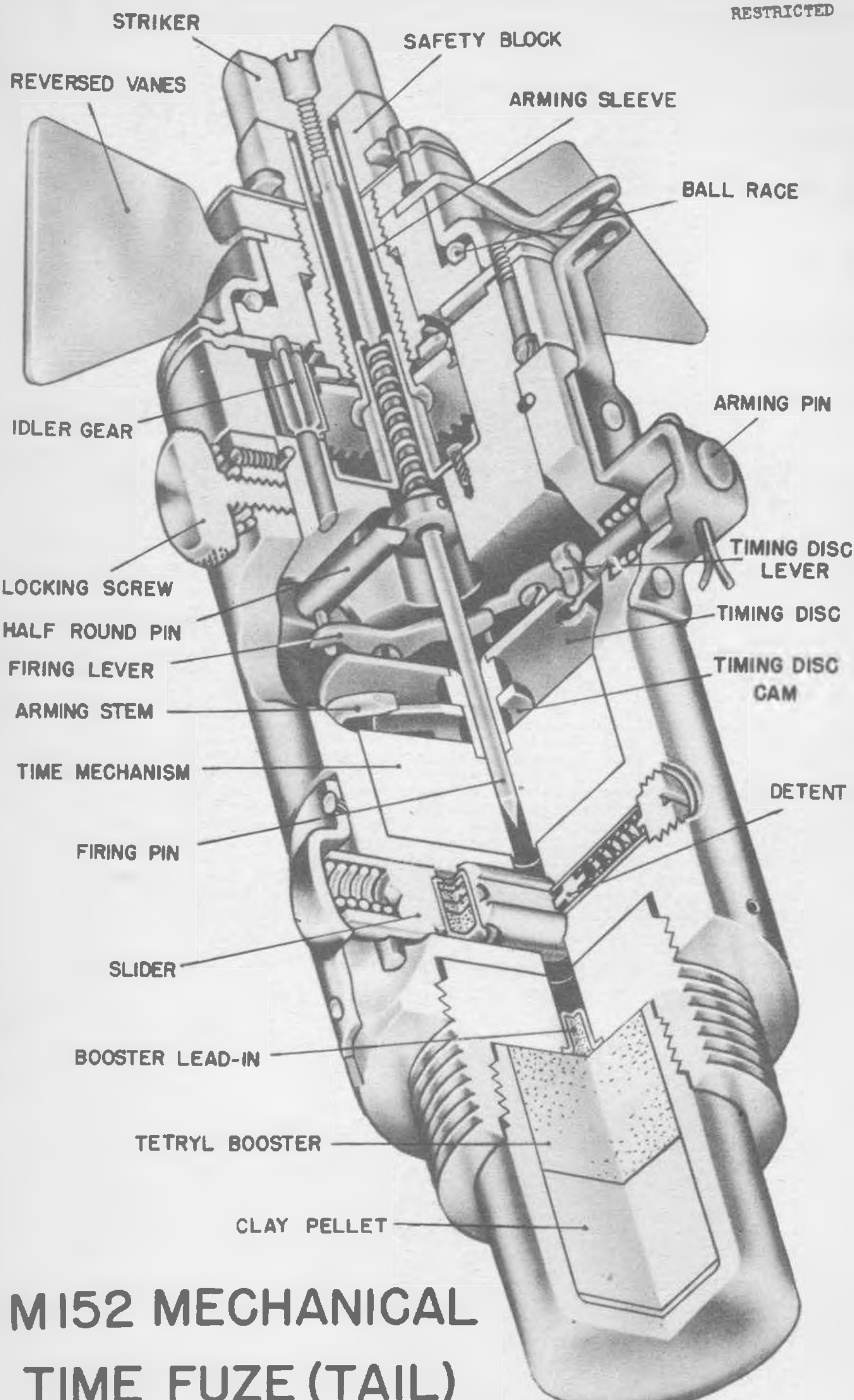
GENERAL: The M144 is similar to the M146 described on p. 183, except for the following:

Direct drive, instead of gear reduction arming, results in ejection of the safety block after approximately 6-9 turns of the arming vane. The direct drive involves the removal of the stationary gear from the arming hub, the movable gear from the arming sleeve, and the idler gear from the pin. The arming sleeve stop plate fixed to the bottom of the arming sleeve has a fork which engages the pinion gear pin and prevents the arming sleeve from rotating. This change was made to ensure that the safety block is ejected in less than the mechanical functioning time of the fuze.

In addition, the M144 incorporates a clock mechanism which runs 3 times as fast as the M146 clock mechanism. This results in a minimum setting of 1.6 seconds (instead of 5), a maximum setting of 30.6 seconds (instead of 92), and a slider arming time of 1.5 ± .5 seconds (instead of 4.5 ± 1.5). Because of the shorter running time the clockwork is more accurate in the M144.

OPERATION: Upon release of the bomb the arming wire is withdrawn from the fuze, the vanes are free to rotate and the arming pin jumps out. The vanes are positively attached to the arming hub and rotate as one unit. The arming sleeve, which is threaded to the arming hub, is prevented from rotating since the stop plate attached to it engages the idler gear pin. However, the arming sleeve moves down due to rotation of the arming hub, and after approximately 6 to 9 vane revolutions the arming sleeve has withdrawn far enough for the safety collar to be thrown clear by centrifugal force. The timing disc, meanwhile, has been rotated by the spring-driven clockwork. After 1.5 ± .5 seconds of rotation, the timing disc cam, located below the timing disc (and turning with it), frees the crank-shaped end of the arming stem. Balance of operation same as M146 fuze, page 185.

This fuze is not procured for Navy use.



M152 MECHANICAL TIME FUZE (TAIL)

RESTRICTED

U. S. ARMY FUZE

M152, M153

M152 (Service)

MECHANICAL TIME, AERIAL BURST

Data

BOMBS USED IN.	M23 Incendiary Cluster Adapter
FUNCTIONING.	Aerial Burst, 5-92 sec.; or impact instantaneous if slider aligned.
ARMED CONDITION. . . .	When safety collar and arming pin are both out, and detonator is aligned under firing pin.
FUZES USED WITH. . . .	M145 nose fuze.
ARMING TIME	Approximately 260 vane revolutions.
VANE SPAN	3 in.
MAX. BODY DIAMETER . .	1.93 in.
OVERALL LENGTH	6.2 in.
MATERIAL	Aluminum alloy body with zinc or cadmium plated steel striker.

GENERAL:

The M152 is the same as the M145 described on p. 183, except for the following:

The M152 has reversed vanes so that it will properly arm as a tail fuze. In addition a change was made in the construction of the thrust bearing for the arming vane assembly, to insure free rotation with the reversed thrust direction of a tail fuze as compared with a nose fuze. (See drawing on opposite page).

The M153 is the same as the M145 except that the vanes are reversed so that it will properly arm as a tail fuze. The vanes of the M152 and M153 are painted red to distinguish them from nose fuzes.

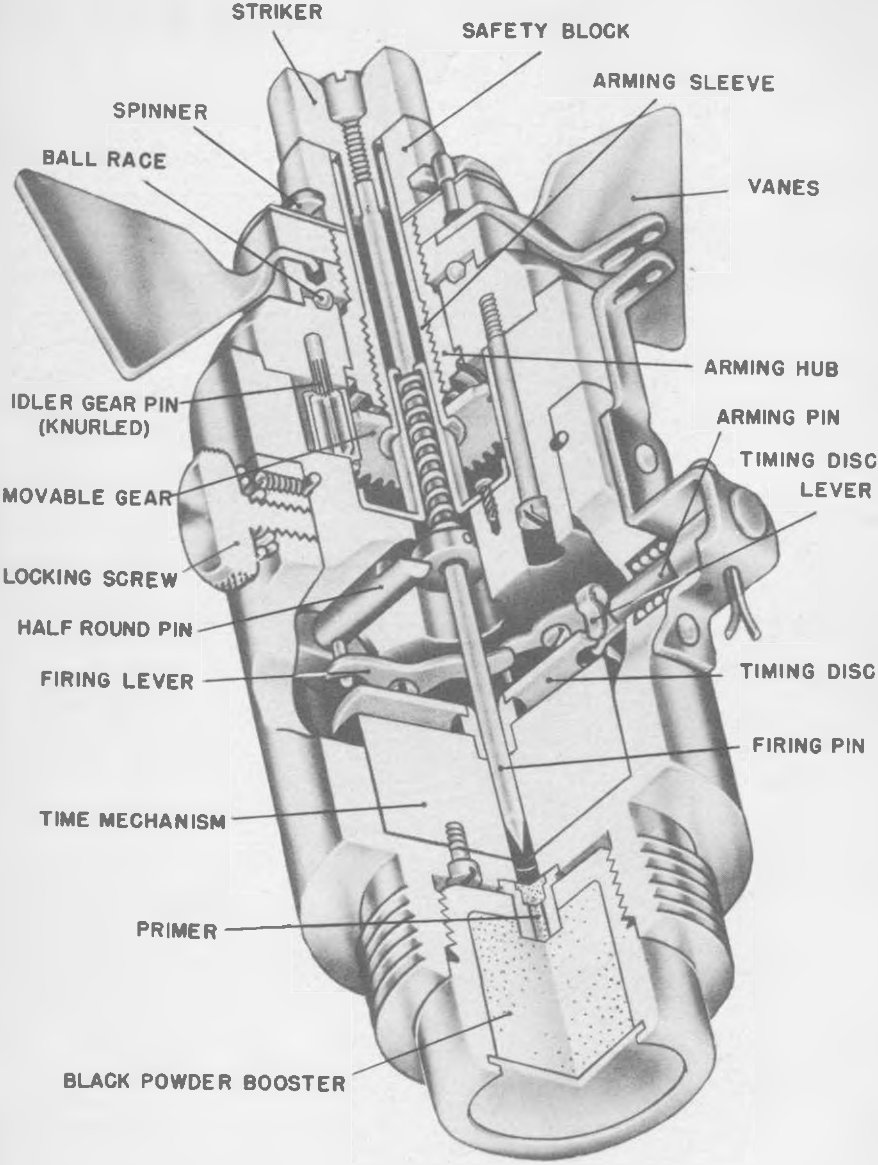
OPERATION:

The operation of both these fuzes is the same as the M145 on p. 183.

REMARKS:

The M152 will replace the M153. The M153 fuze is being manufactured to provide tail fuzes to meet requirements pending availability of the M152.

The M153 is not procured for Naval use.



M155

MECHANICAL TIME FUZE (NOSE)

RESTRICTED

U. S. ARMY NOSE FUZE

M155

CLOCKWORK AERIAL BURST

BOMBS USED IN . . . . . M26 Cluster (20 - AN-M41, 20# Frag. Bombs).
M27 Cluster (6 - M82, 90# Frag. Bombs).
M15,M16 Frag. Clus. Adapters

FUNCTIONING . . . . . Aerial burst, 5 - 92 secs. or impact instantaneous.

ARMED CONDITION . . . . When safety block and arming pin are both out.

FUZES USED WITH . . . . None

ARMING TIME . . . . . Approximately 6 - 9 vane revolutions.

VANE SPAN . . . . 3 in.

MAX. BODY DIAMETER. . . 1.63 in.

OVERALL LENGTH . . . . 4.5 in.

MATERIAL . . . . Aluminum alloy body with zinc or cadmium plated steel striker.

GENERAL: The M 155 (formerly the T71) is the same as the M 111A2 except that the gear reduction system has been eliminated. A spinner device is incorporated to force the safety block to rotate with the arming vane. Elimination of the gear reduction system has been accomplished by removing the stationary gear from the arming hub, and pinning the pinion gear in place so that it cannot rotate.

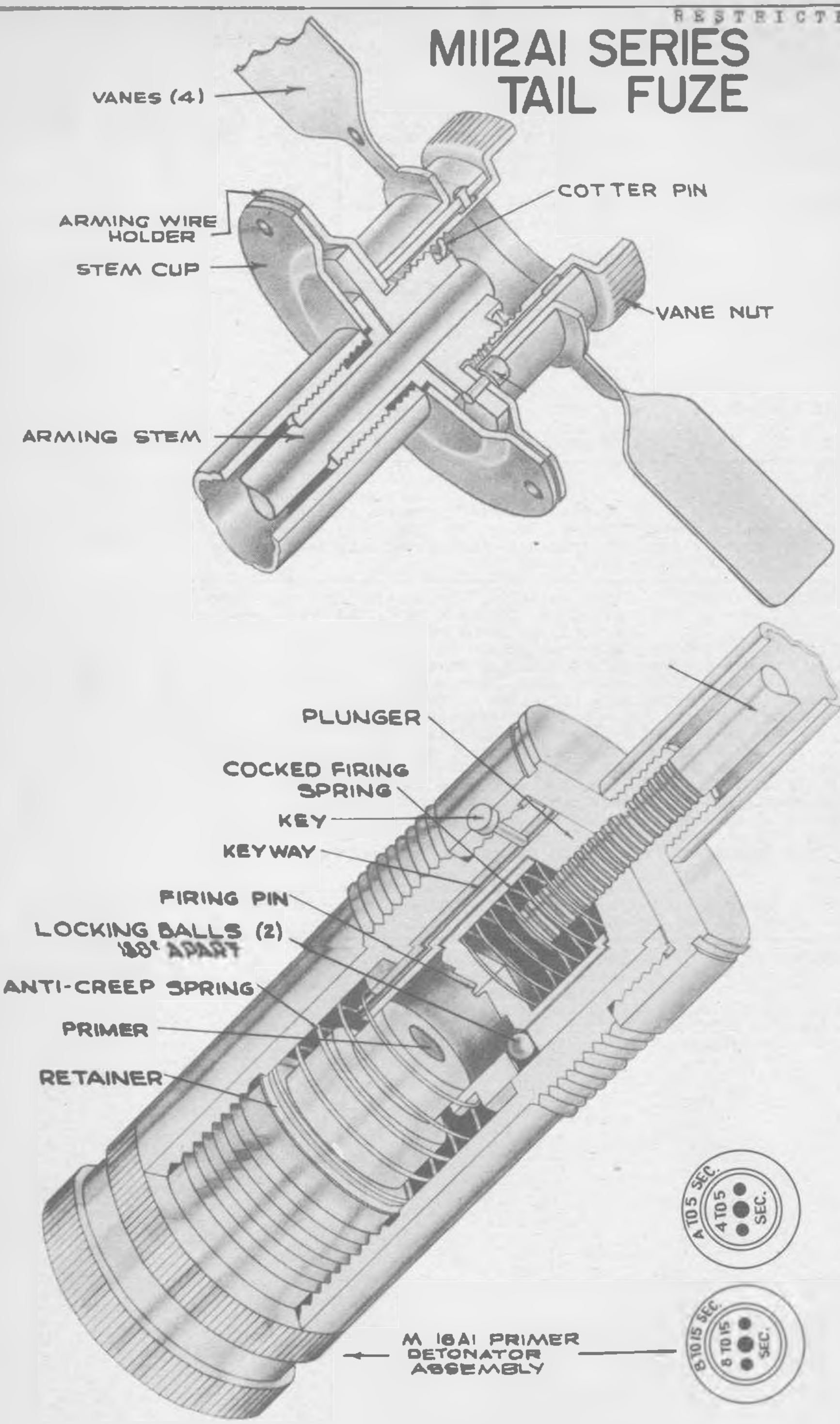
OPERATION: Upon releasing the cluster from the plane, the arming wire is withdrawn from the fuze, the vanes are free to rotate and the arming pin jumps out. The vanes are positively attached to the arming hub and rotate as one unit. The arming sleeve, which is threaded to the arming hub, is prevented from rotating since the movable gear which is attached to it, meshes with the pinned pinion gear. However, the arming sleeve moves down due to rotation of the arming hub, and after approximately 6 - 9 vane revolutions the arming sleeve has withdrawn far enough for the safety block to be thrown clear by centrifugal force. The timing disc, meanwhile, has been rotated by the spring-driven clockwork. After the predetermined time has elapsed, the slot in the timing disc will be positioned opposite the timing disc lever. Through a series of levers, pressure forces this timing disc lever into the slot thus freeing the firing lever. Since the half round pin is no longer retained by the firing lever, it is free to rotate under the pressure of the spring-loaded firing pin, a collar on the firing pin bearing on one side of the notch in the half round pin. As the half round pin rotates, the firing pin is released and impinges on the primer, firing the booster.

If the timing mechanism should fail, the fuze would still detonate on impact, because the striker would be forced down and would shear any obstruction between it and the primer.

REMARKS: The M 155 replaces the M 111A2 in the above-mentioned clusters. Replacement was made since clusters fuzed with the M 111A2 sometimes failed to open with low fuze settings since the cluster flight is not always stable enough to permit arming of the M 111A2 fuze before the set time expires. Elimination of the gear reduction system obviates this difficulty. The spinner insures ejection of the safety block at completion of arming.

This fuze is not procured by the Navy.

M112A1 SERIES TAIL FUZE



M112A1, M113A1, M114A1

(Service)
MECHANICAL IMPACT
PYROTECHNIC DELAY
(For Skip or Masthead bombing from land-based planes only)
M112, M113, M114
(Obsolescent)

Data

BOMBS USED IN:	
M112A1	AN-M30, 100 lb.G.P. AN-M57, 250 lb.G.P.
M113A1	AN-M43, 64, 500 lb.G.P. AN-M58 500 lb.S.A.P. M32, 600 lb. G.P.
M114A1	AN-M44, 65,1000 lb.G.P. AN-M58, 1000 lb. S.A.P. M33, 1100 lb. G.P. AN-M34, 66,2000 lb.G.P. M103, 2000 lb. S.A.P.
FUNCTIONING.	M16A1 primer detonators with 4-5 or 8-15 seconds delay are interchangeable. (Masthead, skip bombing).
ARMED CONDITION. . . .	When vane assembly has risen .75 in.
FUZES USED WITH. . . .	None
ARMING DATA.	18-21 vane revolutions; 100 ft. air travel
VANE SPAN.	5 in.
MAX. BODY DIAMETER . .	1.5 in.
OVERALL LENGTH.	M112A1, 9.6 in. M113A1, 12.6 in. M114A1, 16.6 in.
MATERIAL.	Cadmium plated steel

GENERAL: The only difference in these three fuzes is in the length of the arming stem. Larger bombs require a longer arming stem so that the vanes can catch the air slip from the bomb.

OPERATION: As the vanes rotate, the arming stem is unthreaded from the plunger. There are no reduction gears in the vane assembly, the arming stem being secured to the vane nut by a cotter pin, and 18 to 21 revolutions of the vanes will free the plunger. A key pin riding in a groove in the plunger prevents it from rotating as the arming stem is withdrawn. On impact, the plunger compresses its creep spring and the spring-loaded firing pin forces the locking balls out into the enlarged part of the fuze cavity, freeing the firing pin. The cocked firing pin spring forces the firing pin against the primer, initiating the delay in the primer detonator.

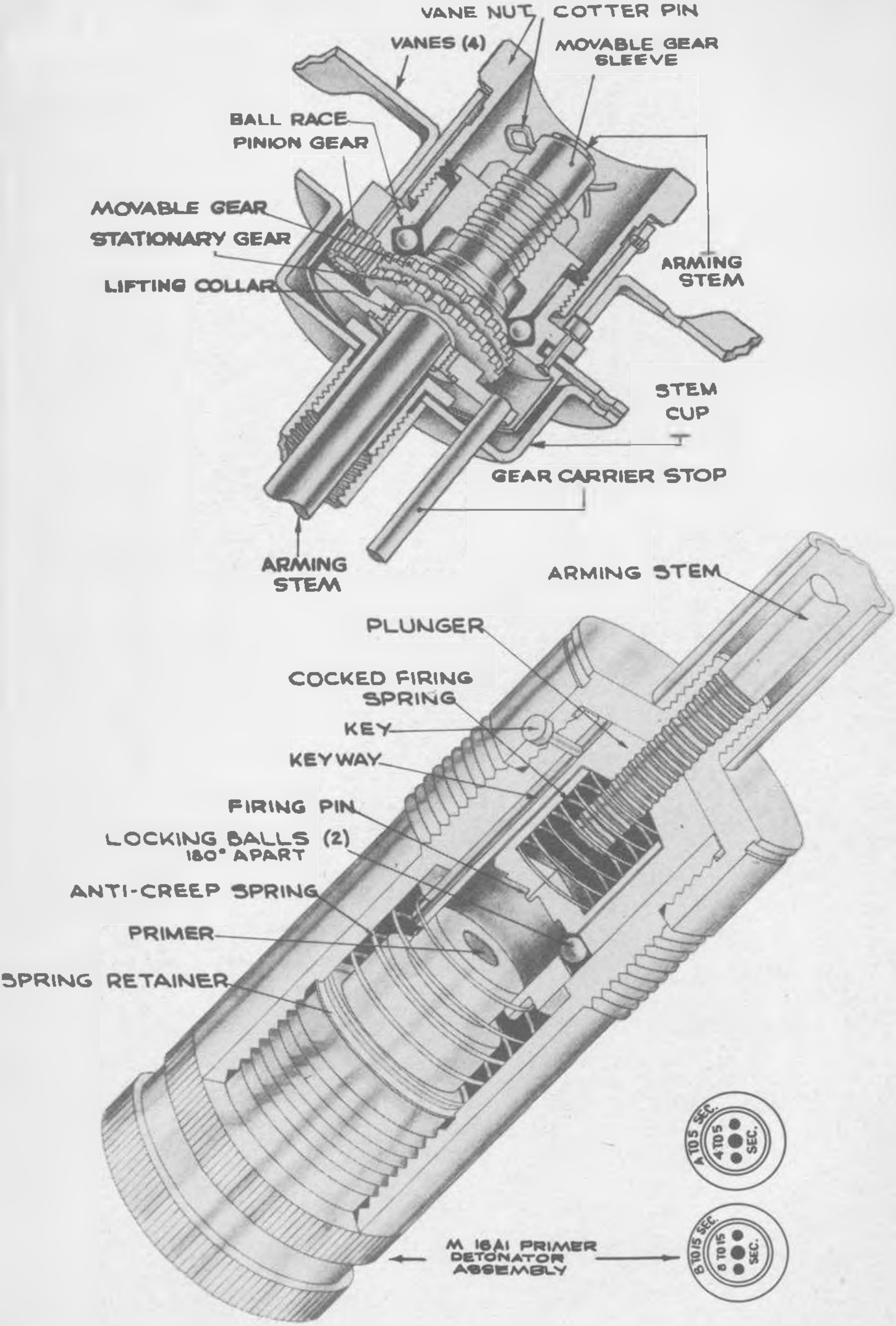
EARLY DESIGNS: The original M 112, M 113, and M 114 used the M 16 primer detonator, which is the same as the M 16A1 except that the shoulder is lower. Hence, when the M 16A1 was designed it was necessary to alter the base of the fuze slightly to permit use of this primer detonator with the higher shoulder on its external surface. The alternative M 16 primer detonators had delays of 4-5 or 8-11 seconds, whereas the longer delay M 16A1 has a range of from 8-15 seconds. This delay consists of a barium chromate silicon powder in place of the lead chromate silicon mixture used in the M 16 primer detonator. The M 16, though no longer being manufactured, can still be used in the M 112A1, M 113A1, and M 114A1 fuzes.

REMARKS: This fuze will function on impact angle of 3°, and gives positive action because of its cocked firing pin. This fuze is unsafe for carrier landings. Delay of 4-5 seconds should be used against sea targets, and delay of 8-15 seconds against land targets.

NEVER TURN THE VANES COUNTER-CLOCKWISE TO RENDER FUZE SAFE, AS THE ARMING STEM MAY DEPRESS PLUNGER INSTEAD OF ENGAGING IT.

These fuzes may have a groove around the top of the fuze body (as in drawing) or the top may be straight like the M 123 series fuzes (see page 199). This groove is a distinguishing mark used by those manufacturers making both the M 112 and M 123 series fuzes, and is not to be considered a positive mark for fuze identification.

M115 SERIES TAIL IMPACT FUZE



U. S. ARMY TAIL FUZES

M115, M116, M117

(Service)
MECHANICAL IMPACT
PYROTECHNIC DELAY

(For Skip or Masthead bombing from land or carrier bases)

Data

BOMBS USED IN:

M 115	AN-M30, 100 lb. G.P. AN-M57, 250 lb. G.P.
M 116	AN-M43, 64, 500 lb. G.P. AN-M58, 500 lb. S.A.P. M32, 600 lb. G.P.
M 117	AN-M44, 65, 1000 lb. G.P. AN-M58, 1000 lb. S.A.P. M33, 1100 lb. G.P. AN-M34, 66, 2000 lb.G.P. M103, 2000 lb. S.A.P.

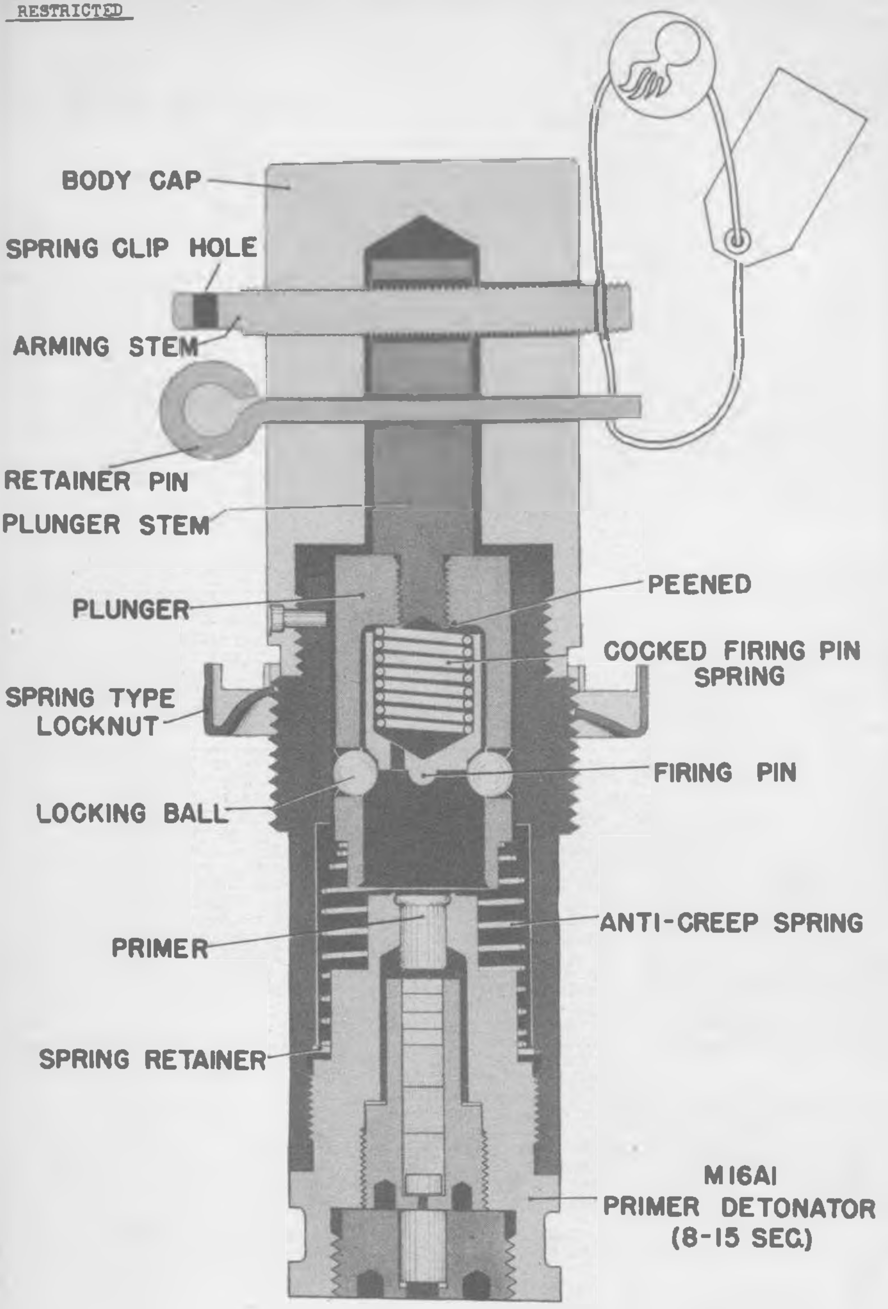
FUNCTIONING	M 16A1 primer detonators: 4-5, 8-15 sec. delay. M 16 primer detonators: 4-5, 8-11 sec. delay. (Masthead, skip bombing)
ARMED CONDITION	When gear carrier stop protrudes less than 1 in. below vane cup.
FUZES USED WITH	None
ARMING DATA	Same as AN-M100A2, AN-M101A2, AN-M102A2 respectively. See page 151.
VANE SPAN	5 in.
MAX. BODY DIAMETER	1.5 in.
OVERALL LENGTH	M 115, 9.6 in. M 116, 12.6 in. M 117, 16.6 in.
MATERIAL	Cadmium plated steel

GENERAL: The only differences between these fuzes is in the length of the arming stem. Larger bombs require a longer arming stem so that the vanes can catch the air slip from the bomb. The only difference between these three fuzes and the M 112A1 series is that this series employs the reduction gears as used in the AN-M 100A2 series, consequently having a longer arming time. Actually, the M 115 series is a composite of the M 112 series body with the AN-M 100A2 series vane and reduction gear assembly.

OPERATION: As the vanes rotate, the pinion gear which is attached to the vane assembly revolves around the stationary gear. Since the movable gear has 30 teeth and the stationary gear 29 teeth, the movable gear is rotated clockwise one tooth per revolution of the pinion gear. The arming stem is secured by a cotter pin to the movable gear sleeve and hence unthreads from the firing plunger as the movable gear is rotated. In unthreading, the arming stem lifts the movable gear, and since the stationary gear is held by a collar threading into the lower extension of the movable gear sleeve, the stationary gear is lifted also. After 150-170 revolutions of the vanes, the arming stem will have unthreaded from the firing plunger and the fuze will be armed. Further air travel will unthread the arming stem from the fuze body and the entire arming assembly will fly off. On impact, the plunger compresses its creep spring and the spring-loaded firing pin forces the locking balls out into the enlarged part of the fuze cavity, freeing the firing pin. The cocked firing pin spring forces the firing pin against the primer, initiating the delay in the primer detonator.

REMARKS: These fuzes will take either the M 16 primer detonators with delays of 4-5 or 8-11 seconds, or the M 16A1 primer detonators with delays of 4-5 or 8-15 seconds. Actually the M 16's are no longer being manufactured, though they are still to be found in the field. These fuzes can be used for skip or masthead bombing from land or carrier bases. These fuzes may have a groove around the top of the fuze (as in drawing) or the top may be straight as in the AN-M100 series (see page 151). The groove is a distinguishing mark used by manufacturers making both fuzes and is not to be considered a positive sign for fuze identification.

NEVER TURN THE VANES COUNTER-CLOCKWISE TO RENDER FUZE SAFE, AS THE ARMING STEM MAY DEPRESS PLUNGER INSTEAD OF ENGAGING IT.



M 151 BOMB TAIL FUZE

RESTRICTED

U. S. ARMY TAIL FUZE

M151

MECHANICAL IMPACT
PYROTECHNIC DELAY

Data

BOMBS USED IN	AN-M30, 100 lb. and AN-M57, 250 lb. G.P. Bombs equipped with M17 anti-ricochet assembly. AN-M64, 500 lb. G.P. bomb with M16 anti-ricochet assembly.
FUNCTIONING	M 16A1 primer detonator with 8 - 15 second delay.
ARMED CONDITION . . .	Consider armed if arming stem extends 1-5/16" from fuze body (vane shaft side), or after approximately 12 vane revolutions.
FUZES USED WITH . . .	None
ARMING TIME	Approximately 12 vane revolutions
VANE SPAN	5 in.
MAX. BODY DIAMETER. .	1.5 in.
OVERALL LENGTH . . .	5.55 in.
MATERIAL	Cadmium plated steel

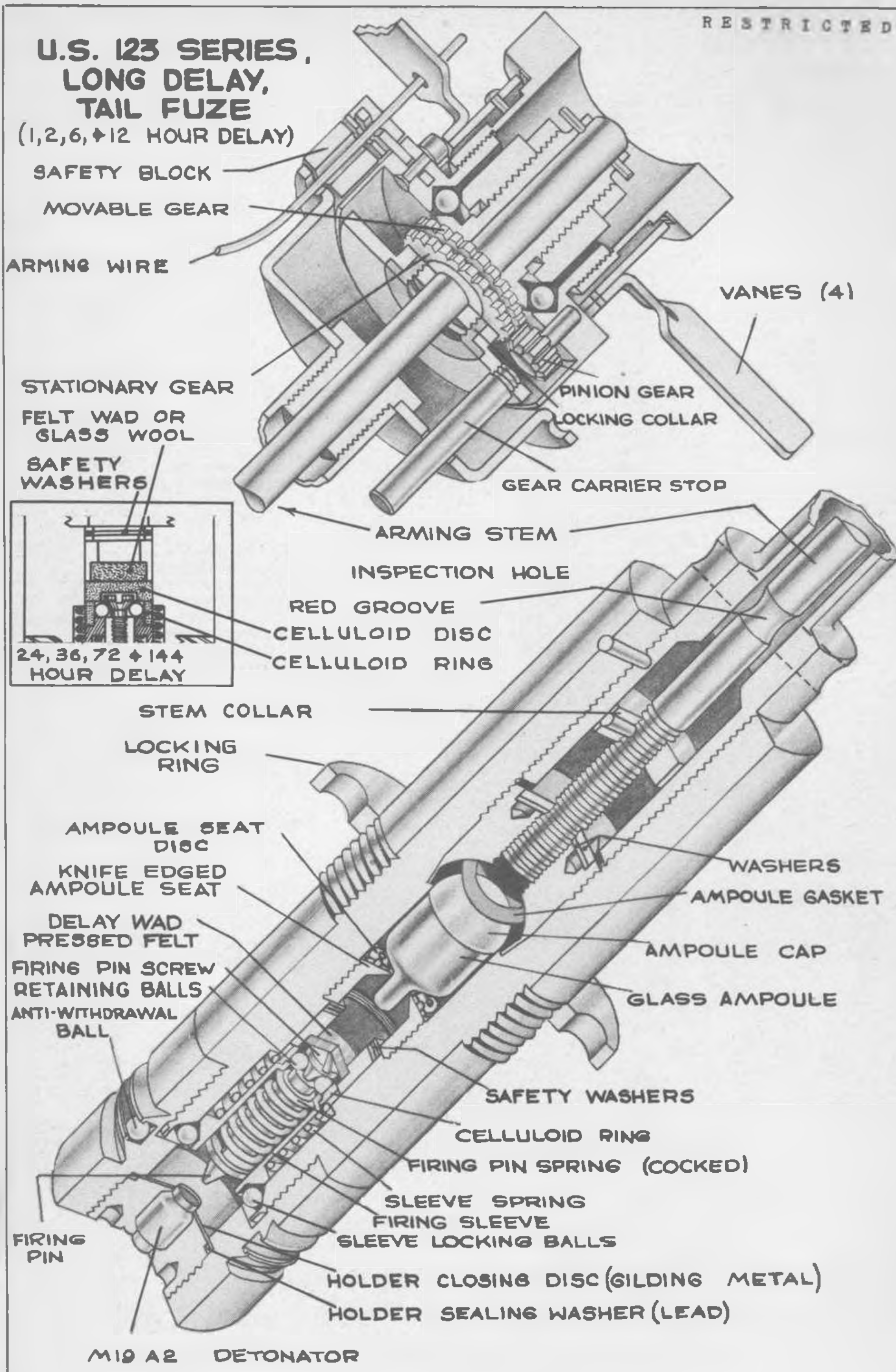
GENERAL: The M 151 consists of a modified M 112A1 series fuze body. The body has been lengthened to accommodate a plunger stem which is attached to the plunger proper. A transverse arming stem replaces the regular in line arming stem. A retainer pin and spring type lock nut have been incorporated. In addition the M 151 uses an anemometer type vane. The anemometer vane arming shaft is attached to the arming stem by a spring clip. For complete assembly see page 38 .

OPERATION: Upon withdrawal of the arming wire from the arming shaft, the anemometer vane is free to rotate and causes the arming stem to unscrew from the fuze. After approximately 12 vane revolutions the arming stem has withdrawn completely from the plunger stem and the fuze is armed. On impact, the plunger compresses the anti-creep spring and the spring loaded firing pin forces the locking balls out into the enlarged part of the fuze cavity, freeing the firing pin. The cocked firing pin spring forces the firing pin against the primer, initiating the delay in the primer detonator.

This fuze is not procured for naval use.

U.S. 123 SERIES, LONG DELAY, TAIL FUZE

(1,2,6,+12 HOUR DELAY)



RESTRICTED

U. S. ARMY TAIL FUZES

M123, M124, M125

(Obsolescent)

CHEMICAL TIME
ANTI-WITHDRAWAL

BOMBS USED IN:	
M123.	AN-M30A1 100# G.P. AN-M57A1 250# G.P.
M124.	AN-M64A1 500# G.P. AN-M58A2 500# S.A.P.
M125.	AN-M65A1 1000# G.P. AN-M66A1 2000# G.P. AN-M59A1 1000# S.A.P. M103 2000# S.A.P.
FUNCTIONING	Chemical long delay fuze: delays of 1, 2, 6, 12, 24, 36, 72, and 144 hours.
ARMED CONDITION . . .	Considered armed if dropped, because of glass ampoule, or after 75.6 - 190 revolutions of vanes.
FUZES USED WITH . . .	None, though a nose anti-disturbance fuze is being developed to be used with it.
ARMING TIME	75.6 - 190 revolutions
VANE SPAN	5"
MAX. BODY DIAMETER. .	1.5"
OVERALL LENGTH. . . .	M123, 9.6"; M124, 12.6"; M125, 16.6"
MATERIAL	Zinc plated and dichromate coated steel.

GENERAL: The only difference in these three fuzes is in the length of the arming stem. Larger bombs require longer arming stem so that vanes can catch the air slip from the bomb. Functioning time of these fuzes is determined as follows:

For the 1, 2, 6 and 12 hour delays, by varying the concentration of the alcohol-acetone solution.

For the 24, 36, 72 and 144 hour delays, by varying the thickness of the celluloid disc (thickness increases as delays increase). The M19A2 detonator contains primer mixture, lead azide and tetryl.

OPERATION: The stem case and gear system of these fuzes are identical with the fuzes in the AN-M 100A2 series, except that the threads on the arming stem are right hand threads and thread downward instead of out. The pinion gear revolves around the stationary gear and in so doing rotates the movable gear, which has one more tooth than the stationary gear, one tooth per revolution. Since the arming stem is secured to the movable gear sleeve, it also rotates counter-clockwise, threading down toward the glass ampoule. The arming stem exerts pressure on the ampoule cap causing the glass ampoule to break where it rests on seat disc and knife edge. Attached to the arming stem is a stem collar, which compresses a rubber washer to seal the upper part of the fuze from leakage. (344-387 revolutions of vanes to seal). In the 1, 2, 6, and 12 hour delays, the acetone or alcohol-acetone solution is freed to act on the celluloid ring retaining the locking balls. In the 24, 36, 72, and 144 hour delays, the acetone is freed to act on the celluloid disc and subsequently the celluloid ring retaining the locking balls. As the acetone or alcohol-acetone solution acts on the celluloid ring, the locking balls are forced out by the head of the screw which is threaded into the spring loaded firing pin. After the predetermined delay, as effected by varying the concentration of the alcohol-acetone solution or by varying the thickness of the celluloid disc, the balls will be forced clear of the screw head and the firing pin will strike the detonator.

If an attempt is made to withdraw the fuze once it has been installed, the anti-withdrawal locking ball will ride into the shallow part of its groove, and lock the lower fuze body to the adapter booster. Further turning of the fuze will merely unthread the upper fuze body from the lower part, allowing the spring-loaded firing pin sleeve to force the sleeve balls into the separation, driving both the sleeve and the firing pin toward the detonator. A separation of 3/64* of an inch activates the fuze, regardless of the length of time the acetone or alcohol-acetone solution has been acting, or if the fuze is in an unarmed condition.

REMARKS: (a) Never attempt to withdraw the fuze during or after installation in the bomb.

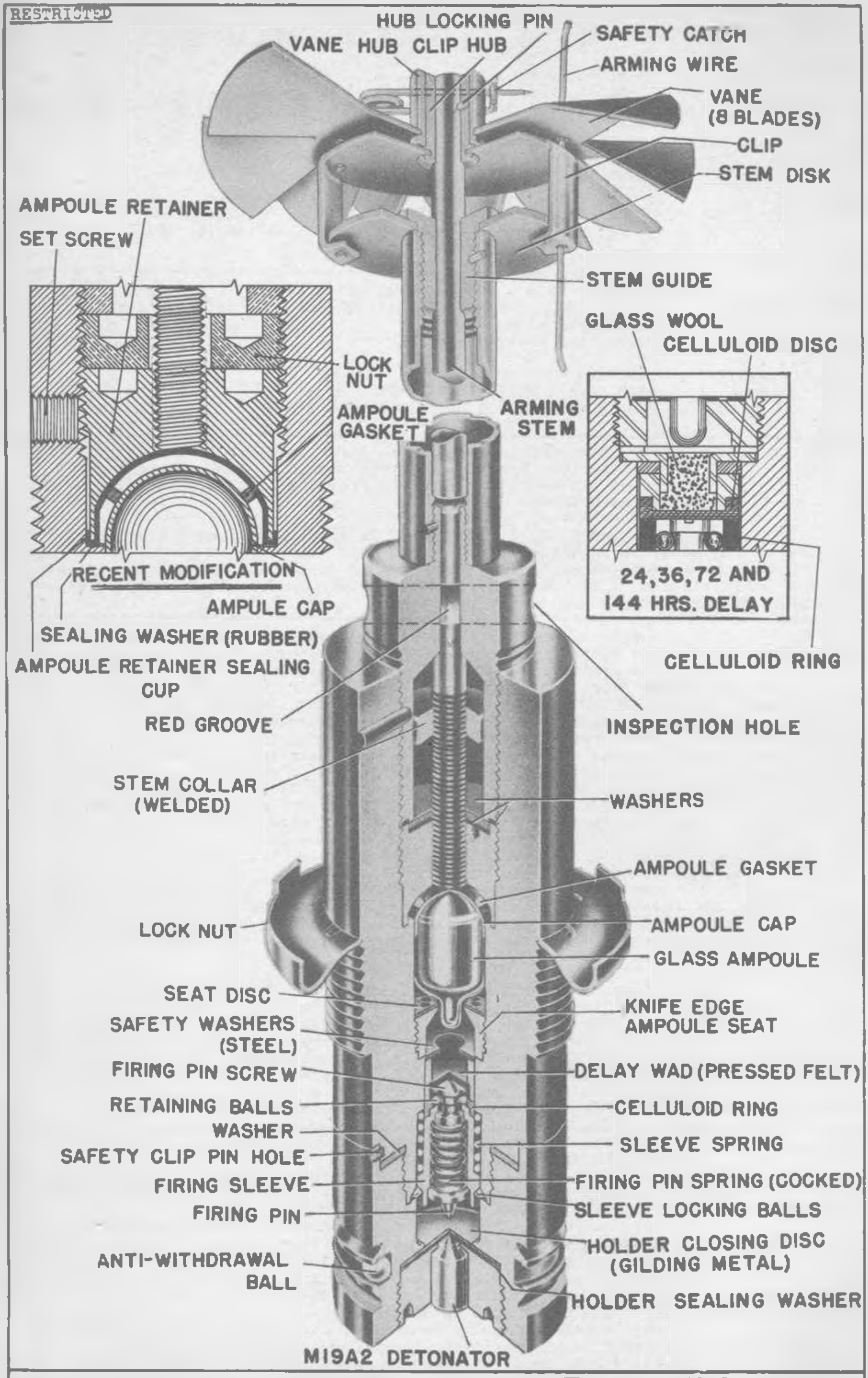
(b) If the bombs with this fuze are not dropped, they must be jettisoned over enemy territory or in the sea. They cannot be considered safe even if dropped unarmed.

(c) The fuzes should not be subjected to temperatures exceeding 120°F. (High temp. may damage celluloid ring). In the packing box are 2 vials of powder, one a green stoppered vial, the other a red stoppered vial. If temperature exceeds 150°F., powder in green stoppered vial will melt or solidify, and fuzes are not to be used for low altitude bombing. If temperature exceeds 170°F., powder in red stoppered vial will melt or solidify, and fuzes must be destroyed.

(d) In assembling the detonator, care should be taken to avoid damage to the anti-withdrawal locking ball and the crimp holding this ball.

(e) Before inserting fuze in bomb, gage the adapter booster cavity with the plug gage provided in each box of fuzes. Any bomb with which difficulty is experienced in inserting this gage, must not be fuzed with these fuzes.

(f) Later lots of these fuzes equipped with new type lock nut as shown on the M 123A1 series. *Later lots require 1½ turns or 3/32" to activate.



U.S. 123 A1 SERIES LONG DELAY TAIL FUZE
(1,2,6 & 12 HOURS DELAY)

RESTRICTED

U.S.ARMY TAIL FUZES

M123A1 M124A1 M125A1

(Service)

CHEMICAL TIME, ANTI-WITHDRAWAL

BOMBS USED IN:	
M123A1	AN-M30A1 100# G. P. AN-M57A1 250# G. P.
M124A1	AN-M64A1 500# G. P. AN-M58A2 500# S.A.P.
M125A1	AN-M65A1 1000# G.P. AN-M66A1 2000# G.P. AN-M59A1 1000# S.A.P. M103 2000# S.A.P.
FUNCTIONING	Chemical long delay fuze: delays of 1, 2, 6, 12, 24, 36, 72, and 144 hours.
ARMED CONDITION . .	Considered armed if dropped because of glass ampoule, or after 4 to 6 turns of the vanes.
FUZES USED WITH . .	None, though a nose anti-disturbance fuze is being developed to be used with it.
ARMING TIME	4 to 6 turns of the vanes
VANE SPAN	5"
OVERALL LENGTH . . .	M123A1 - 9.39" M124A1 - 12.39" M125A1 - 16.39"
MATERIAL	Zinc or cadmium plated steel.

GENERAL: The only difference in these three fuzes is in the length of the arming stem. Longer bombs require longer arming stem so that vanes can catch the air slip from the bomb. The M 123A1 series fuzes were developed to eliminate any possibility of premature firing resulting in aerial bursts, which sometimes occurred in the unstaked *M 123 series. Essentially, the M 123A1 series differs from the M 123 series in that the gear reduction system has been eliminated, and a direct drive arming system has been installed. Functioning time in these fuzes is determined in the same manner as the M 123 series. The M 19A2 Detonator contains primer mixture, lead azide, and tetryl.

OPERATION: When the arming wire is withdrawn, the vane assembly starts to rotate, causing rotation of the clip hub, clip, and arming stem. After about 4 to 6 turns of the vanes, the arming stem moves inward far enough to break the ampoule. Approximately 5 to 6 additional turns are sufficient to seal fuze, i.e., stem collar is flush against rubber retainer washer. Balance of operation is same as the M 123 series. (See page 199).

REMARKS: *(a) Prior to the development of the M 123A1 series, the M 123 series (with gear reduction) was modified by pinning the body extension of the fuze to the body by use of two steel shear pins to prevent premature firing, aerial burst being caused by the torque developed by the gear reduction system after sealing. Kits were also provided for installing these shear pins in the field.

(b) Before the M 123A1 series was in production, existing stocks of M 123 series fuzes on hand in this country were modified; the stem cup was utilized without the gear reduction assembly, and a vane hub, clip hub, clip, safety catch, and 8 bladed vane installed. (Designated M 123A1 series).

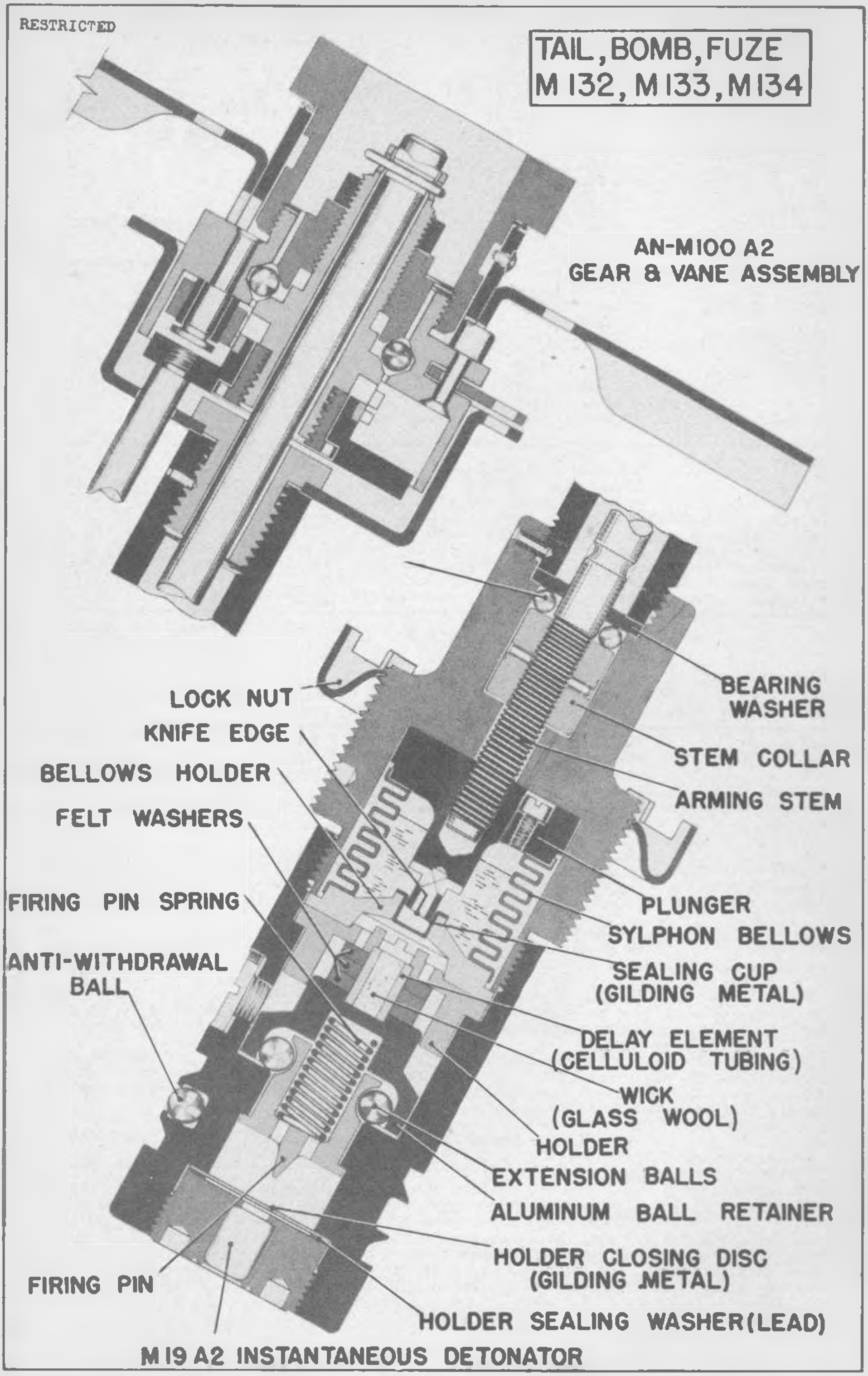
(c) More rigid specifications and factory inspection tests were instituted on later lots of the M 123 series ampoules, and are being carried out on the M 123A1 series also.

(d) The M 123A1 series as well as the later M 123 series lots do not have the solvent dyed in various colors. (Dye particles entered pores of ampoule glass at the sealing point, increasing the possibility of breakage and leakage).

(e) In the M 123A1 series, if the body extension is backed off approximately 3/32 of an inch from the body, fuzes are activated, regardless of the length of time the acetone or alcohol-acetone solution has been acting, or if the fuzes are in an unarmed condition.

(f) Refer to "Remarks" covering M 123 series (page 199), items (a) to (e).inclusive listed, apply to the M 123A1 series also.

RECENT MODIFICATION: Recently the M 123A1 series was modified as shown in the insert entitled "Recent Modification" on the opposite page. The change consists of adding an ampoule retainer sealing cup made of gilding metal, a sealing washer, set screw and lock nut. This modification assures more effective sealing, since the arming screw crushes but does not break through the ampoule retainer sealing cup. The set screw and lock nut hold the ampoule retainer in place and assure a tight fit against the retainer cup. Current production incorporates this modification. No modification designation has been assigned.


TAIL, BOMB, FUZE
M 132, M 133, M 134
AN-M100 A2
GEAR & VANE ASSEMBLY
LOCK NUT
KNIFE EDGE
BELLOWS HOLDER
FELT WASHERS
FIRING PIN SPRING
ANTI-WITHDRAWAL BALL
FIRING PIN
M 19 A2 INSTANTANEOUS DETONATOR
BEARING WASHER
STEM COLLAR
ARMING STEM
PLUNGER
SYLPHON BELLOWS
SEALING CUP (GILDING METAL)
DELAY ELEMENT (CELLULOID TUBING)
WICK (GLASS WOOL)
HOLDER
EXTENSION BALLS
ALUMINUM BALL RETAINER
HOLDER CLOSING DISC (GILDING METAL)
HOLDER SEALING WASHER (LEAD)

M132, M133, M134

(Service)
CHEMICAL TIME
ANTI-WITHDRAWAL

Data

BOMBS USED IN:		
M 132	AN-M 30A1	100# G.P.
	AN-M 57A1	250# G.P.
M 133	AN-M 64A1	500# G.P.
	AN-M 58A2	500# S.A.P.
M 134	AN-M 65A1	1000# G.P.
	AN-M 66A1	2000# G.P.
	AN-M 59A1	1000# S.A.P.
	M103	2000# S.A.P.

FUNCTIONING . . . . . . 10 minutes average chemical delay with range of 6 - 80 minutes delay possible due to temperature variations.
ARMED CONDITION . . . . No external indication, assumed to be armed if dropped.
FUZES USED WITH . . . . None
ARMING TIME . . . . . 63 vane revolutions (min.)
84 vane revolutions (max.)
VANE SPAN . . . . 5 in.
MAXIMUM BODY DIAMETER . 1.5 in.
OVERALL LENGTH . . . . M 132 - 9.57 in.
M 133 -12.57 in.
M 134 -16.57 in.
MATERIAL . . . . Cadmium, zinc plate or cronak treated zinc plated steel.

GENERAL: The only differences in these three fuzes is in the length of the arming stem. Larger bombs require longer arming stems so that the vanes can catch the air slip from the bomb. These fuzes are dependent upon chemical action for normal functioning, and atmospheric temperatures will have a direct bearing on the length of the delay. The fuzes are similar in principle to the M 123 series, but are safer in that the solvent is contained in a flexible copper bellows rather than a glass ampoule. The fuze body does not project far beyond the adapter booster; hence, there is less chance of breakage upon severe multiple impacts. THIS FUZE, AS IN THE M 123 SERIES, HAS A BALL LOCKING DEVICE AND ANY ATTEMPT TO REMOVE THE FUZE WILL RESULT IN DETONATION OF THE BOMB.

OPERATION: When the bomb is dropped, the arming wire is withdrawn, and the vanes rotate. The vane assembly is the same as in the M 123 series, and the vanes act through reduction gears like those in the AN-M 100A2 series fuzes, to turn the arming stem, which is threaded to the plunger carrying the knife edge. As the arming stem turns, the plunger carrying the knife edge threads down, compressing the sylphon bellows and piercing the gilding metal sealing cup. The T-slot channel in the knife edge allows the acetone to drain out of the bellows and act on the celluloid tubing delay element. The three felt washers and the glass wool wick absorb excess acetone and concentrate it on the delay element. As the delay element is dissolved after a minimum of five minutes, the compressed firing pin spring thrusts the aluminum ball retainer upwards, freeing the extension balls holding the firing pin in place. The firing pin spring then forces the firing pin down onto the M 19A2 detonator.

If an attempt is made to withdraw the fuze once it has been installed, the anti-withdrawal locking ball will ride into the shallow part of its groove and lock the lower part of the fuze body to the adapter booster. Further turning of the fuze will unthread the upper part of the fuze and permit the ball retainer to be forced up by the cocked firing pin spring, allowing the balls to be forced out and the firing pin to strike the M 19A2 primer detonator.

REMARKS: The concentration of acetone is not varied in these fuzes as in the M 123 series, nor are additional celluloid plugs added to prolong the delay. Variable delays result only from temperature variations, as is indicated in the following table:

Temperature	Length of Delay
122° F	6 min.
110° F	7.5 min.
85° F	15 min.
70° F	21 min.
55° F	30 min.
40° F	40 min.
32° F	45 min.
10° F	80 min.

RESTRICTED

FIG. 1
M129 FUZE GROUND OR
AIR BURST

FIG. 2
M 130 FUZE - TIME

FIG. 3
M 131 FUZE ANTI-DISTURBANCE

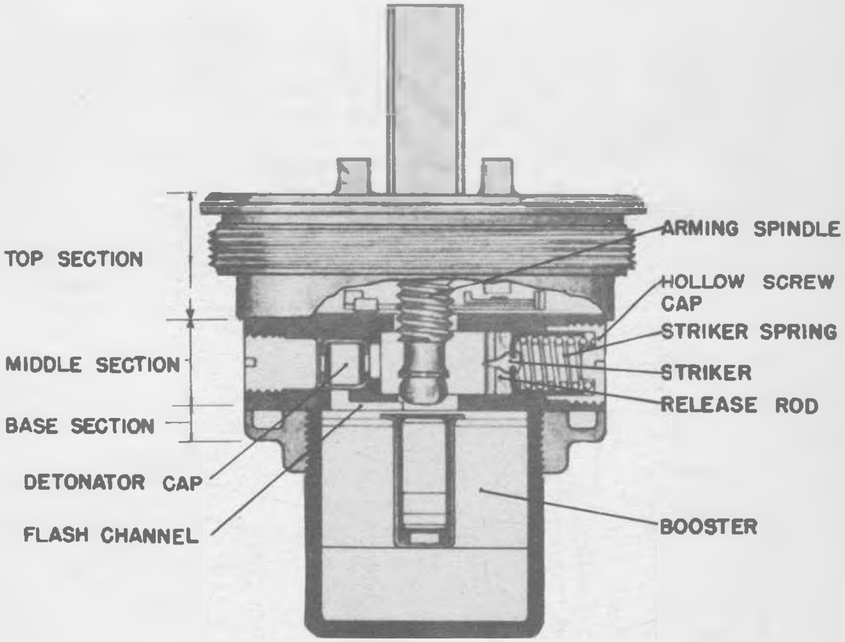


FIG. 4 CROSS SECTIONAL VIEW

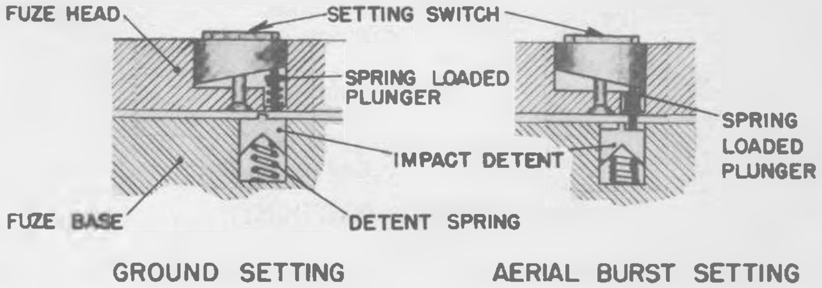


FIG. 5 SETTING SWITCH

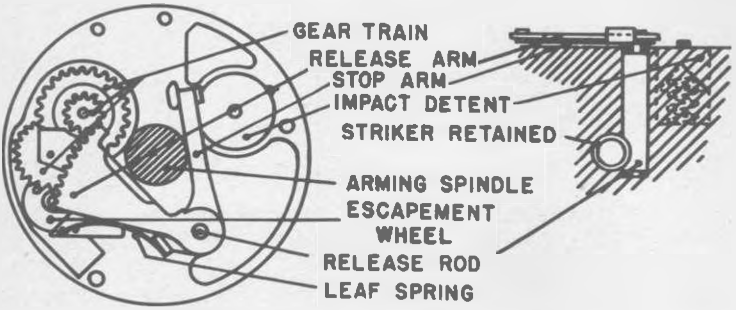


FIGURE 6 (UNARMED POSITION)

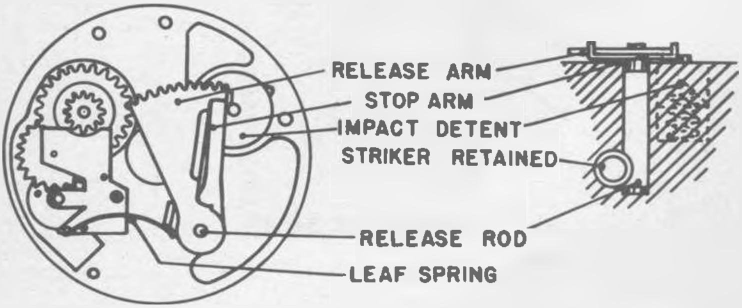


FIGURE 7 (ARMED POSITION)

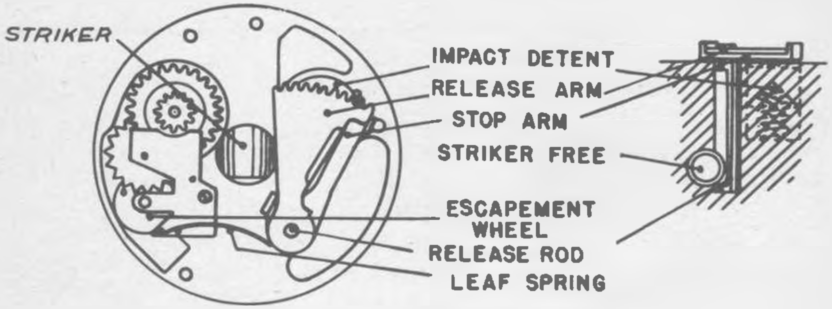


FIGURE 8 (FIRING POSITION)

M129 FUZE AIRBURST OR IMPACT

U. S. ARMY "BUTTERFLY" FUZE

M129

(Service)

IMPACT OR AERIAL BURST

Data

BOMB USED IN	M 83 4 lb. Frag. (Butterfly)
FUNCTIONING	Aerial Burst or Impact (with slight inherent delay).
ARMED CONDITION	When arming spindle has been unthreaded 3½ turns, must be assumed to be armed.
FUZES USED WITH	None
ARMING TIME	2.5 seconds
DIAMETER OF FUZE	1.75 in.
LENGTH (w/booster) . . .	2 in.
SPINDLE LENGTH	6.5 in.
MATERIAL	Three zinc alloy castings, top, middle, and base, held together by three long screws.

GENERAL: The top section of the fuze is centrally threaded for the arming spindle, the middle section houses the clockwork and firing mechanism, and the base section is a simple flat casting added only to afford a means of screwing the plastic booster cup to the fuze. The fuze screws into the bomb with a left hand thread and is tightened with a spanner wrench which fits into the two spanner holes in the top of each fuze. Luting on the threads insures a tight, moisture-proof fit. Assembly of the fuzes in the bombs is done at the factory.

OPERATION: "GROUND" Burst:

The release arm is prevented from moving in the unarmed position by the presence of the arming spindle. The release arm is attached to the release rod, which has a cutaway section against which the spring-loaded striker bears (see Fig. 6). When the arming spindle unthreads about 3.8 turns, the pressure of the striker against the release rod causes it to rotate and move the release arm in a clockwise direction. A gear train, through which the external teeth of the release arm pass, controls the speed of the release arm and in 2.5 seconds the release arm engages the stop arm. Both the stop arm and release arm are prevented from further rotation by a projection on the impact detent (Fig. 5). The fuze is now fully armed (see Fig. 7). On impact, the impact detent overcomes its light coil spring due to inertia, and as it is forced down, permits both the stop arm and the release arm to be rotated further under influence of the striker spring against the cutaway release rod. The release rod thus rotates until the striker is no longer retained by the cutaway section, and the striker fires the detonator cap (see Fig. 8).

"AIR" Burst:

When the setting switch is set for "AIR" burst, the fuze operates exactly as above except that the impact detent has already been depressed by means of the spring-loaded plunger under the setting switch (Fig. 5). In this condition, the projection on top of the impact detent does not offer any resistance to the release arm and stop arm during their travel across the face of the mechanism. Hence, the striker is free to fire the detonator as soon as the release arm and stop arm have by-passed the impact detent and the release rod has rotated sufficiently to free the striker.

REMARKS: This fuze is the only one of the three fuzes for the M 83 4 lb. Frag. (Butterfly) Bomb which can be identified after it has been inserted in the bomb. Its setting switch, marked "AIR-GROUND" on top of the fuze, identifies it. This fuze is a copy of the Germain (41) Butterfly fuze.

In present production, an all-ways action detent replaces type of detent shown in Fig. 5.

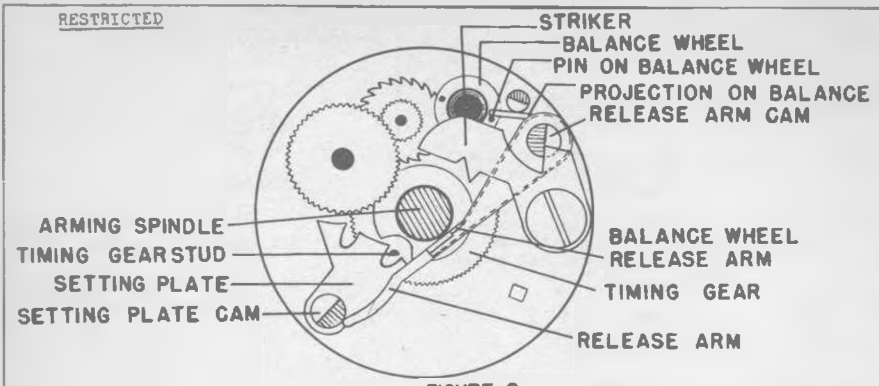


FIGURE 9

(20 MINUTE SETTING)

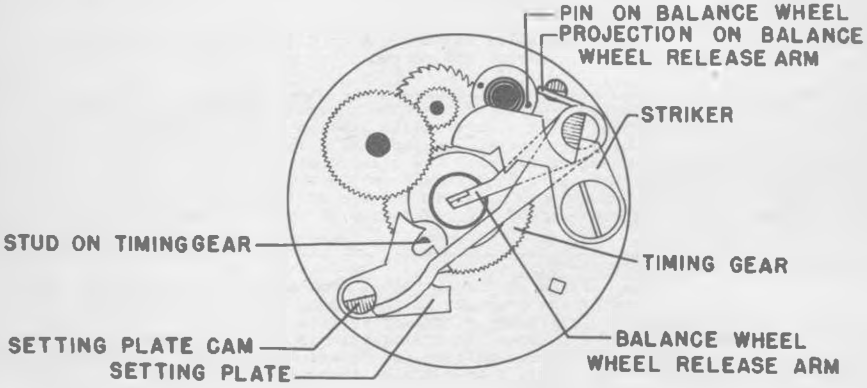


FIGURE 10

(10 MINUTES TO FIRE)

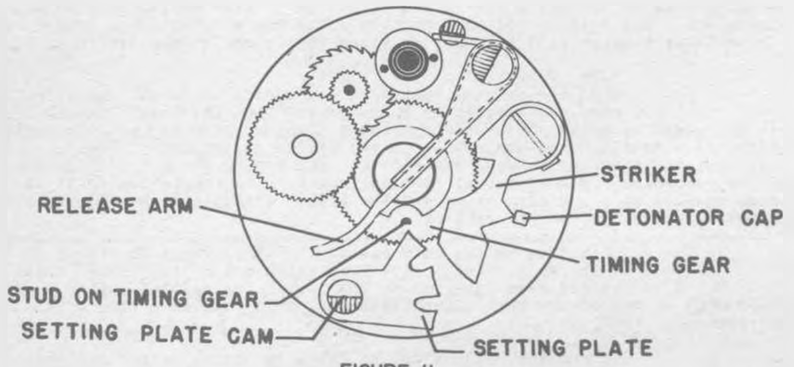


FIGURE 11

(FIRED POSITION)

M130 MECHANICAL TIME FUZE

RESTRICTED

U. S. ARMY "BUTTERFLY" FUZE

M130

(Service)

Mechanical Time

Data

BOMB USED IN	M 83 4 lb. Frag. (Butterfly).
FUNCTIONING	Mechanical time fuze, max. setting of 30 minutes.
ARMED CONDITION	Assumed armed when arming spindle is out .25 in., as there is no external indication of the time setting.
FUZES USED WITH	None
ARMING TIME	3.5 rotations of arming spindle.
DIAMETER OF FUZE	1.75 in.
LENGTH (w/booster) . . .	2 in.
SPINDLE LENGTH	6.5 in.
MATERIAL	Three zinc alloy castings, top, middle, and base, held together by three long screws.

GENERAL: The top section of the fuze is centrally threaded for the arming spindle, the middle section houses the clockwork and firing mechanism, and the base section is a simple flat casting added only to afford a means of screwing the plastic booster cup to the fuze. The fuze screws into the bomb with a left hand thread and is tightened with a spanner wrench which fits into the two spanner holes in the top of each fuze. Luting on the threads insures a tight, moisture-proof fit. Assembly of the fuzes in the bombs is done at the factory.

OPERATION: The clockwork mechanism in the unarmed position is seen in Fig. 9. When the arming spindle has been withdrawn approximately .25 inch, the balance wheel release arm, pivoted on the release arm cam, moves a limited distance until it is centered over the hole previously occupied by the arming spindle, Fig. 10. This action prevents the reinsertion of the arming spindle and starts the mechanism in operation as the projection on the balance wheel release arm frees the balance wheel. With a maximum setting time of 30 minutes, the functioning is as follows:

(1) The timing gear, under the influence of its clock spring, rotates in a counter-clockwise direction. Near the end of its first revolution, the stud on the timing gear engages the first slot of the setting plate and pulls the latter around with it a limited distance in a clockwise direction.

(2) Near the end of the timing gear's second revolution, the stud engages the second slot in the setting plate, once again moving it a limited distance.

(3) Near the end of the third revolution, the stud on the timing gear engages the heel of the setting plate to move the latter clear of the timing gear. With the setting plate in this position, the setting plate cam presents its cutaway section to the release arm, thereby freeing the release arm. The release arm is forced past the setting plate by the spring-loaded striker bearing against the release arm cam. As the pivoted striker clears the release arm cam it is free to strike in a counter-clockwise direction and fire the detonator, Fig. 11.

REMARKS: Each complete rotation of the timing gear takes approximately 9 to 10 minutes and with the maximum setting of the setting plate a delay of 27 to 30 minutes will result. By varying the initial position of the setting plate and/or timing gear at the factory, the fuze can be set to function for any desired time up to 30 minutes. This fuze is a copy of the German (67) Butterfly fuze.

M131 ANTI-DISTURBANCE FUZE

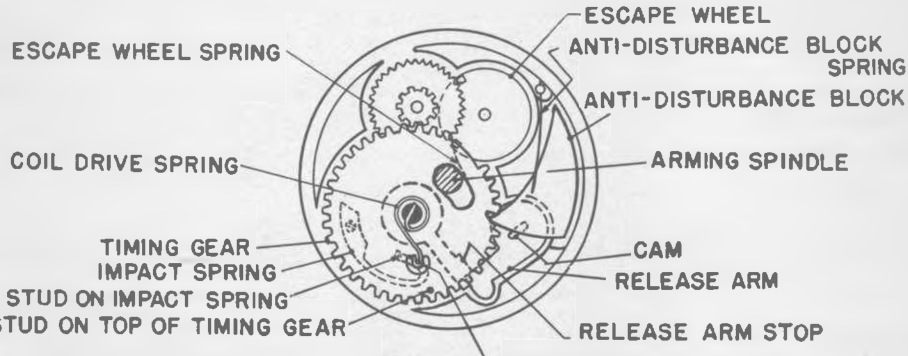


FIG 12 UNARMED POSITION

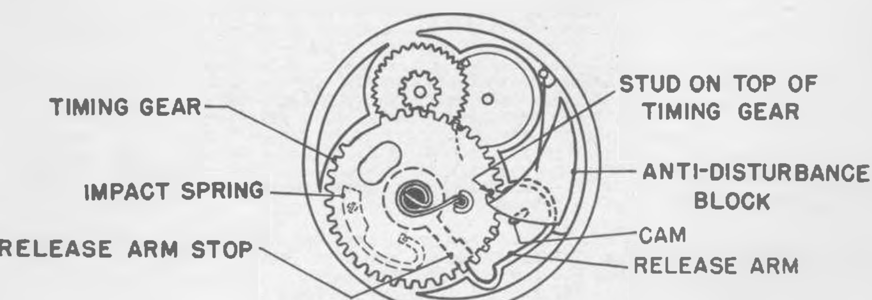


FIG. 13 ARMED POSITION

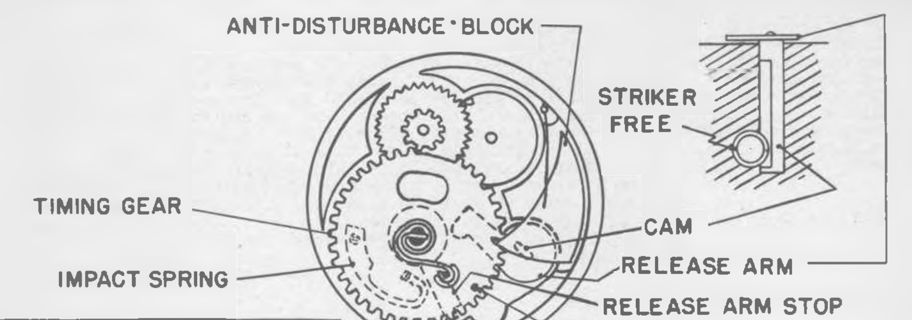


FIG. 14 FIRED POSITION

RESTRICTED

U. S. ARMY "BUTTERFLY" FUZE

M131

(Service)

ANTI-DISTURBANCE

Data

BOMB USED IN	M 83 4 lb. Frag. (Butterfly).
FUNCTIONING	Anti-disturbance.
ARMED CONDITION	No external indication
FUZES USED WITH	None
ARMING TIME	Approximately 5 seconds after impact.
DIAMETER OF FUZE	1.75 in.
LENGTH (w/booster) . . .	2 in.
SPINDLE LENGTH	6.5 in.
MATERIAL	Two zinc castings.

GENERAL: The fuze consists of two castings, the top one having a center hole threaded for the arming spindle and the outer threads to screw the fuze into the bomb; the lower casting containing the timing, anti-disturbance and firing mechanisms, with its base internally threaded for the tetryl booster cup. Assembly is held together by three long screws. On one side of the lower casting is a large hollow screw which holds the firing pin and the firing pin spring under compression. Diametrically opposite is another smaller screw retaining the primer detonator.

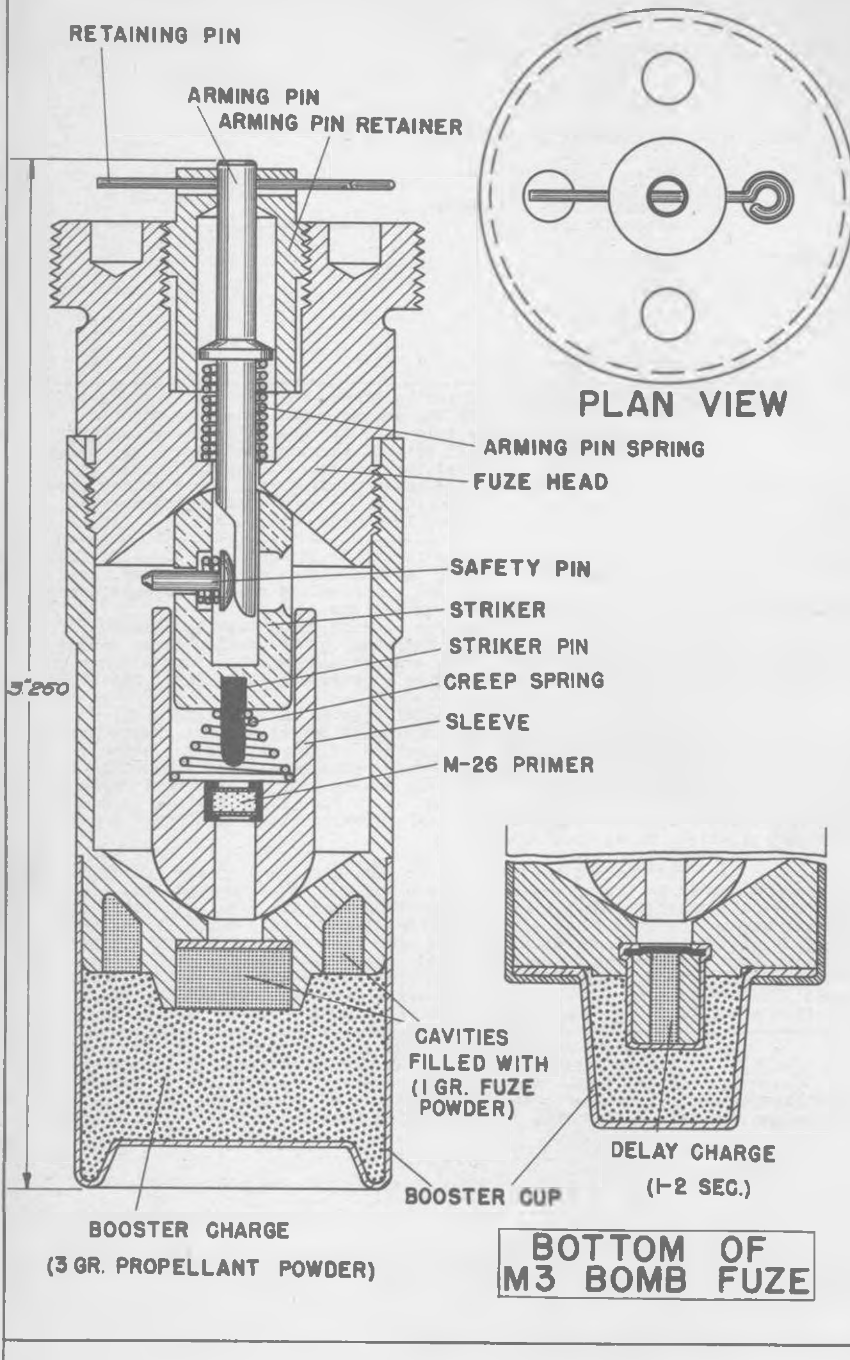
OPERATION: When the arming spindle is withdrawn approximately .25 inch, the escape wheel spring and the timing gear are freed, and the fuze commences to arm. During the complete operational circle, the fuze acts in three successive steps as follows:

(1) After about .5 second, during which time the timing gear rotates in a clockwise direction under the influence of the coiled drive spring, the entire mechanism is brought to a halt as the stud on the impact spring engages the stud under the timing gear and the fuze remains in this condition until impact.

(2) On impact, the force of inertia on the flat impact spring is sufficient to disengage the studs on the impact spring and the timing gear. The timing gear now continues its rotation for a period of approximately 5 seconds until the stud, seated in place above the timing gear, engages a small projection on the end of the anti-disturbance block. Here the timing gear is once again brought to a halt with the fuze in a fully armed position, as in Fig. 13. The fuze is now in an extremely sensitive condition, since the anti-disturbance block is supported only by the delicate anti-disturbance block spring.

(3) Should the fuze now be subjected to handling, shock, or vibration, the projection on the anti-disturbance block and the stud above the timing gear would become disengaged. The timing gear can thus make its final run, this time until its blank segment permits it to slip by the small gear (with which it was previously engaged) with increased momentum. During this last swift movement, the stud under the timing gear strikes the release arm stop, moving it away from the release arm, and the spring-loaded striker can now rotate the release arm cam as the release arm is freed. The cam is forced around in a clockwise direction, permitting the striker to slip by and fire the detonator cap, initiating the booster, as in Fig. 14.

REMARKS: There are no markings on the fuze to identify it, and when fitted into the bomb, it can not be distinguished from the M 130 fuze. This fuze is so sensitive that the vibration caused by an aircraft propeller nearby may be sufficient to release the anti-disturbance block and fire the fuze. This fuze is copied from the German (70)B, Butterfly fuze.



M 142 BOMB FUZE

RESTRICTED

U. S. ARMY NOSE FUZE

M142, M142A1

M3

(Service)

ALL-WAYS ACTION TYPE FUZE

Data

BOMBS USED IN.	M74 - 10 lb. Incendiary (IM or NP)
FUNCTIONING.	Instantaneous
ARMED CONDITION. . . .	When arming pin is out
FUZES USED WITH . . .	None
ARMING TIME	Instantaneous
MAX. BODY DIAMETER . .	1.125 in.
OVERALL LENGTH	3.250 in.
MATERIAL	Steel head, zinc alloy die casting.

GENERAL: The M142 fuze supersedes the M3 nose fuze. The M3 fuze was used in experimental production of the M74; however, it was found that the 1 to 2 second delay incorporated in this fuze was unnecessary, as the inherent delay was sufficient. Therefore, it was re-designed and designated the M142.

The M142 fuze is an all-ways action fuze which screws into the nose of the bomb. This fuze consists essentially of a steel head and arming pin retainer, steel striker pin and safety pin; zinc alloy die casting striker, sleeve, fuze casing and arming pin; M26 percussion primer, cavities in end of case filled with 1 gram of fuze powder, and a zinc booster cup filled with 3 grams of propellant powder.

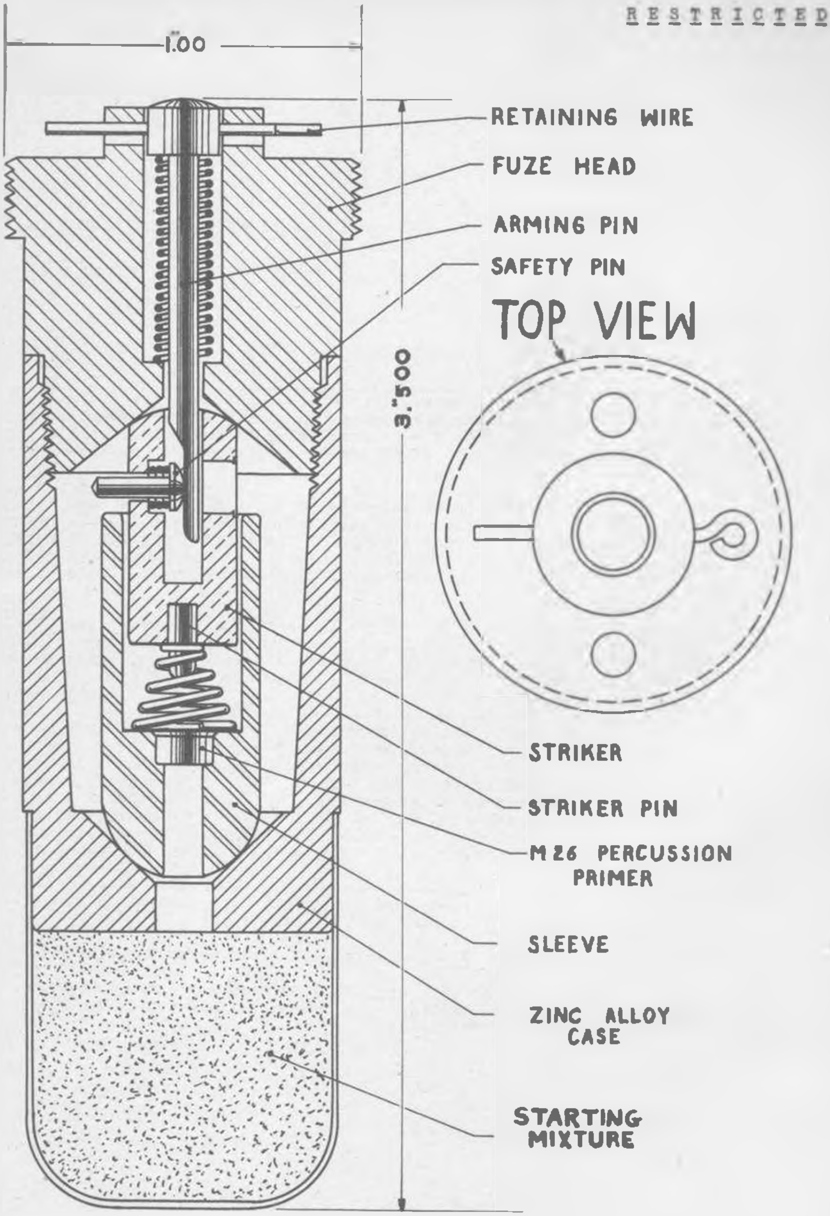
The M3 differed in that it had a M29 percussion primer, built-in delay charge comprised of a lead spitter fuze (potassium nitrate, sulfur and charcoal) capped at both ends by match composition (60% black powder, 40% collodion) and a cellulose nitrate booster cup filled with 1 gram of fuze powder.

OPERATION: The retaining pin is removed when the fuzed bombs are assembled in the cluster. While the bombs are in the cluster, a spring loaded release clip holds the arming pin in the body of the fuze. Upon release from the cluster, the release clip springs off allowing the arming pin to jump out under action of its spring. This action permits the safety pin to enter the cavity in the striker, and the fuze is armed. Impact forces the striker and sleeve together, causing the striker pin to pierce the M26 percussion primer, which in turn initiates the cavity charges and booster charge.

REMARKS: The M26 percussion primer is better than the M29 since it will function even on soft surface impact.

See M74, page 110, showing M142 fuze assembled in bomb.

M142A1 (E9R23) will replace M142 because latter cannot be resafed after arming pin is released. Release pin can be re-inserted in M142A1. M142 fuze is reclassified as substitute standard.



FUZE M-150 (ALL-WAYS ACTION) FOR BOMB SMOKE (HC) M77

RESTRICTED

U. S. ARMY TAIL FUZE

M150

(Service)

ALL-WAYS ACTION TYPE FUZE

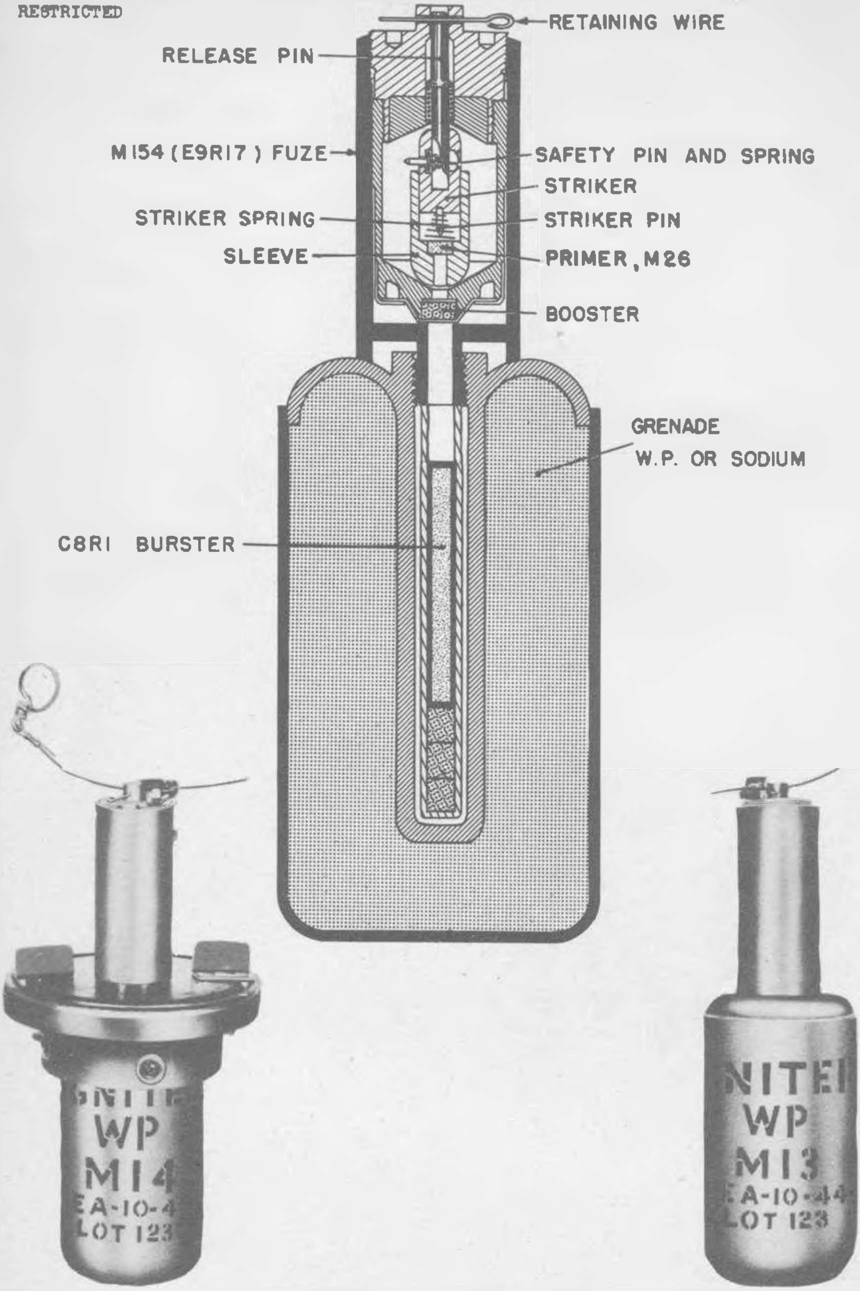
Data

BOMBS USED IN. . . .	M77 10 lb. Smoke (HC)
FUNCTIONING.	Instantaneous
ARMED CONDITION . .	When arming pin is out.
FUZES USED WITH . .	None
ARMING TIME	Instantaneous
MAX. BODY DIAMETER .	1 in.
OVERALL LENGTH . . .	3.5 in.
MATERIAL	Zinc alloy die castings

GENERAL: The M150 fuze is an all-ways action fuze which screws into the tail of the M77 bomb. This fuze consists essentially of a zinc alloy fuze head, arming pin, striker, striker sleeve, and case, a steel striker pin and safety pin, a M26 percussion primer and a starting mixture enclosed in a zinc cup.

OPERATION: The retaining wire is removed when the fuzed bombs are assembled in the cluster. While the bombs are in the cluster, their proximity holds an arming band with spring against the head of the fuze, depressing the arming pin. When the bombs are released, the arming pin, together with the arming band, is forced out by the arming pin spring permitting the safety pin to enter the cavity in the striker. Impact forces the striker and sleeve together causing the striker pin to pierce the M26 percussion primer which in turn ignites the starter mixture, and subsequently the HC Smoke Mixture.

REMARKS: See M77 bomb, page 112, showing M150 (M4) fuze assembled in bomb.



M154 FUZE
M13 AND M14 IGNITERS

RESTRICTED	M13	M14
BOMBS USED IN. . . .	Aircraft Jettisonable Fuel Tanks, Incendiary Filled	
TYPE	External	Internal
FUZE	M154	M154
BURSTER.	C8R1	C8R1
CAP (ADAPTER). . . .	None	Supported
FUNCTIONING.	Inst.	Inst.
ARMED CONDITION. . .	If arming wire and retaining wire are missing	
IGNITERS USED WITH .	M16	M15
ARMING TIME.	Armed when dropped from plane	
OVERALL LENGTH . . .		
MAXIMUM DIAMETER . .		

ARMY-NAVY IGNITER

M154(E9R17) FUZE
M13(E3R3) IGNITER
M14(E4R5) IGNITER

E3R1	E4R1	E4R4
E3R2	E4R2	E4R6
E3R4	E4R3	E4R7

GENERAL: Thirteen igniters were developed simultaneously for use with the "fire bombs" of which four have been standardized--namely, the M13, M14, M15 and M16. Considered on this page are the igniters which use the M154 (E9R17) fuze, a modification of the M142, greatest emphasis being placed on the M13 (E3R3) and M14 (E4R5) which will eventually supplant all other igniters using the M154.

The M13 and M14 differ in that the M13 is designed to be attached to the outside of the bomb by means of a clamp, while the M14 has an adapter which allows the igniter to be installed in the filler cap opening in the tank. Because of this difference, the M13 is known as an External igniter, while the M14 is called an Internal igniter. The M13 and M14 igniters consist of either a sodium (Na) or white phosphorous (WP) M15 hand grenade and a C8R1 burster (DuPont C56 blasting cap and 2.5 grams of tetryl) fitted to a M154 all-ways action fuze.

If the bombs are to be dropped at sea, the Na grenade is used, while if the bombs are employed against land targets the WP grenade is attached. At the present time, the Na filled M13 is restricted and the WP filled M13 is to be dumped by Navy activities. Both the WP and Na filled M14 are available. Neither the M13 or the M14 are considered safe for carrier landings.

OPERATION: When the bomb is released, the arming wire is pulled permitting the spring loaded arming pin to move upwards, thus allowing the safety pin to fly inward, arming the fuze. On impact the striker pin and sleeve are forced together igniting the M26 primer. Flash from the primer initiates the black powder booster and latterly the C8R1 burster, which in turn breaks the grenade case allowing the WP or Na to ignite the incendiary mixture scattered by the bursting tank.

MODIFICATIONS: The following are experimental igniters developed concurrently with the M13 and the M14.

The E3R1, E4R1, and E4R2 differ from the M13 and M14 respectively in that they use an Infallable Powder burster (similar to Ballistite) instead of the C8R1 burster of the standardized models. In addition the E4R1 has an unsupported cap instead of a supported one as in the M14 and the E4R2. The unsupported cap is a standard filling cap modified for use as an igniter. The supported cap is one specifically designed for the igniter. All three use the M154 fuze; they are restricted by the Navy to land base training use only.

The E3R2, E4R3, and E4R4 differ from the M13 and M14 respectively in that they use a C8 burster, known commercially as the DuPont C56 blasting cap, instead of the C8R1 which is similar except for a supplementary 2.5 grams of tetryl. In addition, the E4R4 has an unsupported rather than a supported cap as in the E4R3 and the M14. All three use the M154 fuze; for the Navy the WP filled igniters using the C8 burster are unserviceable and should be dumped; and the Na filled ones are restricted.

The E3R4 and the E4R7 differ from the M13 and M14 respectively in that they use the E9R20 fuze rather than the M154. The E9R20 is an anemometer arming all-ways action fuze converted from the M154 (E9R17). The C8R1 burster is present in both igniters as in the M13 and M14, and the E4R7 has a supported cap. Both Na and WP filled igniters are unserviceable under Navy order and should be dumped.

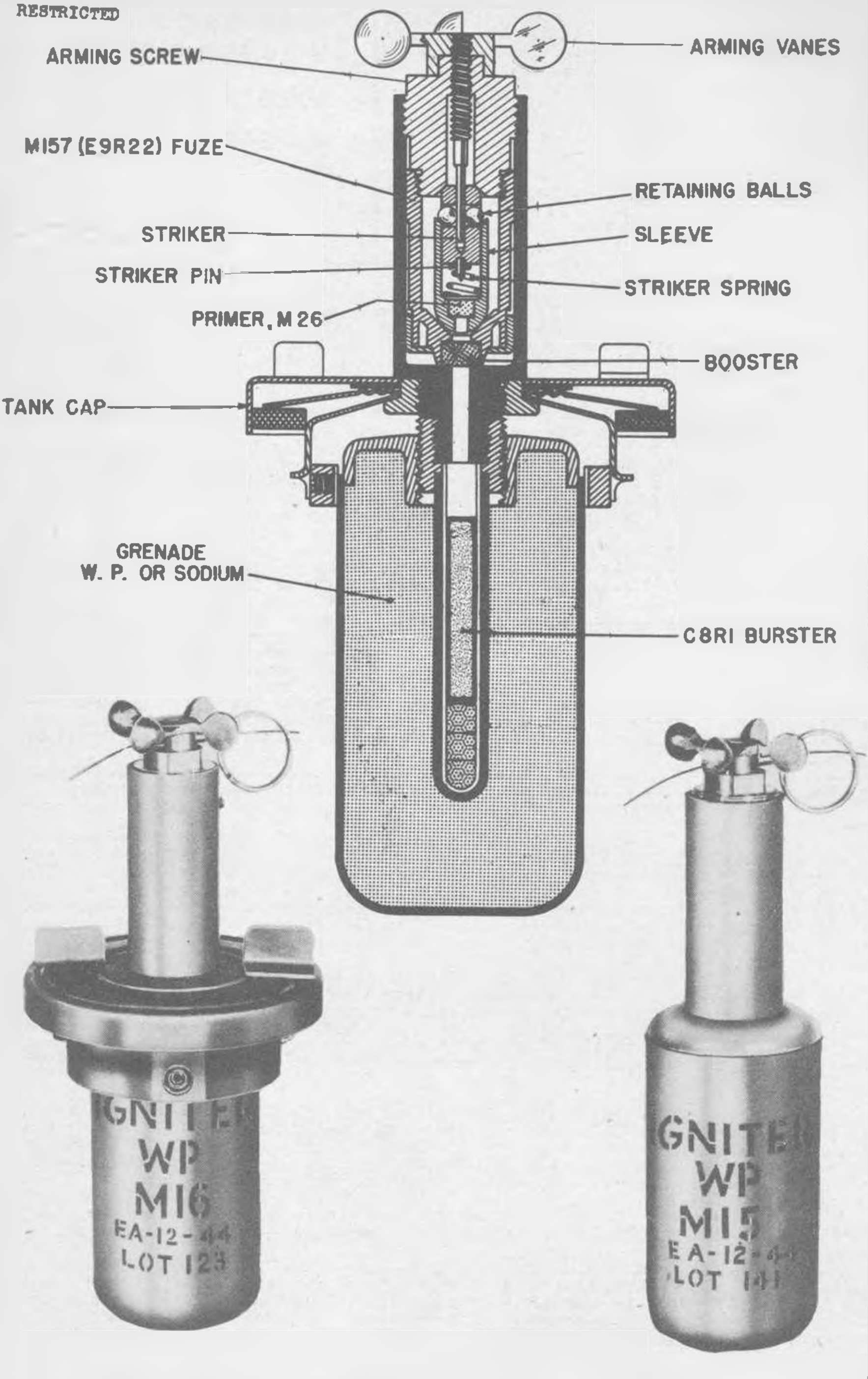
The E4R6 is identical with the M14 except that it has an unsupported cap. It uses the M154 fuze and has a C8R1 burster. The WP filled E4R6 is to be dumped.

REMARKS: The M15 igniter is designed to be clamped externally to the tank of fin assembly at any convenient point at which a suitable clamp has been provided or improvised. In cases where no clamp has been provided, the local ordnance officer must insure that the igniter is rigged in accordance with the best ordnance practice. The clamp must be installed so that the axis of the igniter is at 90° to the axis of the tank.

See page 219 for further Remarks on Fire Bomb igniters; see page 131 for jettisonable fuel tanks.

These igniters are no longer being procured for naval use.

RESTRICTED



M157 FUZE
M15 AND M16 IGNITERS

RESTRICTED

ARMY-NAVY IGNITER

M157(E9R22) FUZE
M15(E3R5) IGNITER
M16(E4R8) IGNITER

(Service)

	M15	M16
BOMBS USED IN	Aircraft Jettisonable Fuel Tanks, Incendiary Filled.	
TYPE	External	Internal
FUZE	M157	M157
BURSTER	C8R1	C8R1
CAP (Adapter)	None	Supported
FUNCTIONING	Inst.	Inst.
ARMED CONDITION . . .	Any unthreading of M157.	
IGNITERS USED WITH .	M14	M13
ARMING TIME	18-30 vane revolutions. 150-220 ft. air travel.	
OVERALL LENGTH . . .		
MAXIMUM DIAMETER . .		

GENERAL: Thirteen igniters were developed simultaneously for use with the "fire bombs" of which four have been standardized - the M13, M14, M15, and M16. Considered on this page are the igniters which use the M157 (E9R22) anemometer arming, all-ways action fuze, namely the M15 (E3R5) and the M16 (E4R8) igniters. The M15 and M16 differ in that the M15 is designed to be attached to the outside of the bomb by means of a clamp, while the M16 has an adapter which allows the igniter to be installed in the filler cap opening in the tank. Because of this difference, the M15 is known as an External igniter, while the M16 is called an Internal igniter.

The M15 and M16 igniters consist of either a sodium (Na) or white phosphorus(WP) M15 hand grenade and a C8R1 burster (DuPont C56 blasting cap and 2.5 grams of tetryl) fitted to the M157 fuze. If the bombs are to be dropped at sea, the Na grenade is used, while if the bombs are employed against land targets, the WP grenade is attached. WP and Na filled M15 and M16 igniters are available and are suitable for carrier use.

OPERATION: When the bomb is released, the arming wire is pulled permitting the anemometer vanes to rotate. The rotation of the vanes threads the arming stem out of the fuze body; the fuze is armed when the stem clears the arming balls, allowing them to fall inward freeing the striker for movement on impact. The arming assembly threads completely out of the fuze and falls away. On impact the striker pin and sleeve are forced together igniting the M26 primer. Flash from the primer initiates the black powder booster and latterly the C8R1 burster, which in turn breaks the grenade case allowing the WP or Na to ignite the incendiary mixture scattered by the bursting tank.

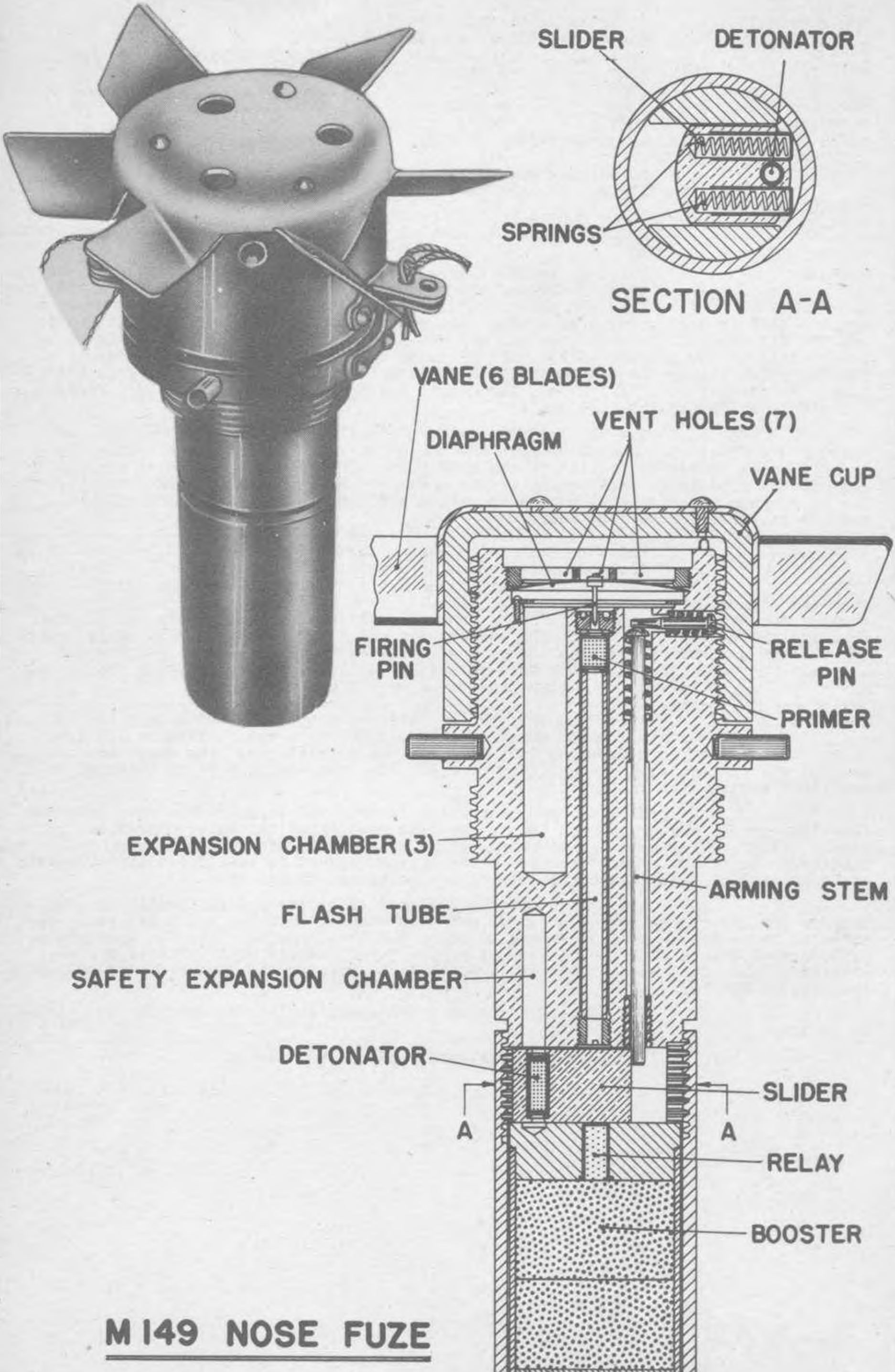
REMARKS: Fuzes and igniters are shipped separately and should not be assembled until immediately prior to use. Likewise the igniters should not be installed until use. The fuzes are shipped with a retaining pin which is removed after the arming wire is attached to the short arming wire in the fuze.

Even though the igniter is released safe and the fuze does not function, impact may break open the M15 grenade scattering its white phosphorus or sodium filler. This will ignite the gasoline gel just as though the burster had scattered the filler. For this reason the igniter cannot be considered to be capable of being dropped "safe" with absolute assurance of non-functioning.

The M15 igniter is designed to be clamped externally to the tank or fin assembly at any convenient point at which a suitable clamp has been provided or improvised. In cases where no clamp has been provided, the local ordnance officer must insure that the igniter is rigged in accordance with the best ordnance practice. The clamp must be installed so that the axis of the igniter is at 90° to the axis of the tank.

The supported cap is a cap specifically designed for use with an igniter.

See page 131 for jettisonable fuel tanks.



M 149 NOSE FUZE

RESTRICTED

U. S. ARMY NOSE FUZE

M149

(Service)

IMPACT OR BLAST PRESSURE

Data

BOMBS USED IN.	All bombs receiving AN-M103A1. See page 169
FUNCTIONING.	For Air-Burst due to blast pressure of preceding bomb dropped or instantaneous action on impact.
ARMED CONDITION . . .	12 to 13 vane revolutions, release pin out.
FUZES USED WITH . . .	None
ARMING TIME	8 to 9 vane revolutions for ejection of release pin. 12 to 13 vane revolutions to fully arm.
VANE SPAN	5.25 in.
MAX. BODY DIAMETER . .	2.5 in.
OVERALL LENGTH	7.56 in.
MATERIAL	Cadmium or zinc plated steel.

GENERAL: The M149 is a detonator-safe nose fuze for use in any G. P. bomb which can accommodate the AN-M103A1 nose fuze. The fuze is designed for both instantaneous action on impact and for air-burst a short distance above the target as a result of blast wave from the first bomb of a stick of bombs. The first bomb will detonate on impact while its blast, if of sufficient intensity, will detonate the second bomb, etc., in the air over the target. For example, if 500 lb. bombs are dropped in train at 0.05 second intervals at air speed of 200 m.p.h. (14.7 foot spacing) from 10,000 feet, the burst of the second bomb in air will be at a point approximately 7 feet ahead of (horizontal separation) the first bomb and 23 feet above (vertical separation) the first bomb. Other bombs in the stick will function the same distances from the bomb which precedes them.

OPERATION: As the arming wire is withdrawn, the vane cup rotates. After approximately 8 or 9 turns of the vane cup the release pin is ejected by its spring. The arming stem rises under pressure of its spring, permitting the detonator slider to align itself below the flash tube. After 12 - 13 turns of the vanes the vane cup falls off and the fuze is now fully armed. Bombs fuzed with the M149 should be released in close train to take advantage of the air burst feature of the fuze. The first bomb of a stick will detonate on impact with the ground; impact simply snaps the diaphragm to its reversed position causing the firing pin to strike the primer.

The second bomb of the stick will be detonated by the pressure blast of the first bomb. The blast of the first bomb will cause the diaphragm in the fuze of the second bomb to snap over while the bomb is still in the air a relatively short distance above the target and thus cause detonation. The third bomb will then function as the second, etc.

Should the diaphragm fail to function for air burst, the fuze can still fire from impact action.

REMARKS: When installing the M149, the vane cup should be checked to see that it is free to turn. However, DO NOT unscrew the vane cup as only a few turns are required to arm the fuze. In the armed condition the fuze must of necessity be very sensitive. Handle accordingly.

The fuze is equipped with 3 expansion chambers so that as the diaphragm snaps in, it will not be resisted by an air cushion, which might prevent complete inward movement of the diaphragm.

This fuze is detonator safe. In the unarmed position, the detonator is lined up with the safety expansion chamber. If the detonator should function prematurely, the force of detonation is dissipated in this cavity, and will not set off the lead-in and booster charges.

Production of the M149 fuzes has been discontinued, since VT fuzes offer better assurance of air burst.

VT BOMB FUZES

The VT Principle of Fuzing

The VT principle of fuzing makes possible the detonation of explosive ordnance in such a position upon approach to a target that maximum fragmentation damage is obtained. Fuzes utilizing this principle of operation initiate detonation by electrical interaction involving closeness of the target, and rate of approach of the fuze to the target, both factors necessarily being present to a certain definite degree before the fuze operates. These fuzes operate entirely automatically, no time setting being necessary or possible. Each fuze is designed to operate at the most effective point for the specific weapon in which it is to be used and is not effective in other weapons.

Two different types of VT bomb fuzes are in production and use; the ring type (see T50E1) and the bar type (see M166). They are similar in operation but somewhat different in behavior. The ring type is more sensitive to passing targets and generally gives lower bursts upon direct frontal approach to a target. The bar type is quite sensitive to targets directly in front of it and correspondingly less sensitive to passing targets. This gives the possibility of selecting a fuze to give burst heights where desired for a specific target. The ring type is excellent for defoliating trees because it is more sensitive to tree tops; it is also good for roof top bursts against tall city buildings. The bar type gives higher bursts over flat ground and tends to pass tall trees or buildings, waiting to burst on approach to the surface.

The bar type fuze can be used effectively in any bomb with a fuze well that will accommodate the AN-M103 nose fuze while the ring type, although it fits the same fuze well, can be used only in the bomb sizes for which it is specified. When used in improper bombs, very low bursts, 3' - 10' will generally be obtained with ring type fuzes.

Factors Affecting Burst Height

The burst height that will be obtained depends on certain factors which may be tabulated as follows: (1) factors over which user has no control - fuze sensitivity, nature of target, size and height of the target, and; (2) factors over which user has control - size of bomb, height of release, aircraft speed at time of release.

Fuze sensitivity is adjusted in design and manufacture to give the most effective burst heights for the particular ordnance items for which the fuze is to be used; i.e., a fuze for use against ground targets will have a lower sensitivity than a fuze for use against aircraft because the target is larger and therefore influences the fuze more strongly. No changes in sensitivity can be made after manufacture is complete.

The size and type of target will affect burst heights. A larger target will naturally have a greater effect on the fuze and cause it to operate earlier. A wet target has more influence on the fuze. Burst heights over water will be approximately double those over average land. Marshy land will fall in between these figures. Very dry land or dry sand will cause burst heights about 2/3 as high as average land. Burst heights are normally given in relation to average land unless specifically indicated otherwise.

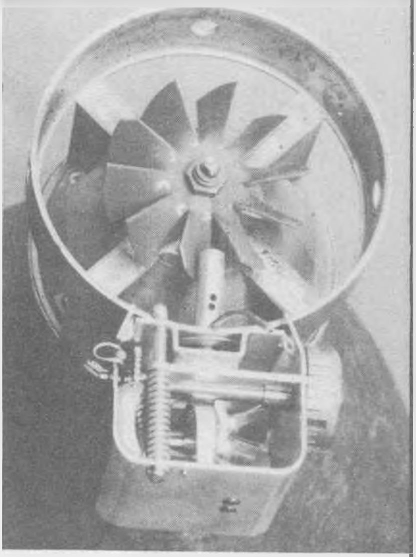
A mass of tall trees or large buildings will increase burst heights over land in their vicinity but the increase in burst height will be somewhat less than the height of objects, the degree of influence being dependent on the density of the object.

The size of the bomb in which the fuze is used will vary burst heights widely, but in no predictable pattern. Burst heights are tabulated for various bomb sizes with different VT fuzes and the tables must be followed in predicting burst heights.

The height of release and air speed at time of release affect burst heights by controlling the rate and angle of approach of the fuze to the target. In general the ring type fuzes are influenced by angle and rate of approach while the bar type fuzes are rather insensitive to these differences. Bursts with ring type fuzes are generally lower as the angle of approach nears the vertical. However, burst heights of ring type fuzes increase with approach speed up to a certain point. By balancing these factors of approach speed and approach angle, fairly constant burst heights have been obtained for straight bombing at altitudes of less than 10,000 ft. At altitudes of release above 10,000 feet, burst heights are reduced somewhat. However, for any given altitude of release on level bombing runs, bursts will be higher with greater plane speeds when using ring type fuzes because approach angle will be less vertical.

The air travel necessary to cause a VT bomb fuze to arm is designated as SAT (Safe Air Travel). Min. SAT, the minimum safe air travel, of any fuze in a lot is stencilled as part of the ordnance nomenclature on each fuze of the lot. No fuze will arm at less air travel in any bomb than the figure specified as Min. SAT on the fuze. These figures of Min. SAT are obtained from test droppings of representative samples of the lot in 100 lb. bombs. All fuzes of the lot will be armed in a spread of 600' after Min. SAT. That is, if a Min. SAT of 3600 feet were specified on a lot of fuzes, none would be armed at 3600 feet of air travel and they would all be armed at 4200'. Min. SAT will be longer for larger bomb sizes due to reduced air-stream velocity over the vanes. These increases are as follows for various bomb sizes: 260 lb. AN-M81, 3%; 250 lb. AN-M57, 12%; 500 lb. AN-M64, 24%; 1000 lb. AN-M65, 33%; 2000 lb. AN-M66, 43%.

Under certain conditions, it is desirable to delay arming of VT fuzes longer than the Min. SAT provided in the fuze. When flying stack formation with other units of the formation flying 2000' or more below, or with a large fighter cover working below, if the fuzes were armed in the normal time and passed near the lower friendly aircraft, influence bursts would occur causing casualties to friendly craft. To prevent this, mechanical arming delays for attachment to these fuzes have been developed. These M1 (T2E1) Air Travel Arming Delays are so installed that they prevent spring loaded arming pin from releasing the fuze vanes for a preset air travel distance.



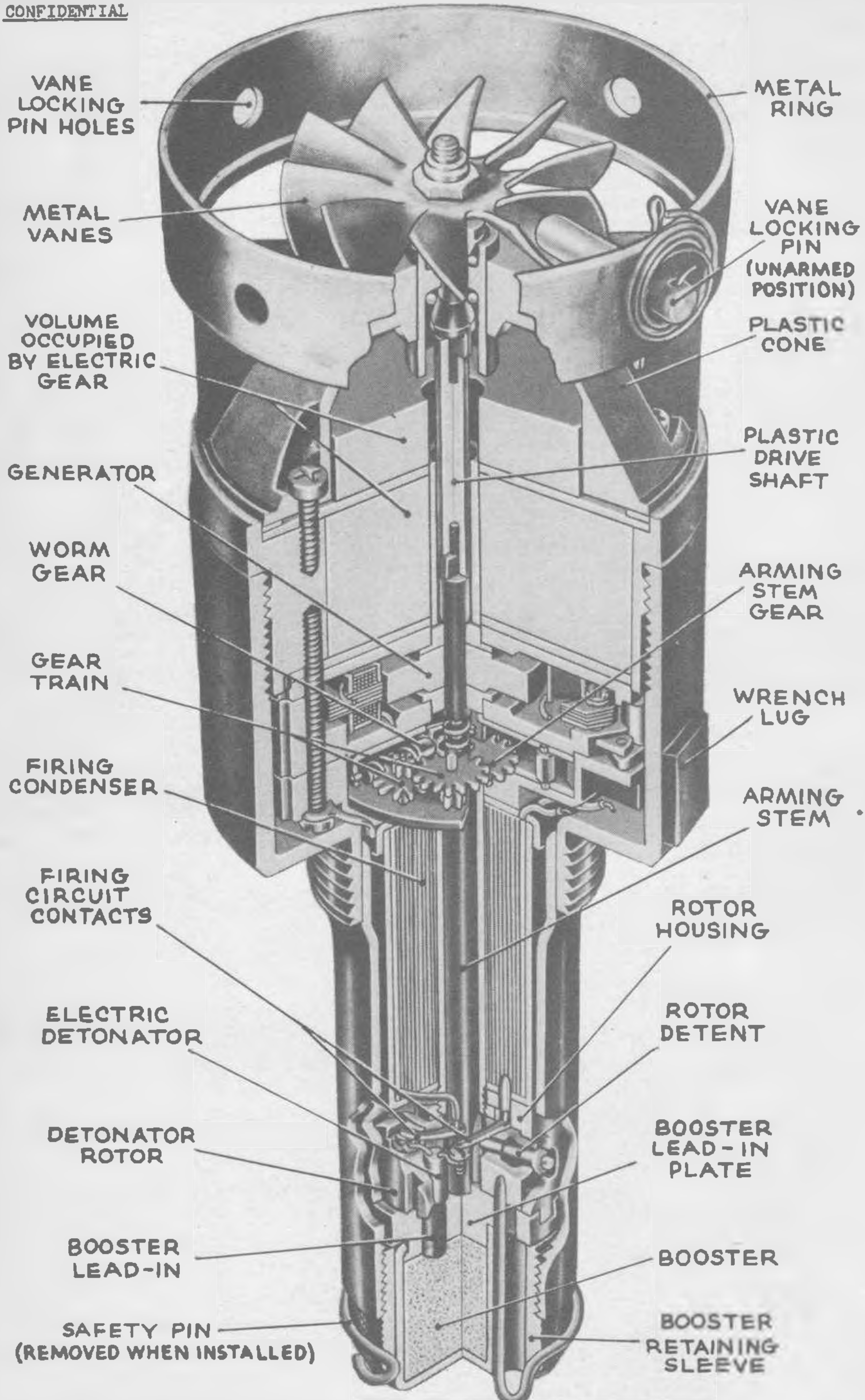
MI (T2EI) AIR TRAVEL ARMING DELAY

Start of fuze arming may be delayed by use of this device through air travel distances up to an additional 20,000 feet.

These fuzes are not to be partially prearmed by turning the vanes to make possible use from lower release altitudes. Casualties to the carrying aircraft will usually result. Bombs fuzed with VT fuzes may be jettisoned safely unarmed and detonation will not occur.

Salvo release of armed VT fuzed bombs is not recommended because an early function of one fuze will cause detonation of all bombs of the group by interaction. These fuzes are designed to function upon a sudden change in their surroundings and detonation of one bomb of a salvoed group will cause them all to function. For the same reason, minimum train spacing should be greater than 50 feet for 100 lb. bombs and 100 feet for 500 lb. bombs to assure that early functions of one bomb of the group will not cause interaction on other fuzes of the "stick".

CONFIDENTIAL



T89-T90 VT BOMB NOSE FUZE (ARMED)

CONFIDENTIAL

U. S. ARMY - NAVY FUZE

T50E1, T89
T50E4, T90

Aerial Burst, VT Nose Fuze

BOMBS USED IN:	
T50E1, T89	AN-M30 100 lb. G.P. AN-M57 250 lb. G.P. AN-M66 2000 lb. G.P. AN-M88 220 lb. Frag. M81 260 lb. Frag.
T50E4, T90	AN-M64 500 lb. G.P. AN-M65 1000 lb. G.P. AN-M78 500 lb. Chem. AN-M79 1000 lb. Chem.
FUNCTIONING	Automatic aerial burst, 10-40 ft. above ground.
ARMED CONDITION	If vanes are free to rotate, assumed to be armed (Unless safety pin can be inserted as in T89 and T90)
ARMING TIME	3600 ft. min. SAT (some lots of T50E4 3100 ft)
FUZES USED WITH	AN-M100A2 series normally; M160 series
OVERALL LENGTH	10.4 in.
MAXIMUM BODY DIAMETER. .	3.4 in.
MATERIAL	Steel body, plastic top, metal ring, steel or plastic vanes.

GENERAL: These are VT fuzes of the ring type. They are designed to detonate the bomb at a point above the earth which will give effective fragmentation. These ring type fuzes are especially sensitive to "passing objects" and therefore are useful in defoliating by blast and in getting roof top bursts in city areas.

At the present stage of development approximately 80% of the fuzes will operate properly upon approach to the target; up to 15% may function spontaneously after arming but before approaching the target; and 5% will be inoperative.

OPERATION: When the bomb is dropped the arming wire is pulled, releasing the spring-loaded vane locking pin which jumps out, freeing the vanes for rotation. The vanes rotate and drive the electric generator and the worm and spur gear reduction train. After the required number of vane revolutions, the detonator lines up with the booster lead-in and at the same time becomes electrically connected to the firing circuit. The rotor detent in the detonator rotor snaps into a hole in the rotor housing, locking the detonator in the armed position and at the same time withdrawing from the keyway in the arming stem. The vanes continue to rotate at high speed, driving the generator which in the meantime has activated the VT element and charged the firing condenser. The fuze is now armed.

Upon approach to the target under the proper conditions, the VT element activates the firing circuit which discharges the firing condenser through the electric detonator, initiating the explosive train.

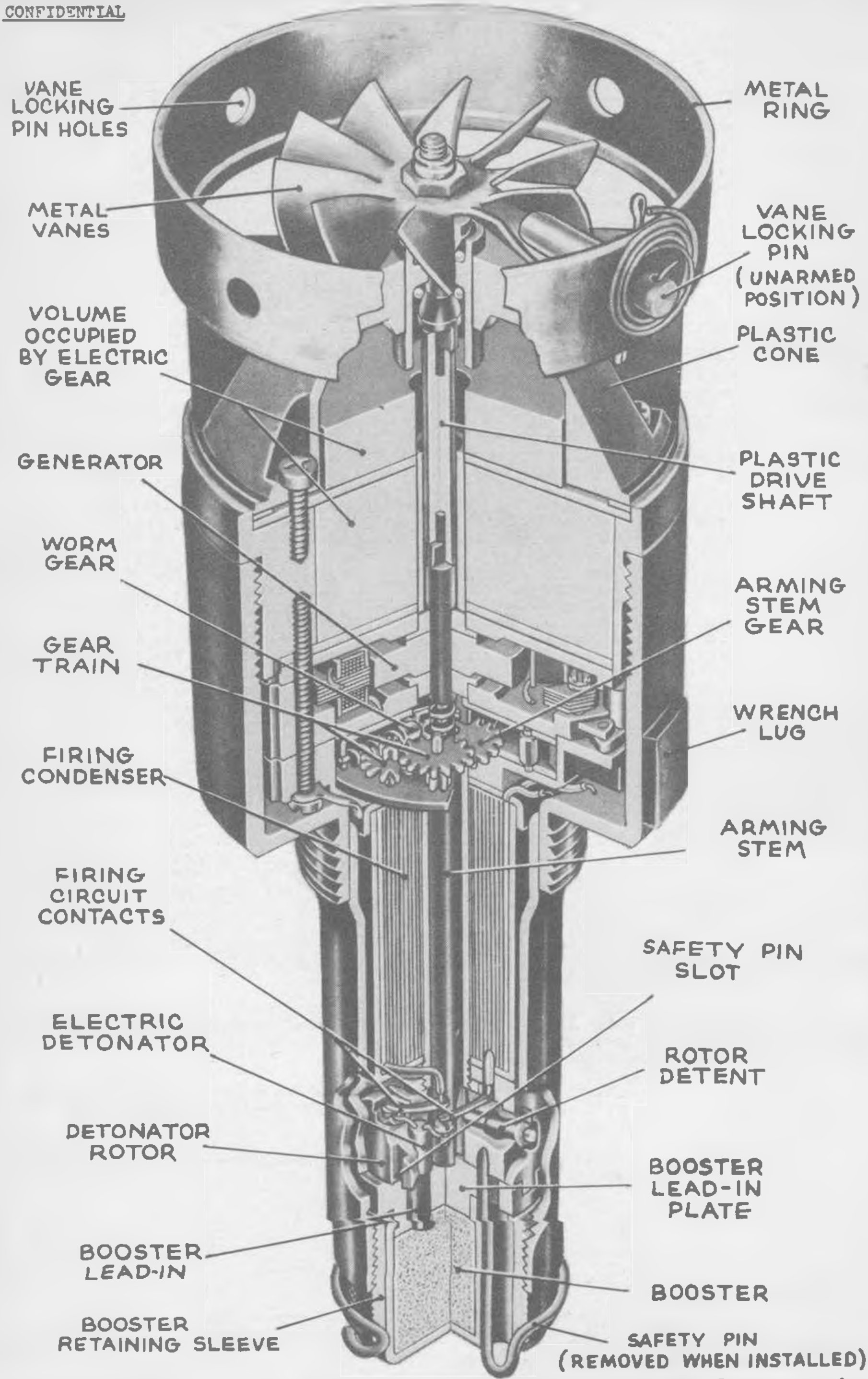
REMARKS: These fuzes are mechanically interchangeable with the AN-M103 nose fuze but are not tactically interchangeable with impact fuzes or with each other. If the T50E1 or T89 fuzes are used in bomb sizes for which the T50E4 or T90 fuzes are specified, very low air bursts will result. The same is true for the reverse transposition.

Some lots of the T 50E4 cannot accommodate the M1 (T2E1) Air Travel Arming Delay because of a much heavier steel ring around the vanes. No delayed arming can be accomplished on these lots of fuzes.

The T89 and T90 have a safety pin running alongside the booster to secure the detonator rotor in the unarmed position. Before installation in a bomb, the safety pin should be removed and reinserted. If it cannot be reinserted, the fuze is armed or partially armed and should be destroyed.

The T50E1 and T50E4 do not have the booster safety pin so if a fuze is found with the vane locking pin gone and the vanes free to rotate, it must be considered armed and should not be used.

Vanes may be either 10 bladed steel vanes or three bladed plastic vanes, interchangeably.



T91-T92 VT BOMB NOSE FUZE (ARMED)

CONFIDENTIAL

U. S. ARMY-NAVY FUZE

T91, T92

Aerial Burst, VT Type Nose Fuze

BOMBS USED IN:	
T91	AN-M30 100 lb. G.P. AN-M57 250 lb. G.P. AN-M88 220 lb. Frag. M81 260 lb. Frag. AN-M66 2000 lb. G.P.
T92	AN-M64 500 lb. G.P. AN-M65 1000 lb. G.P. AN-M78 500 lb. Chem. AN-M79 1000 lb. Chem.
FUNCTIONING	Automatic aerial burst, 30-60 ft. above ground when released below 10,000 ft.
ARMED CONDITION . . .	If vanes free to rotate, assumed to be armed unless safety pin can be inserted.
ARMING TIME:	
T91	2000 ft. Min. SAT
T92	2600 ft. Min. SAT
FUZES USED WITH . . .	AN-M100A2 series normally; M160 series
OVERALL LENGTH	10.4 in.
MAX. BODY DIAMETER . .	3.4 in.
MATERIAL	Steel body, plastic top, metal ring, steel or plastic vanes.

GENERAL: These are VT fuzes of the ring type, similar to the T50E1 series. They are designed to detonate the bomb at a point above the earth which will give effective fragmentation. The T91 and T92 differ from the T50E1 group in that they have greater sensitivity and are specially designed to be used for low level, medium level, and dive bombing. These ring type fuzes are especially sensitive to "passing" objects and therefore are useful in defoliating by blast and in getting roof top bursts in city areas.

At present, about 80% will operate properly upon approach to the target; 15% may function spontaneously after arming, and 5% will be inoperative. These fuzes have Min. SAT reduced to 2000 or 2600 ft. for use in low, medium and dive bombing. SAT can be extended by use of the M1(T2E1) Air Travel Arming Delay.

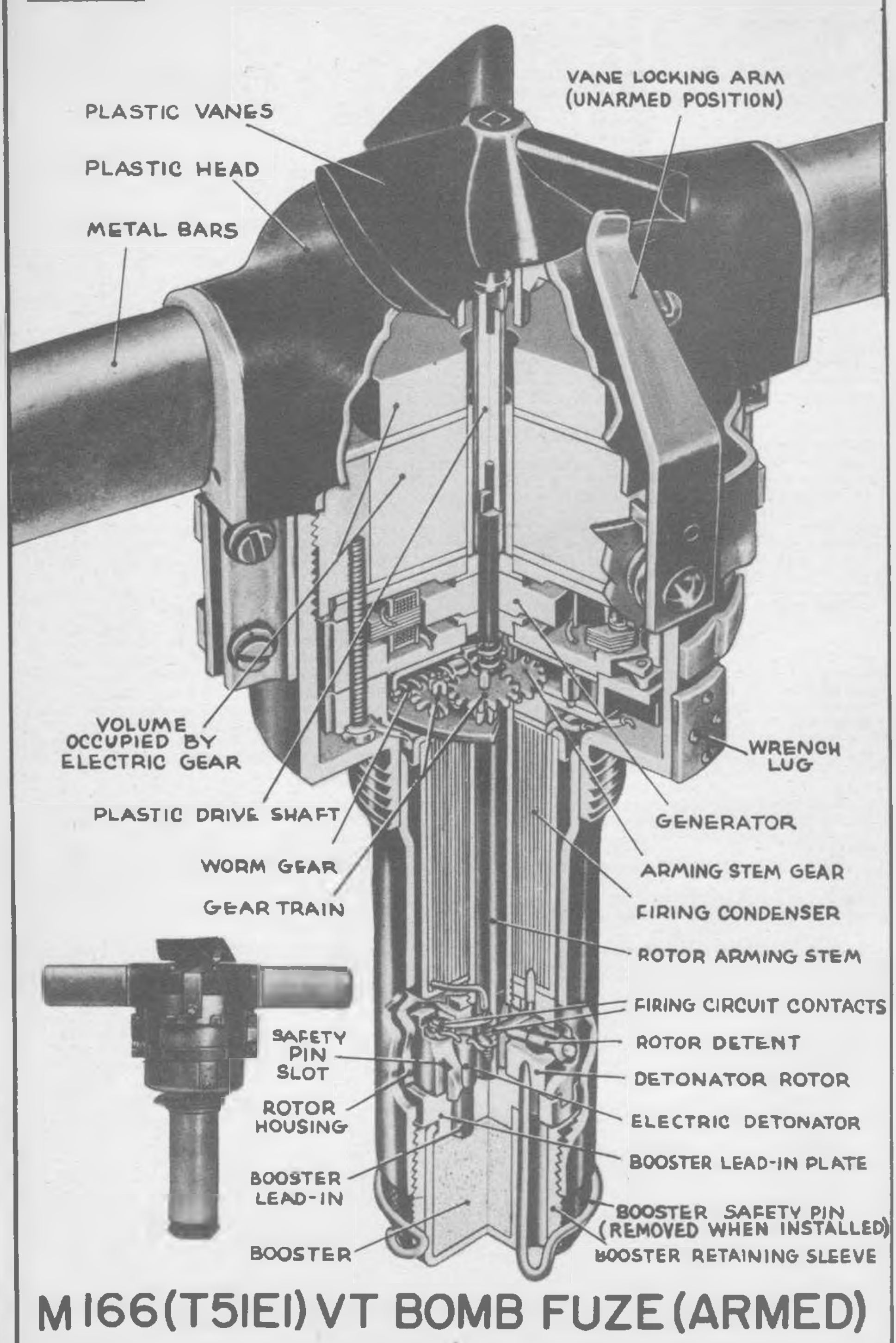
OPERATION: When the bomb is dropped, the arming wire is pulled releasing the spring-loaded vane locking pin which jumps out, freeing the vanes for rotation. The vanes rotate and drive the electric generator and the worm and spur gear reduction train. After the required number of vane revolutions, the detonator lines up with the booster lead-in and at the same time becomes electrically connected to the firing circuit. The rotor detent in the detonator rotor snaps into the socket in the rotor housing, locking the detonator in the armed position and at the same time withdrawing from the keyway in the arming stem. The vanes continue to rotate, driving the generator which has in the meantime activated the VT element and charged the firing condenser. The fuze is now armed.

Upon approach to a target under the proper conditions, the VT element activates the firing circuit which discharges the firing condenser, through the electric detonator, initiating the explosive train.

REMARKS: These fuzes are mechanically interchangeable with the AN-M103 series nose fuzes but are not tactically interchangeable with impact fuzes or with each other. If the T91 fuze is used in bomb sizes for which the T92 is specified, very low air bursts will result. The same is true for reverse transposition.

These fuzes are not to be used for horizontal bomb runs because the Min. SAT is such that the fuzes may be completely armed when only 250 ft. below the carrying aircraft and early bursts in this position would cause damage to the plane.

The following fuzes have been issued: T91, T91E1, T92, T92E1, T92E2, T92E3. They differ in that the T91, T92, and T92E2 have a booster safety pin, making them identical in appearance to the T89 and T90. The T92E2 and T92E3 are modified electrically to give slightly better operating efficiency. Vanes may be either 10 bladed steel vanes or three bladed plastic vanes.



M166(T51E1) VT BOMB FUZE (ARMED)

CONFIDENTIAL

U. S. ARMY-NAVY FUZE

M166(T51E1)

Aerial Burst, VT Type Nose Fuze

BOMBS USED IN	All bombs receiving AN-M103A1 fuze, except AN-Mks 41, 47, 53, 54 Depth.
FUNCTIONING	Automatic aerial burst, 40-60 ft. above ground.
ARMING TIME	3600 ft. Min. SAT
FUZES USED WITH . . .	AN-M100A2 series normally; M160 series.
OVERALL LENGTH	10.4 in.
MAX. BODY DIAMETER . .	10.0 in. (across bars)
MATERIAL	Steel body, plastic top, two aluminum bars athwartships, plastic vanes.

GENERAL: This is a VT fuze of the bar type. It is designed to detonate the bomb at a point above the earth which will give effective fragmentation. This fuze is more sensitive to head on approach to a target than the ring type and less sensitive to "passing" objects. It can be used interchangeably in any bomb which will take the AN-M103A1 when air burst is desired except in the depth bombs noted above where the air stream does not give sufficient velocity to the vanes because of the flat nose.

At the present stage of development, approximately 85% of the fuzes will function properly on approach to the target, a small percentage will be inoperative, and the remainder will function spontaneously after arming but before approaching the target.

OPERATION: When the bomb is dropped, the arming wire is pulled, releasing the spring-loaded vane locking arm which jumps off freeing the vanes for rotation. The vanes rotate and drive the electric generator and worm and spur reduction train. After a minimum number of vane revolutions, the detonator lines up with the booster lead-in and at the same time becomes electrically connected to the firing circuit. The rotor detent in the detonator rotor snaps into a hole in the rotor housing, locking the detonator in the armed position and at the same time withdrawing from the keyway in the arming stem. The vanes continue to rotate driving the generator which in the meantime has activated the VT element and charged the firing condenser. The fuze is now armed.

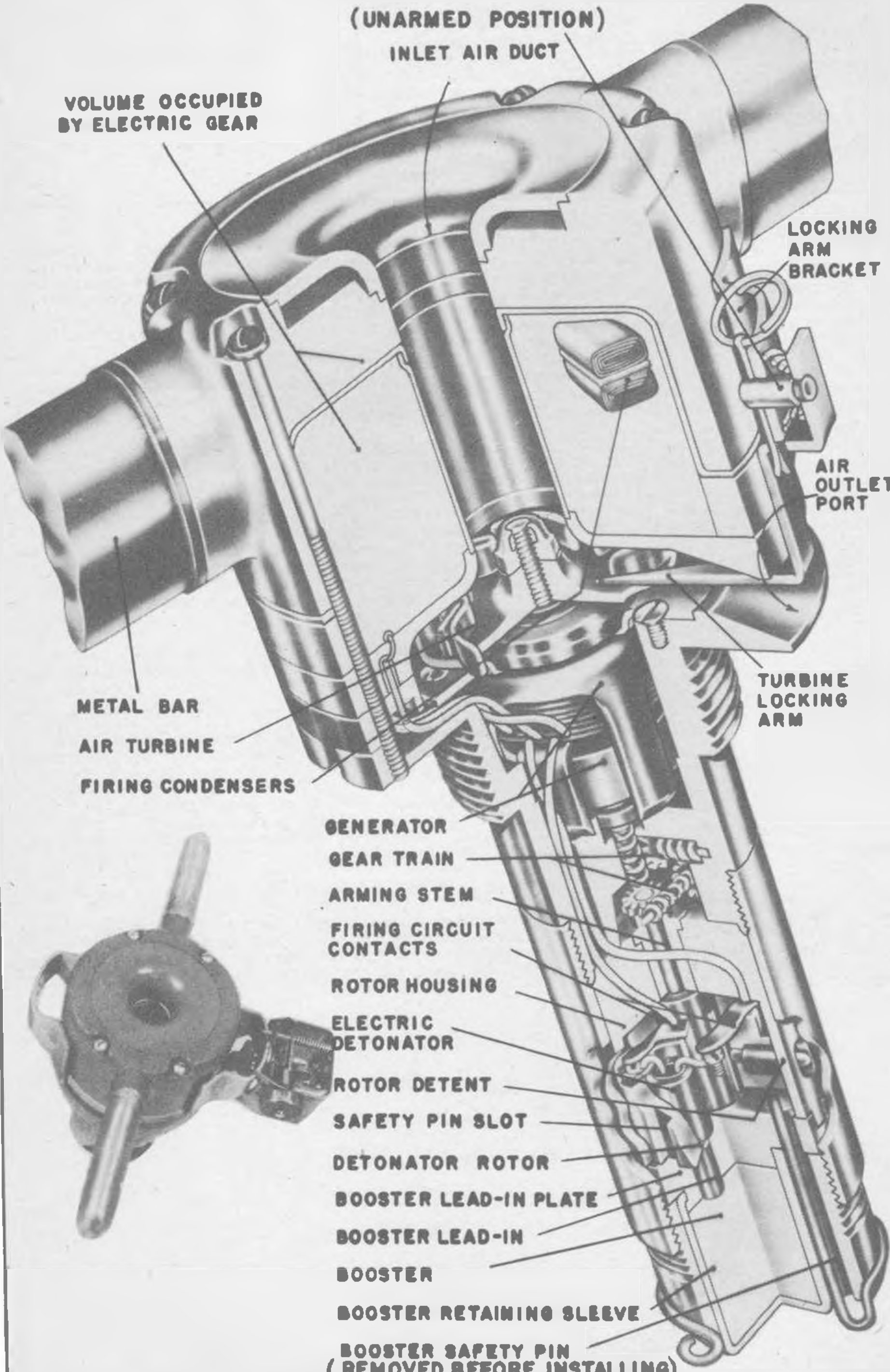
Upon approach to the target under proper conditions, the VT element activates the firing circuit which discharges the firing condenser through the electric detonator initiating the explosive train.

REMARKS: Arming may be further delayed by use of M1 (T2E1) Air Travel Arming Delay. The device clamps onto a bracket, preventing the vane locking arm from releasing the vanes until the preset air travel on the M1 device has been completed.

This fuze has a safety pin running alongside the booster to secure the detonator rotor in the unarmed position. Before installation in a bomb the safety pin should be removed and reinserted. If it cannot be reinserted, the fuze is armed or partially armed and should be destroyed.

The bars of this fuze should not be used to tighten the fuze into the bomb and should be carefully protected from strain or shock. This fuze is not generally recommended for use in bombs less than 10 in. in diameter because of the possibility of damaging the bars in bombing up the plane and in releasing the bombs. Damage to the bars will cause a malfunctioning of the fuze. A few fuzes of this type were issued as the T51 with a 4500 ft. Min. SAT but with other characteristics identical to the M166(T51E1).

T 82 VT BOMB NOSE FUZE (ARMED)



CONFIDENTIAL

BOMBS USED IN	All bombs receiving AN-M103A1 fuze.
FUNCTIONING	Automatic aerial burst 40-60 ft. above ground.
ARMING TIME	3600 ft. Min. SAT
FUZE USED WITH	AN-M100A2 series normally; M160 series.
OVERALL LENGTH	8.4 in.
MAX. BODY DIAMETER . .	10.0 in. (across bars)
MATERIAL	Steel body, plastic top, two aluminum bars athwartships.

U. S. ARMY-NAVY FUZE

T82

Aerial Burst, VT Type Nose Fuze

GENERAL: This is a VT fuze of the bar type. It is designed to detonate the bomb at a point above the earth which will give effective fragmentation. This fuze, like the M166, is more sensitive to head-on approach to a target than the ring type and less sensitive to "passing" objects. It can be used interchangeably in any bomb which takes the AN-M103A1 when air burst is desired.

At the present stage of development, approximately 90% of the fuzes will function properly upon approach to the target and the remainder will either function spontaneously after arming but before approaching a target, or will be inoperative.

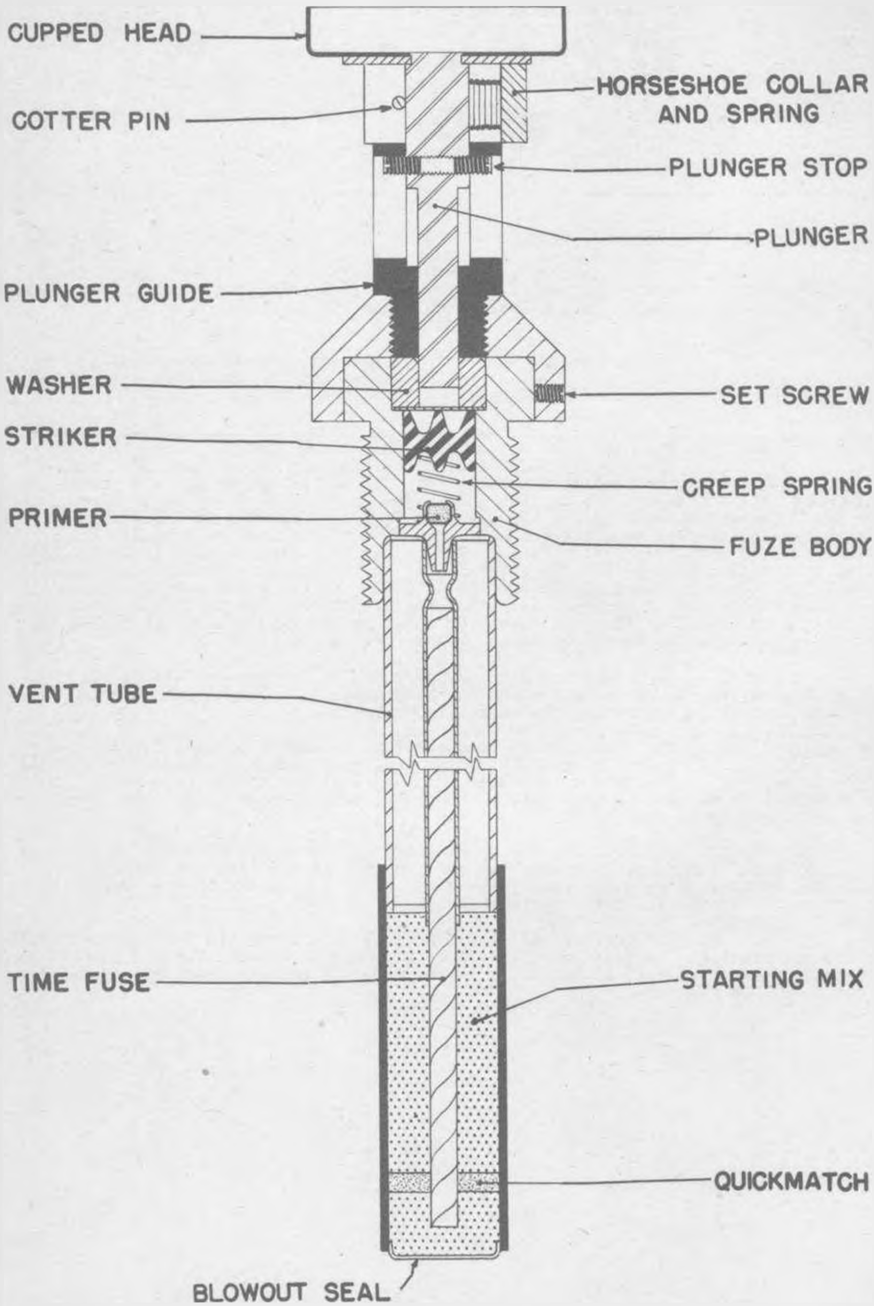
OPERATION: When the bomb is dropped, the arming wire is pulled releasing the spring-loaded turbine locking pin which jumps out freeing the turbine for rotation. The air stream enters the cavity in the fuze head, blows over the air turbine and leaves through the lower ports, around the turbine. The air turbine drives the electric generator mounted in the fuze stem and the gear reduction system. After a minimum number of turbine revolutions, the detonator lines up with the booster lead-in and at the same time becomes electrically connected to the firing circuit. The rotor detent in the detonator rotor snaps out into a hole in the rotor housing, locking the detonator in the armed position and at the same time withdrawing from the keyway in the arming stem. The turbine continues to rotate at high speed, driving the generator which has in the meantime activated the VT element and charged the firing condenser. The fuze is now armed.

Upon approach to a target under the proper conditions, the VT element activates the firing circuit which discharges the firing condenser through the electric detonator, initiating the explosive train.

REMARKS: The fuze differs from previous generator energized bomb nose fuzes in that the entire generator and arming system is mounted inside the fuze stem which fits inside of the fuze well. The firing condenser is carried in that part of the body section which is outside of the bomb and will usually be demolished.

The Min. SAT may be extended by use of the M1 (T2E1) Air Travel Arming Delay which clamps onto a bracket around the body of the fuze and prevents the spring-loaded turbine locking pin from jumping out, and freeing the turbine until the preset air travel of the M1 (T2E1) device has been completed.

The booster safety pin in this fuze locks the detonator rotor in the unarmed position. Before installation of the fuze in a bomb, the pin should be pulled and reinserted. If it cannot be reinserted, the fuze is armed or partially armed and should be destroyed.



NOSE FUZE MK.3 MOD.1 WITH ADAPTER MK.1

MK 3 MOD 1
WITH ADAPTER MK 1

Data

BOMBS USED IN.	Mk 1 Mod 1, Mod 2, and Mk 3 Mod 0 Aircraft Floating Smoke Bombs
FUNCTIONING.	18 second delay after impact
ARMED CONDITION. . . .	When arming wire and spring loaded horseshoe collar are removed.
FUZES USED WITH. . . .	None
ARMING TIME	Instantaneous

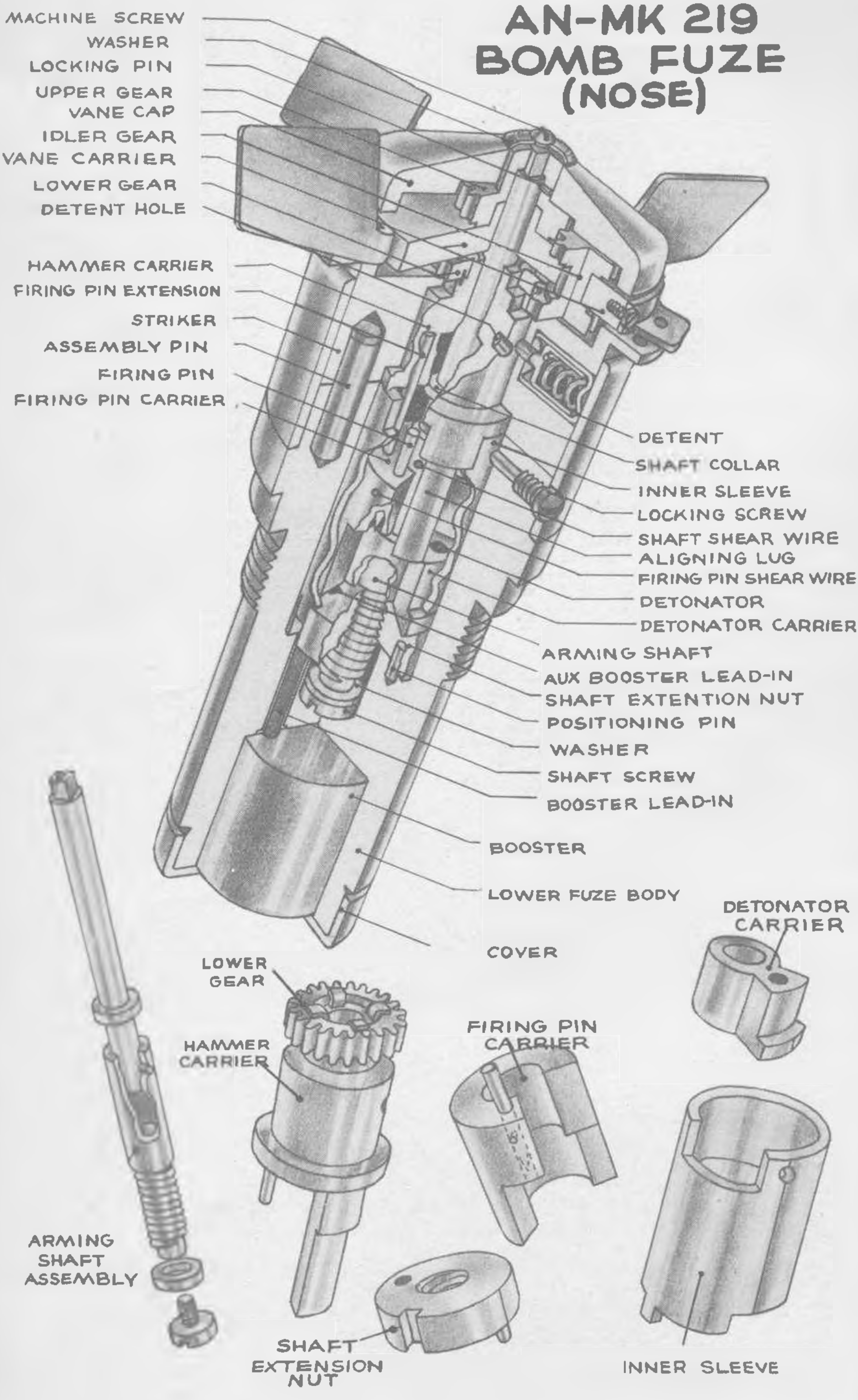
GENERAL: The Mk 3 Mod 1 is a water impact fuze designed as an integral part of each bomb in which it is used. It consists of a fuze body, mounted in the nose of the bomb, and a vent tube assembly running through the HC filler of the bomb. A washer in front of the fuze body serves to retain the firing pin which is held away from the primer by a creep spring. The primer is mounted over a length of time fuse which extends to a quickmatch increment in the starting mixture at the rear of the vent tube. The after end of the vent tube is sealed with a blow-out disc.

The Mk 1 Adapter is attached to the protruding fuze body to insure fuze functioning on either water or land impact. The adapter, which is attached to the protruding body by three set screws, consists of a cup-shaped head mounted on a freely moving plunger. The plunger, which is held in its guide by two stop screws, will transmit any blow on the cup to the firing pin. A spring loaded horseshoe collar is mounted beneath the cup to hold the plunger away from the firing pin.

OPERATION: Upon the release of the bomb, the arming wire is pulled, releasing the spring loaded horseshoe collar which falls away from the adapter. The fuze is armed. On impact with either land or water, the plunger drives the striker into the primer. The primer ignites the time fuse which burns for 18 seconds and then sets off the quickmatch and starting mixture. The starting mixture ignites the HC filler. As pressure builds up in the vent tube, the seal is blown out and since the bomb floats nose down, the smoke passes out through the after end of the vent.

REMARKS: In using smoke bombs for screening landing operations, it was found that a fair number of bombs were dropped on land and the fuze did not function. The addition of the Mk 1 adapter insured functioning of the fuze on either land or water impact.

AN-MK 219 BOMB FUZE (NOSE)



ARMY-NAVY FUZE

AN-MK 219

(Service)

MECHANICAL IMPACT

(Rotor System Arming)

Data

BOMBS USED IN	Mk4,Mods 100 lb. G.P. Mk5 30 lb. Frag Mk12,Mods 500 lb. G.P. Mk13,Mods 1000 lb. G.P. Mk9 L.C. Demolition,500 lb. Mk9 L.C. Demolition,1000 lb. Mk42 100 lb. Chemical All types of Depth Bombs
FUNCTIONING	Instantaneous
ARMED CONDITION	When striker flange has risen more than .31 in. from outer sleeve, and arming wire is gone.
FUZES USED WITH	Mk223 in G.P. bombs, or Mks 224,234,229 or AN-Mk230 in depth bombs.
ARMING TIME	170 vane revolutions
VANE SPAN	4.75 in(4 vanes)
MAX. BODY DIAMETER . .	2.75 in.
OVERALL LENGTH	5.5 in.(with booster)
MATERIAL	Steel, aluminum alloy, and brass parts.

GENERAL: This fuze uses the "rotor system" of arming, and the operation of this system is the same in all the fuzes that use it: AN-Mk 219, Mk 221, Mk 223, and AN-Mk 228. This fuze will function on impact with water or denser medium, providing it has been dropped from sufficient altitude to arm.

OPERATION: There are two stages of arming. During the first stage, the upper gear is free to rotate and the lower gear is held stationary. During the second stage, the lower gear is free to rotate and the upper gear is held stationary.

1st Stage: As the bomb is dropped the arming wire is withdrawn and the vanes begin to rotate in a clockwise direction. Since the idler gear is attached to the vane carrier and is in mesh with the upper and lower gears, when the vanes rotate the idler gear is caused to move about the upper and lower gears. The lower gear is attached to the hammer carrier and is locked because the hammer carrier is resting down in the inner sleeve. Since the upper gear has one more tooth than the lower gear, the upper gear will rotate in a clockwise direction one tooth for every complete revolution of the idler gear. The upper gear is positively attached to the arming shaft, and in rotating threads the arming shaft up until the head of the screw on the end of the shaft locks against the shaft extension nut. A collar on the shaft lifts the hammer carrier and the entire arming assembly. Simultaneously with the locking of the arming shaft and the upper gear, the hammer carrier clears the inner sleeve, freeing the lower gear.

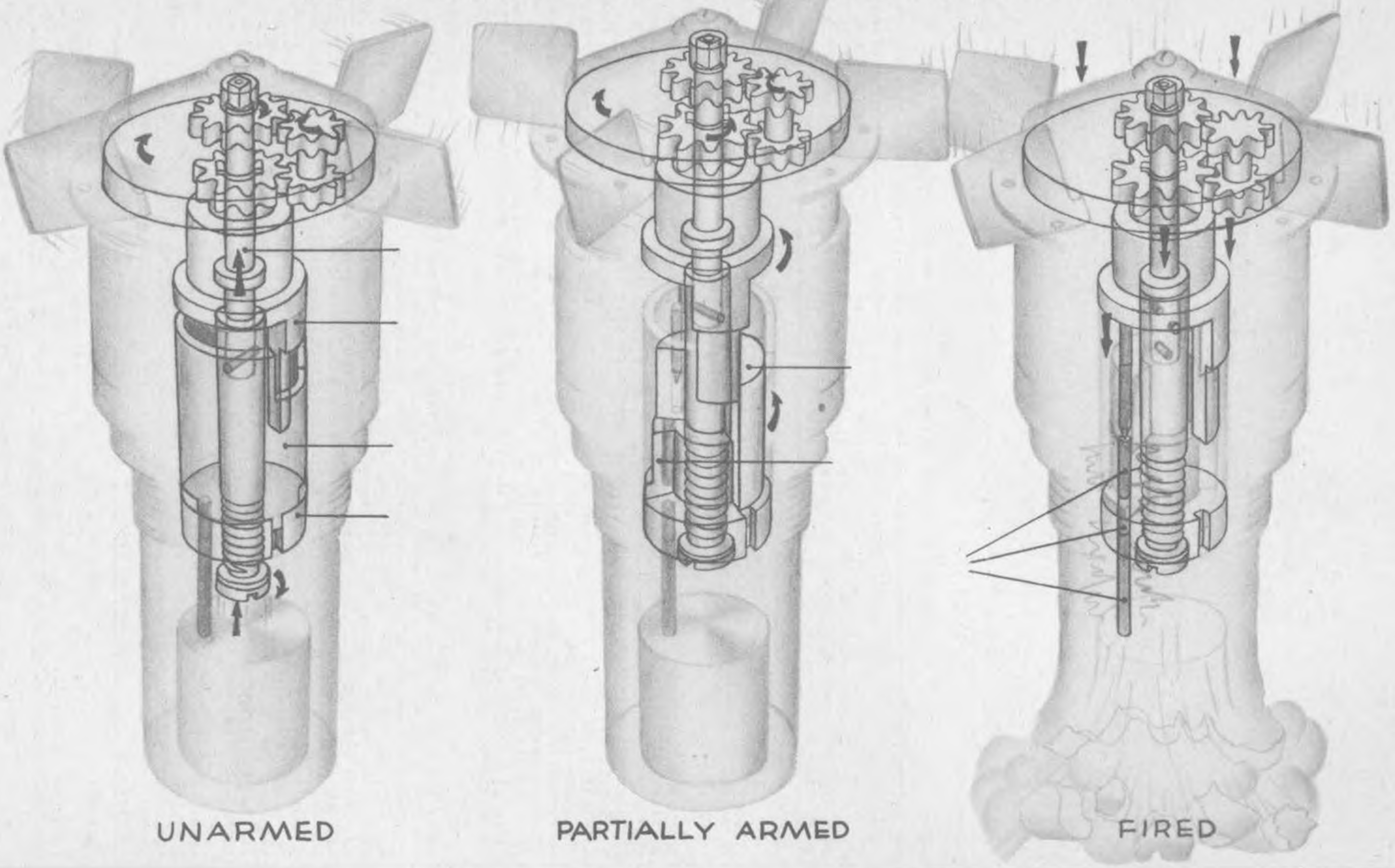
2nd Stage: The lower gear has one less tooth than the upper gear, hence as the pinion continues to revolve (now meshing with the teeth of the stationary upper gear) the lower gear and hammer carrier are rotated in a counter-clockwise direction. The aligning lug on the hammer carrier engages the firing pin carrier, lining up the firing pin extension with the firing pin. Further rotation causes the firing pin carrier to engage the detonator carrier, lining the firing pin up with the detonator. The hammer carrier, firing pin carrier, and detonator carrier continue to rotate through 180 degrees, until the lip on the detonator carrier engages the inner sleeve. Simultaneously, the spring-loaded detent in the striker snaps into a recess in the hammer carrier, thus locking the firing train components in an armed position. Since the upper and lower gears are now both locked, the two copper pins securing the lower gear to the hammer carrier are sheared and the vanes rotate freely. (If the air speed is less than 300 m.p.h., the air pressure will not be sufficient to shear the pins, and the vanes will merely cease rotating.)

The fuze is now fully armed. On impact, the entire upper assembly of the fuze is forced inward. The shear wire in the arming shaft is cut as the upper part of the shaft telescopes into the lower part and the shear wire through the firing pin is cut as the firing pin extension forces the firing pin into the detonator. The detonator sets off the auxiliary booster lead-in, booster-lead-in, booster, and main charge successively.

REMARKS: The early Mark 219, Mods 2, 3, and 4 are identical to the AN-Mk 219. The different mods merely indicated the manufacturer of the fuze. This was important only in that slight differences in the manufacture prevented the interchange of parts made by different manufacturers.

The internal parts are held in the fuze by a single master locking screw.

ROTOR SYSTEM ARMING

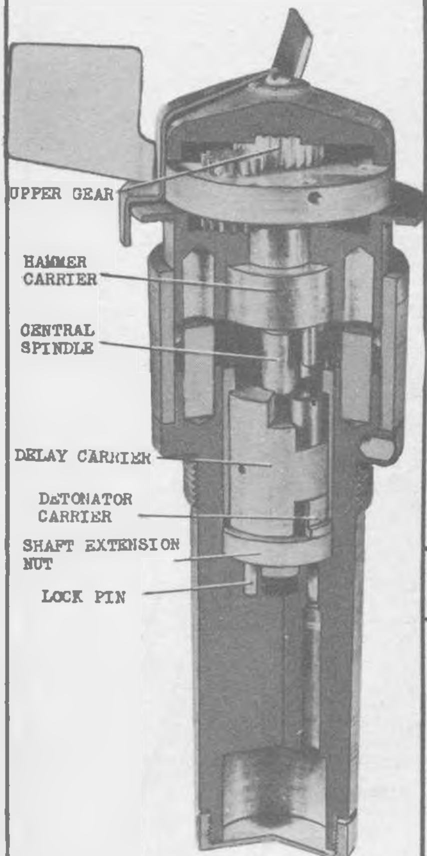


MK 221
MK 239

MECHANICAL IMPACT
(Rotor System Arming)
(Obsolescent)

Data

BOMBS USED IN:	
Mk 221.	500 lb. G.P. Mk 12 1000 lb. G.P. Mk 13
Mk 239	AN-standard G.P. bombs.
FUNCTIONING	0,01 seconds delay
ARMED CONDITION	When striker flange has risen more than 5/16" from outer sleeve, and arming wire is gone.
FUZES USED WITH:	
Mk 221	Mk 223
Mk 239	AN-M 100 Series in AN-M G.P. bombs.
ARMING TIME	Approximately 150 revolutions
VANE SPAN	5.3" (four vanes)
MAX. BODY DIAMETER	2.75"
OVERALL LENGTH	8.5" (with booster)
MATERIAL	Steel, aluminum alloy, and brass.



GENERAL: The Mk 221 is essentially the same as the Mk 219, but it incorporates the following differences:

(1) The body is longer and larger.

(2) It incorporates a delay of .01 seconds. The delay element and percussion type firing pin are housed in the delay carrier. The delay carrier corresponds to the firing pin carrier in the Mk 219.

(3) A protecting cap is over the head. The vanes are screwed to the vane carrier by four screws which pass through the protecting cap to the vane carrier.

(4) There are three lock screws instead of one.

(5) When the fuze is armed, a lock pin in the floor of the fuze body falls through an opening in the shaft extension nut, locking the rotor and delay carrier to the shaft extension nut, and thus preventing the parts from getting out of line before impact.

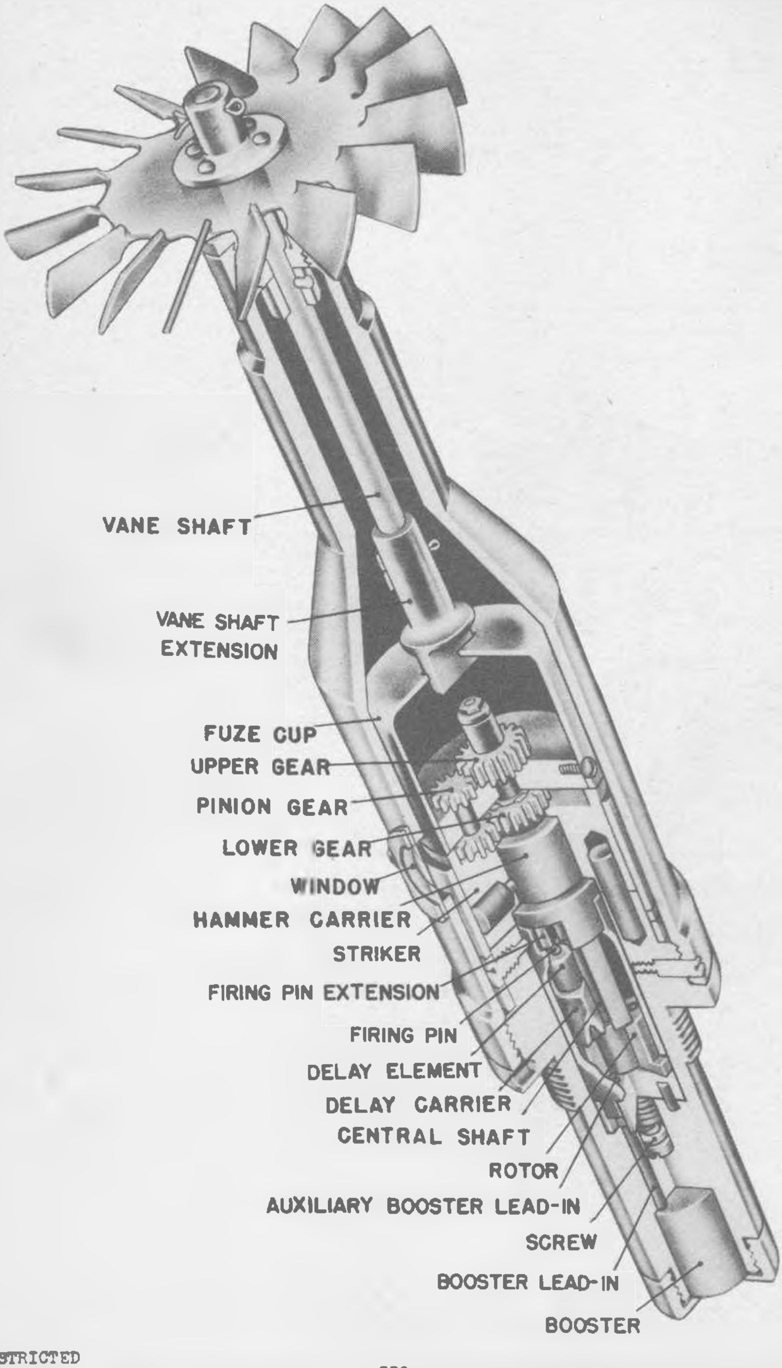
(6) The central spindle has a shear collar and a guide pin which permit the central spindle to telescope. The Mk 239 is a Mk 221 fuze modified by reducing the diameter of the fuze (extending from the booster cup to the fuze threads) from 1.875" (Mk 221) to 1.59". The Mk 239 was designed to utilize present stocks of Mk 221 fuzes in AN-standard G.P. bombs.

OPERATION: The operation of the Mk 221 and Mk 239 are the same as the operation of the AN-Mk 219 on page 235.

REMARKS: The delay element consists of a primer, delay pellet of black powder and a special detonator of fulminate of mercury; the detonator consists of fulminate of mercury mixture; and the auxiliary booster lead-in, booster lead-in, and booster consist of tetryl.

The Mk 221 will fit into the nose of the depth bomb, but the .01 second delay may allow the case of the bomb to be so damaged that a low order detonation may result. Therefore, it is not recommended that the Mk 221 be used with the depth bomb.

MK.223 TAIL IMPACT FUZE
(UNARMED POSITION)



RESTRICTED

U. S. NAVY TAIL FUZE

MK 223

(Obsolescent)

MECHANICAL IMPACT

(Rotor System Arming)

see pages 159, 160

Data

BOMBS USED IN	500 lb. G.P. Mk 12 & Mods 1000 lb. G.P. Mks 13
FUNCTIONING	0.01 sec. delay
ARMED CONDITION	When striker has risen over 5/16" above outer sleeve, as seen through window in aluminum casing.
FUZES USED WITH	AN-Mk 219 or Mk 221
ARMING TIME	150 vane revolutions
VANE SPAN	5.25" (16 vanes unpainted).
MAX. BODY DIAMETER . .	3.25"
OVERALL LENGTH	16.36"
MATERIAL	Bottle shaped external case is cast aluminum; fuze parts are steel, aluminum alloy, and brass.

GENERAL: The fuze is essentially a Mk 221 fuze with an external protective bottle shaped casing of aluminum, a vane extension shaft, and 16 vanes instead of four. This casing screws onto the fuze body and is secured by two lock screws. The lower end of the vane shaft has a flattened surface and fits into a slot in the top of the fuze cap, which is attached by screws to the pinion carrier. The fuze has a delay element in the delay carrier similar to the Mk 221, and a celluloid window in the protective casing permits inspection of the fuze to determine whether or not it is in the armed condition.

OPERATION: When the arming wire is withdrawn, the arming vanes and the vane shaft rotate. The lower end of the vane shaft engages the cap, which rotates and revolves the pinion around the inner gears, operating the reduction gearing. The alignment of the firing pin extension, delay carrier (firing pin carrier in AN-Mk 219), and detonator is similar to that of the AN-Mk 219, see page 235.

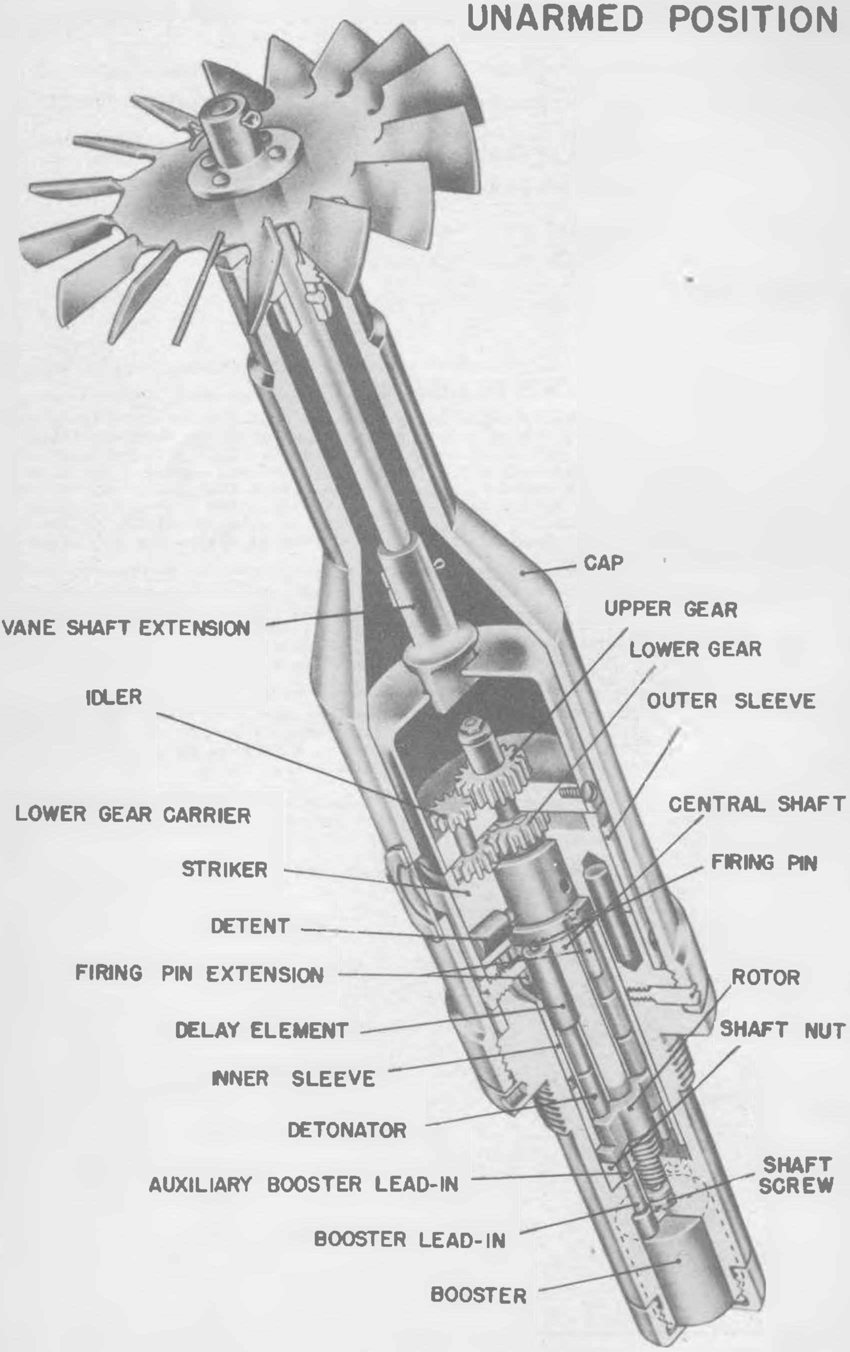
REMARKS: The central spindle in this fuze does not telescope, but the collar on the central spindle which supports the hammer carrier is held by a shear wire which breaks on impact as the cap, vane carrier, and striker move forward due to inertia.

Delay element consists of a primer, delay pellet of meal "D" black powder, and special detonator of Fulminate of Mercury mixture; and the auxiliary booster lead in, booster lead-in, and booster consist of tetryl.

The moving parts housing the firing train are held in the fuze by three locking screws.

AN-MK.228 TAIL IMPACT FUZE

UNARMED POSITION



RESTRICTED

RESTRICTED

U.S. NAVY TAIL FUZE

AN-MK 228

(Service)

MECHANICAL IMPACT

(Rotor System Arming)

Data

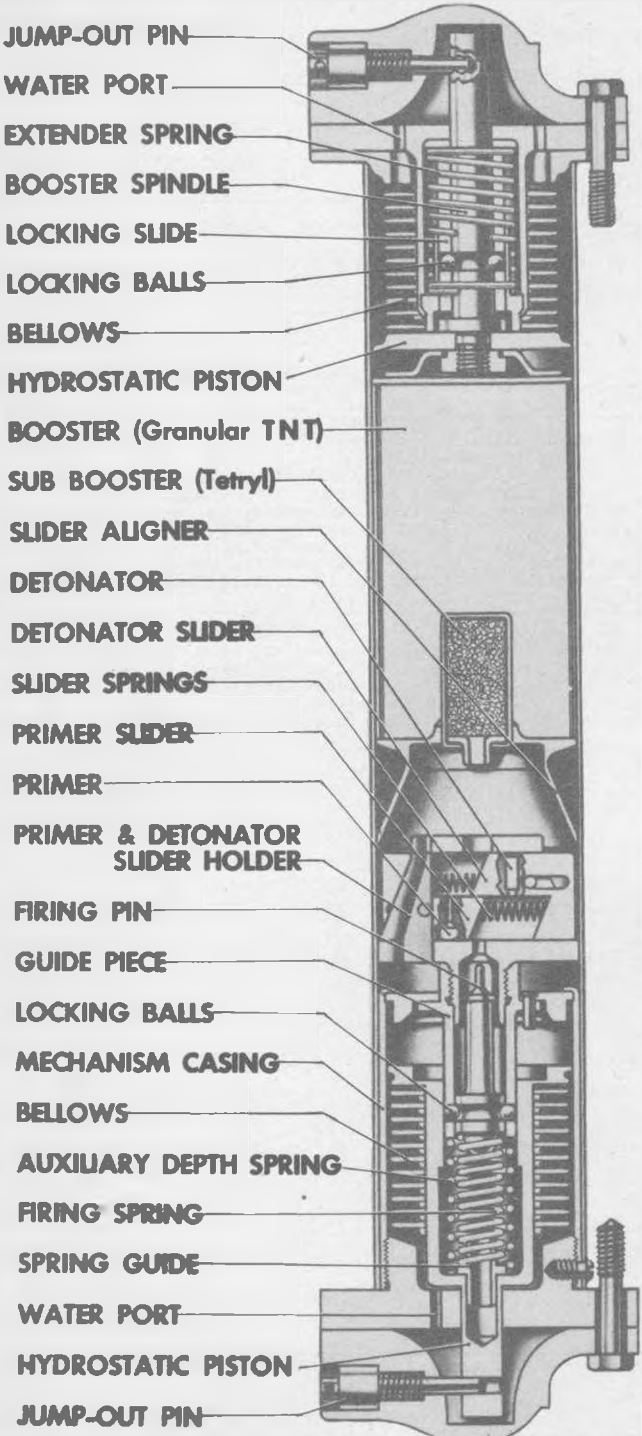
BOMBS USED IN	1000, 1600 lb. A.P. bombs.
FUNCTIONING	0.08 second delay
ARMED CONDITION	When striker flange has risen more than 5/16" above outer collar, as seen thru celluloid window.
FUZES USED WITH	None
ARMING TIME	150-160 vane revolutions
VANE SPAN	5.25" (16 vanes, painted red)
MAX. BODY DIAMETER . .	3.15"
OVERALL LENGTH	16.36" (w/booster)
MATERIAL	Steel, aluminum alloy, and brass; the brass parts are tin plated and some steel parts are cadmium plated. The bottle shaped tail support is cast aluminum alloy.

GENERAL: This fuze is similar in design and operation to the Mk 223, and is almost identical in external appearance. It is distinguished from the Mk 223 in that it has red vanes. The AN-Mk 228 has the following distinctive internal features: It has two separate explosive trains and a delay of .08 second; two firing pin extensions are fitted on the lower end of the hammer carrier. Two delay elements and two delay firing pins are housed in the delay carrier. The detonator carrier has two detonators, and the shaft extension nuts contain two auxiliary booster lead-ins which are aligned with two booster lead-ins in the fuze body. One firing pin is slightly longer than the other, so the two firing trains are not initiated simultaneously.

OPERATION: As the arming wire is pulled, the vanes rotate and turn the arming vane shaft, rotating the cap and revolving the pinion around the inner gears. Arming of the fuze then continues as in the AN-Mk 219, see page 235. The AN-Mk 228 has an added detent in the delay carrier which locks when the firing train is lined up. On impact, a shear wire through the supporting collar and spindle is cut, as the firing pin extensions force the firing pins into the primers.

REMARKS: Delay elements consist of a primer, delay charge of black powder, and special detonator of lead azide; detonator consists of lead azide; auxiliary booster lead-ins, booster lead-ins, and booster consist of tetryl.

AN-MK.224 HYDROSTATIC, ATHWARTSHIP FUZE



BOOSTER EXTENDER

BOOSTER

PISTOL

Actual size

R E S T R I C T E D

ARMY-NAVY ATHWARTSHIP FUZE

AN-MK. 224

(Obsolete)

(HYDROSTATIC)

Fuze is suspended from use

Data

BOMBS USED IN . . . . Depth bombs, Mks. 17, 29, 37, 38; AN-Mks. 17,Mod.2, 41, 44, and 47.

ARMED CONDITION . . . When jump-out pins are out, fuse is partially armed. Arming completed at 12-15' depth of water when primer and detonator are aligned with firing pin.

FUNCTIONING . . . . Water pressure at depth set for, 25, 50, 75, 100, or 125 feet of water.

FUZES USED WITH . . . AN-M 103, AN-Mk 219, or Mk 221 in nose, and Mk 229 in tail in 650 lb. depth bombs.

ARMING TIME . . . . Partially armed when dropped and arming wire is pulled, complete arming time depending on travel through water until depth at which it is set to function is reached.

OVERALL LENGTH . . . Pistol assembly - 6.9"
Booster extender assemblies - 9.9"

MAX. BODY DIAMETER. . 3.6"

MATERIAL . . . . . . Bronze, brass, steel, and aluminum.

GENERAL: This is an athwartships fuse, and is assembled in three subassemblies: pistol, booster, and booster extender. The pistol is marked for the depth at which it is set, and contains the firing mechanism and the detonator sliders. Desired depth setting is made by inserting in the proper firing pin spring and auxiliary spring if necessary, with settings of 25, 50, 75, 100, or 125 feet possible. The following table shows the springs to use for the various depth settings:

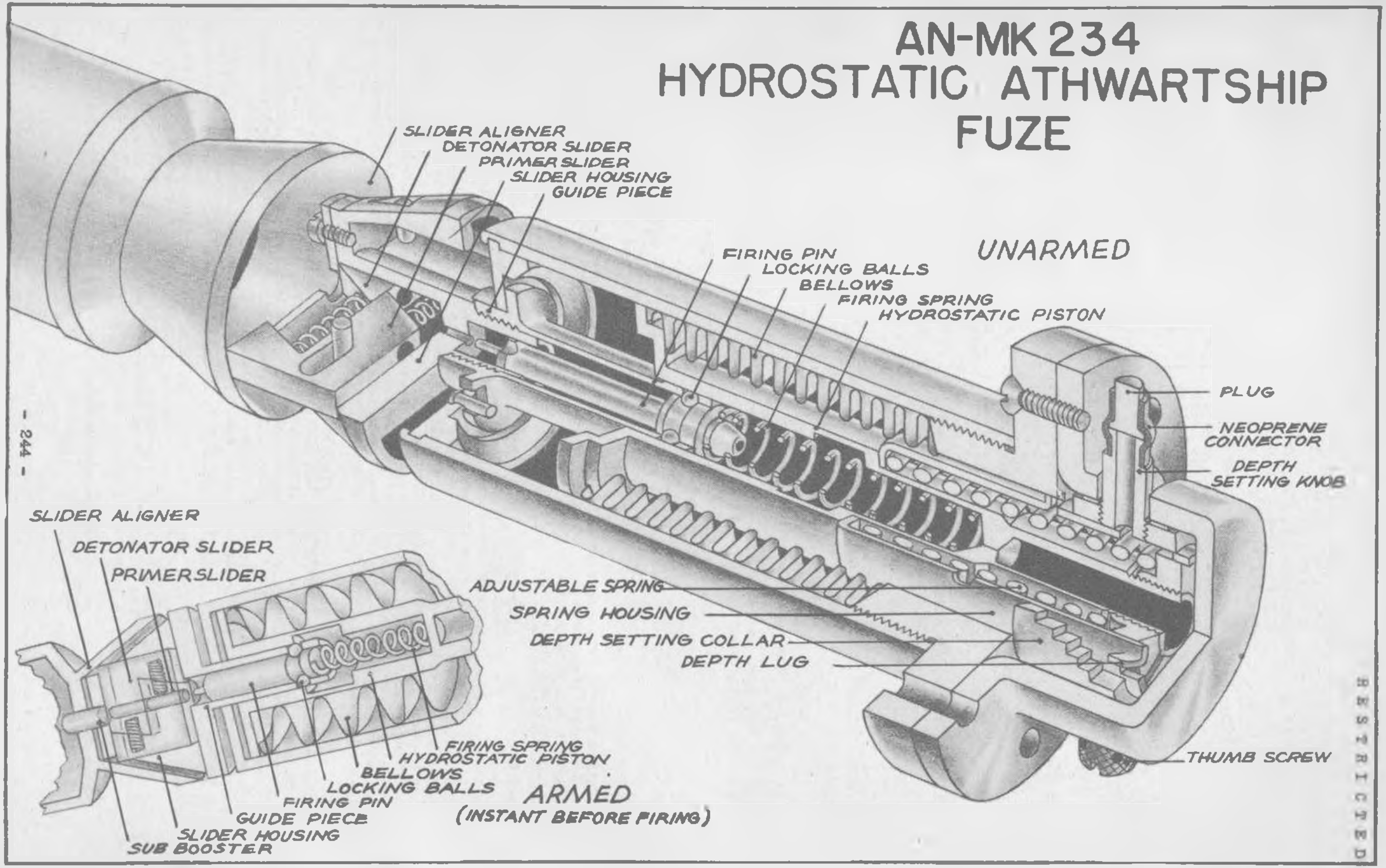
Depth	Spring Color
25 feet	Yellow
50 feet	Black
75 feet	Black & green
100 feet	Yellow and red
125 feet	Black and red

The yellow and black springs as selected actuate the firing pin and in addition serve a depth controlling purpose. Green and red springs are auxiliary depth control springs and do not actuate the firing pin. The booster extender fits into the opposite end of the transverse tube in the depth bomb.

OPERATION: (1) Action in Booster extender: As the arming wire is pulled, the jump-out pin is forced out by its spring, and water enters the assembly as the bomb becomes immersed. The water expands the bellows until it overcomes the pressure of the spring acting against the locking slide. The booster spindle and the locking slide are held together by the locking balls between them. When the water pressure has forced the piston, locking slide, and spindle inward sufficiently for the locking balls to slip into the enlarged groove in the fuse body, the entire booster extension is then free to move the remaining inch toward the pistol. The hollow-cone shaped slider aligner, bearing inward against the L-shaped primer and detonator sliders, forces them inboard against their springs, thus lining up the explosive train.

(2) Action in Pistol: As the water pressure increases and overcomes the tension of the firing and auxiliary depth springs in the piston, the bellows extend and the base of the hydrostatic piston moves down over the firing pin guide piece. This action compresses the firing and auxiliary depth springs, and when the enlarged part of the hydrostatic piston comes opposite the locking balls they are forced out by the spring pressure, freeing the firing pin to be forced against the primer. The L-shaped primer and detonator sliders will have been lined up with the firing pin by the action of the slider aligner as described in (1).

REMARKS: If the booster extender fails to function properly and force the slider aligner over the primer and detonator sliders, the fuse cannot function. The slider aligner which holds them in the armed position is prevented from returning to the unarmed position by the locking slide, which locks after the locking balls are forced out from the spindle in the extender.


AN-MK 234
HYDROSTATIC ATHWARTSHIP
FUZE
UNARMED
SLIDER ALIGNER
DETONATOR SLIDER
PRIMER SLIDER
SLIDER HOUSING
GUIDE PIECE
FIRING PIN
LOCKING BALLS
BELLOWS
FIRING SPRING
HYDROSTATIC PISTON
PLUG
NEOPRENE CONNECTOR
DEPTH SETTING KNOB
ADJUSTABLE SPRING
SPRING HOUSING
DEPTH SETTING COLLAR
DEPTH LUG
THUMB SCREW
SLIDER ALIGNER
DETONATOR SLIDER
PRIMERSLIDER
FIRING SPRING
HYDROSTATIC PISTON
BELLOWS
LOCKING BALLS
FIRING PIN
GUIDE PIECE
SLIDER HOUSING
SUB BOOSTER
ARMED
(INSTANT BEFORE FIRING)

ARMY-NAVY ATHWARTSHIP FUZE

AN-MK. 234

(Obsolescent)

HYDROSTATIC

Fuze is suspended from Use

Data

BOMBS USED IN	Depth bombs, Mks 17, 29, 37, 38; AN-Mks 17, Mod 2, 41, 44, and 47.
FUNCTIONING	Water pressure at depth set for, 25, 50, 75, 100, or 125 feet of water.
ARMED CONDITION	Partially armed when arming wire is pulled and jump-out pins are ejected. Arming completed at 12-15' of water when primer & detonator are aligned with firing pin.
FUZES USED WITH	AN-M 103, AN-Mk 219, or Mk 221 in nose; Mk 229 in tail in 650 lb. depth bombs.
ARMING TIME	Partially armed immediately after arming wire is pulled when jump-out pins are ejected, complete arming time dependent on travel through water until depth of 12-15' is reached.
OVERALL LENGTH	Firing assembly (Pistol) - 6.9" Extender assembly - 9.9"
MAX. BODY DIAMETER . .	3.6"
MATERIAL	Bronze, brass, steel, and aluminum.

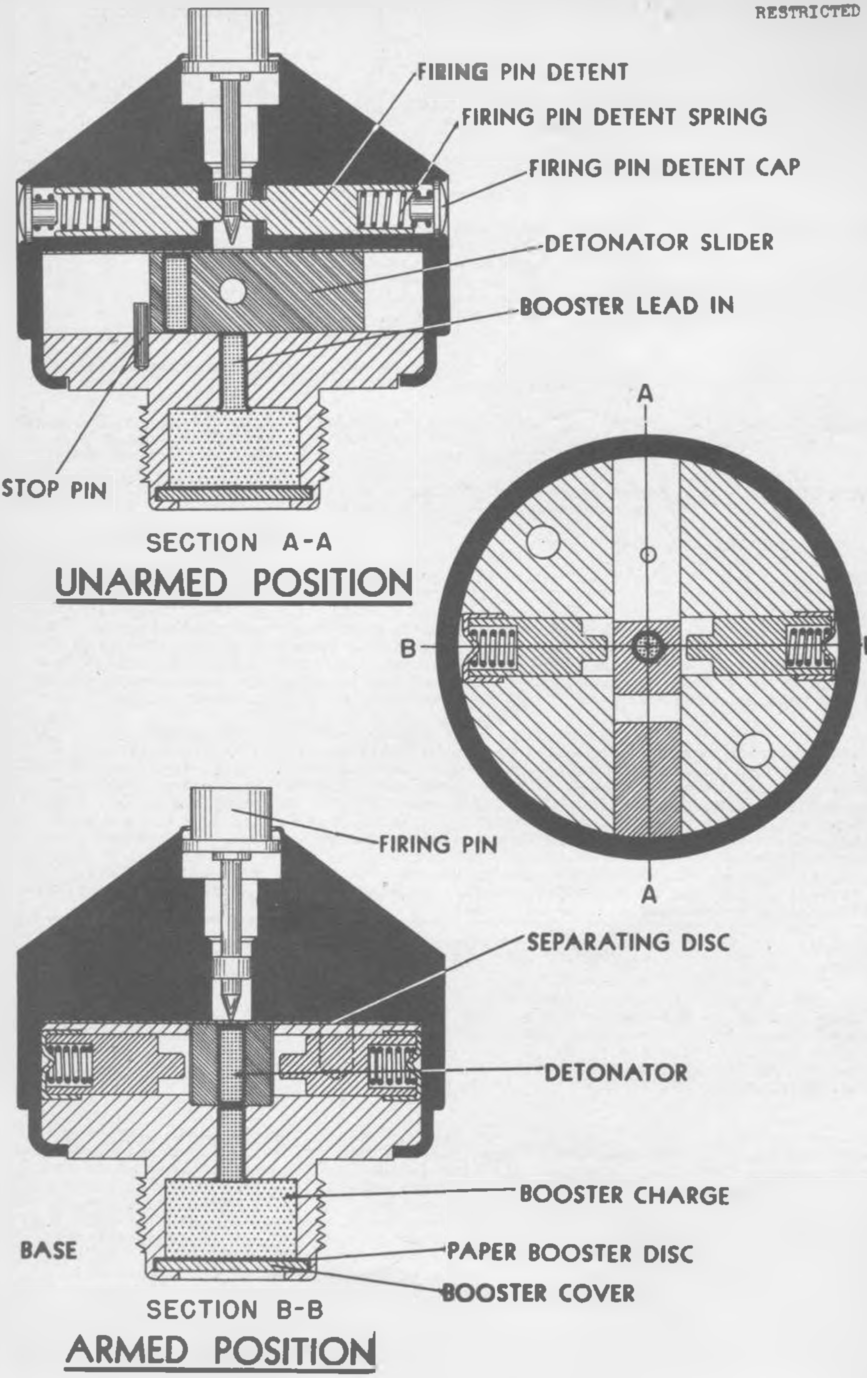
GENERAL: The fuze is essentially the same as the AN-Mk 224, being an athwartship fuze consisting of the pistol, booster, and booster extender. The firing assembly and booster extender are inserted in the athwartships tube of the depth bombs from opposite sides. The AN-Mk 234 differs from the AN-Mk 224 in that it has an external setting device and does not require disassembly to effect depth variations in functioning.

The depth setting is accomplished by varying the amount the adjustable spring must be compressed by the hydrostatic piston as the bellows expand. If a deep setting is desired, the depth setting collar is rotated so that a shallow step on the collar would be positioned under the spring housing depth lug. Thus, the depth lug would engage the collar shortly after entering the water, and the bomb would have to sink farther before the water pressure could overcome the spring resistance. If a deep step were positioned under the lug, the hydrostatic piston could move farther before encountering resistance from the spring. Until the lug is engaged, the spring housing rides inward with the hydrostatic piston, but as soon as the lug is engaged the spring housing no longer moves with the piston and the spring resistance must be overcome.

OPERATION: (1) Action in Booster extender: When the bomb is dropped from the plane, the arming wire to the booster extender is withdrawn from the jump-out pin. The jump-out pin is thrown out by its spring; the booster spindle is freed, and water is permitted to enter the hole created by the jump-out pin. The water expands the bellows until it overcomes the pressure of the spring acting against the locking slide and booster spindle. The locking balls are forced into an enlarged groove in the fuze and the booster and slider aligner move inward, aligning the primer and detonator sliders, as described in the operation of the AN-Mk 224 (see page 243 for diagram and explanation.)

(2) Action in the Pistol: As the arming wire pulls free, it extracts the plug and neoprene connector, permitting water to enter the fuze when bomb immerses in water. The water acts against the flanged base of the hydrostatic piston and as the pressure increases expands the bellows. The hydrostatic piston, adjustable spring, and spring housing all move inward until the depth lug engages the step on the depth setting collar which has been positioned opposite it. At this point the spring housing no longer moves inward. The hydrostatic piston continues to move inward under pressure of the water, but its movement is restricted by the resistance of the adjustable spring. Meanwhile, the movement of the hydrostatic piston compresses the firing spring, and when the enlarged groove in the piston comes opposite the locking balls the firing spring forces the balls out, forcing the firing pin against the primer. The primer fires the detonator, which sets off the sub-booster of tetryl, the booster and the main charge.

REMARKS: For a diagram of the extender and booster assembly, and for a more complete explanation of this assembly, turn to pages 242 and 243.



MK. 227 AIRCRAFT BOMB FUZE

R E S T R I C T E D

U. S. NAVY NOSE FUZE

MK. 227

(Obsolete)

MECHANICAL IMPACT

(Centrifugal Force Arming)

Data

BOMB USED IN . . . . Mk 34 5 lb. A.A. bomb.

FUNCTIONING . . . . Instantaneous impact

ARMED CONDITION . . . . No external indication

FUZES USED WITH . . . . None

ARMING TIME . . . . 1500 ft. air travel at sea level; 3000' at 20,000' altitude.

OVERALL LENGTH . . . . . 2.35"

BODY DIAMETER . . . . . . 2.0"

MATERIAL . . . . Tin plated brass and alloy castings.

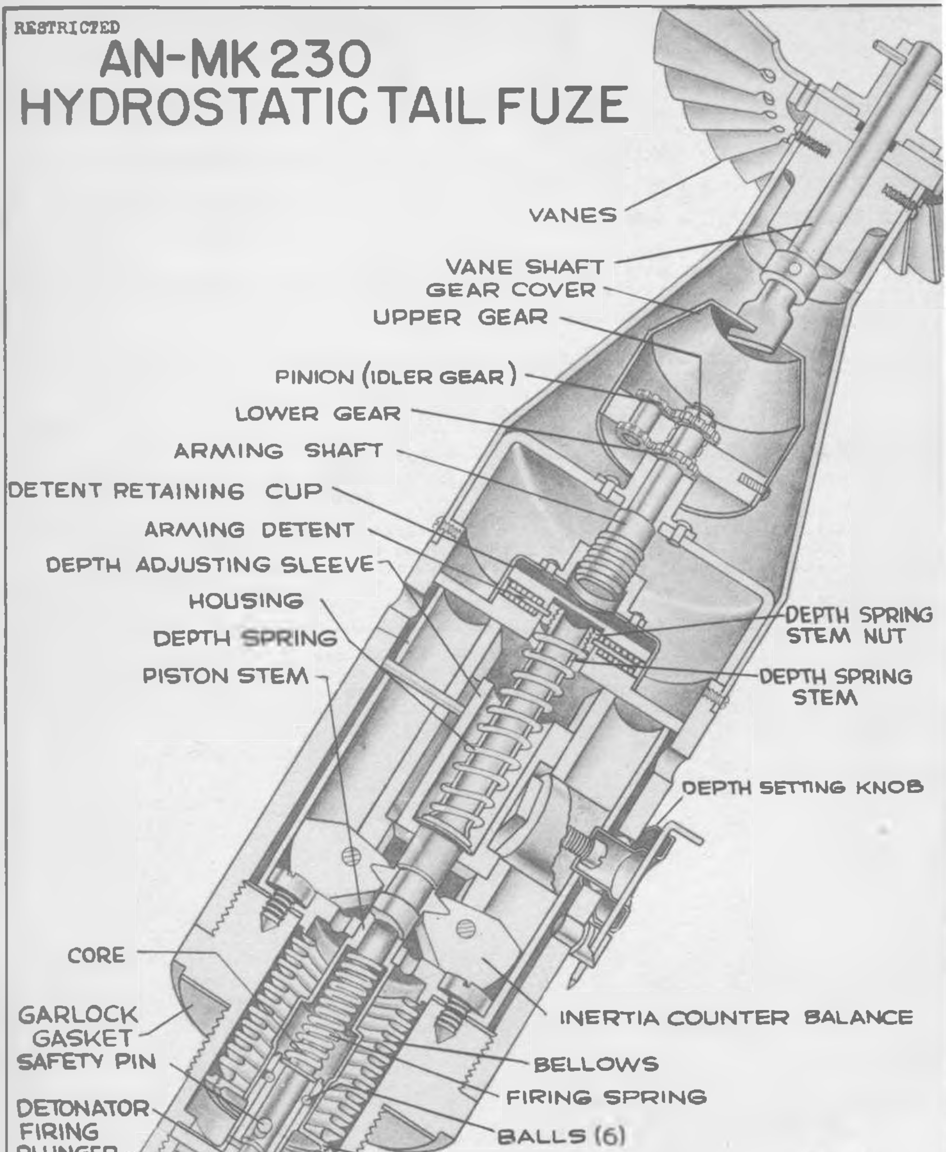
GENERAL: This fuze is unique in American aviation ordnance in using centrifugal force as its arming device. The rotational velocity required to arm the fuze is acquired by the offset tail fins on this small bomb.

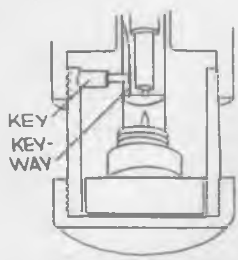
OPERATION: Two pairs of centrifugal detents are employed, one pair supporting the striker, and the second pair positioning the slider with primer detonator out of line with the firing pin. At a rotational velocity of 1500 r.p.m.'s the detents move out of the way, compressing their springs and allowing the slider freedom of movement. The slider is mounted with its center of gravity away from the axis of rotation, so when the detents move out of the slider, centrifugal force carries the slider into line with the firing pin. Upon impact the firing pin is driven into the primer detonator, initiating the explosive action.

REMARKS: The Mk 34 bomb and Mk 227 fuze were designed for air-to-air bombing, but have not proven successful in this use. However, it has had limited use against parked aircraft and has been dropped for its nuisance value on night raids during the early stages of the war in the Pacific.

RESTRICTED

AN-MK 230 HYDROSTATIC TAIL FUZE





VIEW 90° REMOVED SHOWING KEY AND KEYWAY IN FIRING PLUNGER

MK. 229

AN-MK. 230

MECHANICAL ARMING
HYDROSTATIC FIRING
(Obsolete)

Data

BOMBS USED IN:	
Mk 229	650 lb. depth bombs 500 lb. Mks 9 & 12 (LC,GP) 1000 lb. Mks 9 & 13 (LC,GP)
AN-Mk 230	500 lb. G.P. AN-M 64 & 64A1 1000 lb. G.P. AN-M 65 & 65A1 2000 lb. G.P. AN-M 66 & 66A1 325 lb. depth bomb Mk 53 350 lb. depth bomb Mk 54
FUNCTIONING	Hydrostatic pressure with settings for 25, 50, 75, 100, or 125 feet of water.
ARMED CONDITION	No external indication.
FUZES USED WITH	With Mk 229: AN-Mk 219, AN-M 103, or Mk 243, nose. With AN-Mk 230: AN-M 103, Mk 243, nose.
ARMING TIME	110 vane revolutions
OVERALL LENGTH	Mk 229, 16.365"; AN-Mk 230, 15.395"
MAX. BODY DIAMETER	Mk 229, 3.4"; AN-Mk 230, 3.375"
VANE SPAN	5.25" (16 vanes)
MATERIAL	Steel, aluminum alloy, and brass.

GENERAL: These two fuzes are identical except that the part of the Mk 229 fitting into the bomb body is 1.3" longer than the corresponding part of the AN-Mk 230; hence, the AN-Mk 230 cannot be used in bombs that take the Mk 229 fuze. The AN-Mk 230 fits into the M 115 or M 115A1 adapter booster, and can be used in the general purpose bombs taking that adapter booster for use against marine targets.

OPERATION: The desired depth setting is accomplished by turning the depth setting knob and thereby compressing the depth spring the proper amount. If a functioning at 125 feet is desired, the spring would be compressed the maximum amount, consequently causing the water pressure to overcome the greater resistance of more tightly coiled springs. If a shallow water functioning is desired, the springs would be only partially compressed and the water pressure necessary to overcome the more loosely coiled springs would be considerably less. In setting, the depth adjusting sleeve is raised to the desired spring compression by means of a five-sided cam secured to the external depth setting knob, and resting under a projection of the depth adjusting sleeve.

On release from the plane, the arming wire is withdrawn and the vanes are free to rotate. This rotation is transmitted by the vane shaft thru a series of reduction gears to the arming shaft. The upper gear has one more tooth than the lower gear, and as the pinion gear rotates around the lower stationary gear, the upper gear is pushed around clockwise one tooth per revolution of the vanes. This rotation of the upper gear causes the arming screw to rotate clockwise, since the upper gear and arming screw are positively secured, and because of the right-handed threads on the screw, the detent retaining cup threads up on it. As the cup clears the two arming detents locking the depth spring stem nut, their springs force the detents out, freeing the depth spring stem and the piston. The fuze is then armed. On impact with the water the inertia counterbalances prevent the firing assembly from moving down and prematurely firing the fuze because of the deceleration caused by impact. As the bomb submerges, water enters two ports in the outer body and through holes in the depth setting mechanism housing. Hydrostatic pressure acting on the sylphon bellows forces the hydrostatic piston downward, compressing the firing spring, until the retaining balls fall out into the widened portion of the piston. The firing plunger is then forced downward by the pressure of the compressed firing spring onto the fixed firing pin, setting off the explosive train.

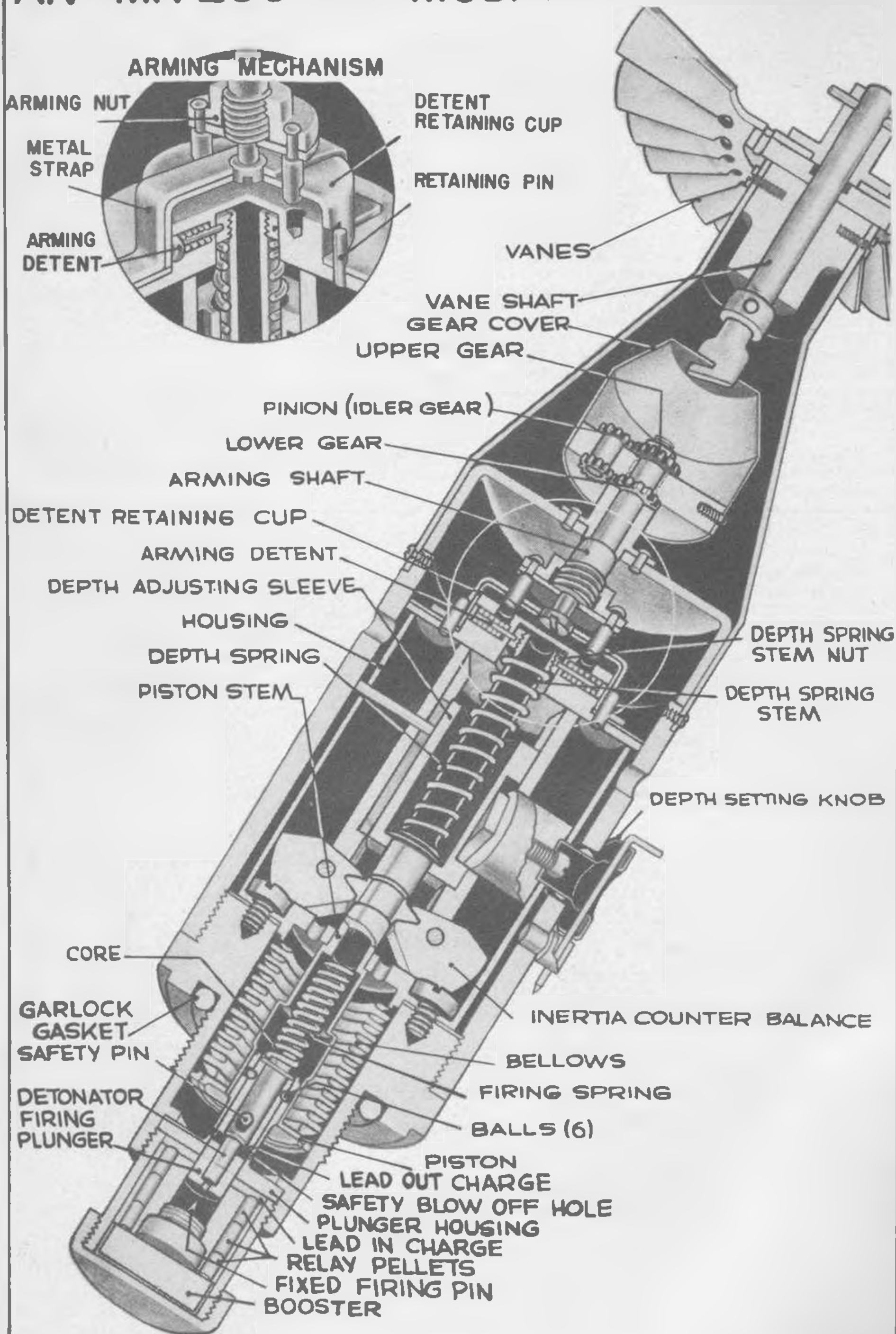
REMARKS:

(1) The detonator consists of fulminate of mercury and tetryl pellets, and the booster lead-in, relay pellets, and booster are tetryl.

(2) The "O" Ring Gasket has replaced the Garlock Gasket. In using the "O" Ring Gasket, a support ring (steel washer .120" thick) must be used to assure metal contact between the fuze and fuze seat liner, thereby preventing distortion of the fuze on impact.

DO NOT DISASSEMBLE THIS FUZE WITHOUT REINSERTING THE SAFETY PIN THROUGH THE LOWER FUZE BODY AND FIRING PLUNGER.

AN—MK 230 TAIL MOD. 4 HYDROSTATIC



RESTRICTED

ARMY-NAVY TAIL FUZES

MK 229 MOD 3
AN-MK 230
MODS 4,5,6

MECHANICAL ARMING
HYDROSTATIC FIRING

Mk 229 Mod 3 (Obsolete)
Mk 230 Mods 4, 5, 6 (Service)

Data

BOMBS USED IN:	
Mk 229 Mod 3. . . .	650 lb. depth bombs Mks 9, 12 500 lbs. LC,GP Mks 9, 13 1000 lb. LC,GP
AN-Mk230 Mods 4, 5, 6 . . .	AN-M 64 500 lb. G.P. AN-M 65 1000 lb. G.P. AN-M 66 2000 lb. G.P. Mk 53 325 lb. depth Mk 54 350 lb. depth
FUNCTIONING	Hydrostatic pressure with settings for 25, 50, 75, 100, or 125 feet of water.
ARMED CONDITION . . .	No external indication
FUZES USED WITH . . .	Mk 229 Mod 3: AN-Mk 219, AN-M 103, or Mk 243, nose. AN-Mk 230 Mod 4: AN-M 103, Mk 243, nose.
ARMING TIME.	110 vane revolutions.
OVERALL LENGTH. . . .	Mk 229 Mod 3: 16.365 in.; AN-Mk 230 Mod 4, 5, 6: 15.395 in.
MAX. BODY DIA. . . .	Mk 229 Mod 3: 3.4 in.; AN-Mk 230 Mod 4, 5, 6: 3.375 in.
VANE SPAN.	5.25 in. (16 vanes)
MATERIAL.	Steel, aluminum alloy, and brass.

GENERAL: The AN-Mk 230 Mod 4 and Mk 229 Mod 3 replace the AN-Mk 230 and Mk 229. The latest Mods incorporate changes which eliminate the possibility of the fuzes arming accidentally when the bomb is dropped safe. The AN-Mk 230 Mod 4 and the Mk 229 Mod 3 are the same as previous Mods with the following exceptions:

(1) The fuze is sealed by a sealing cup above the detent carrier to prevent entrance of the water at any point other than the regular water ports.

(2) The arming mechanism which frees the arming detents operates by rotation of the detent retaining cup rather than by raising it vertically. A metal strap is fitted over the cup. These additions (1) prevent arming of the fuze in case the tail cone or arming mechanism housing is torn off the fuze accidentally upon water entry, and (2) prevent the fuze from firing from hydro-dynamic pressures which are encountered in erratic movement of the bomb through the water or on re-entry after ricochet.

(3) The fuzes now have a slight oval undercut* above the fuze pocket threads to accommodate the new "O" Ring Gasket (live rubber) which has replaced the flat gasket formerly used. By using this "O" Ring Gasket, the holes for the safety rod located above the fuze threads are now sealed from water entry.

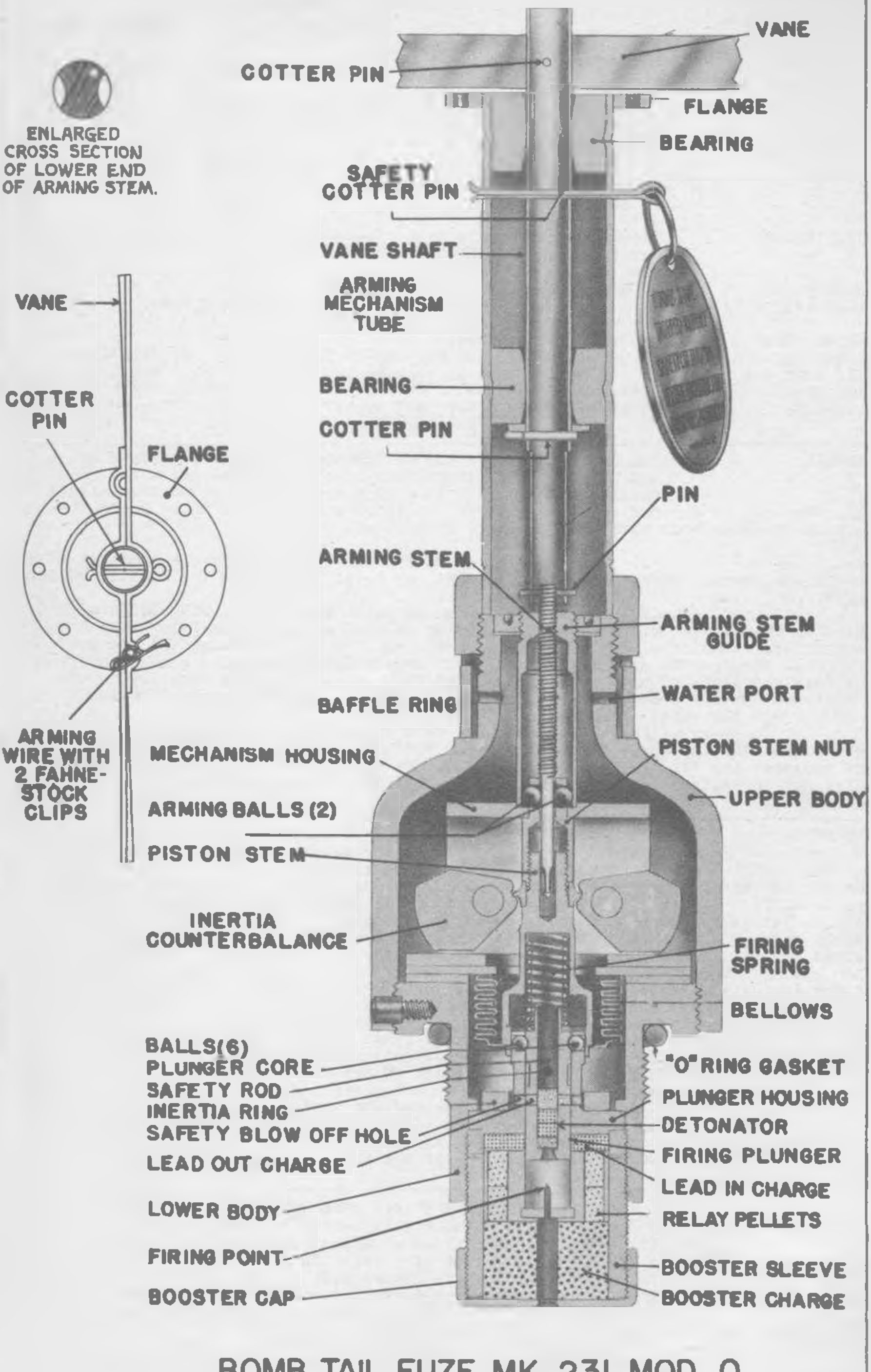
OPERATION: The operation of the Mk 230 Mod 4 is similar to the AN-Mk 230 (refer page 249). When the bomb is released, the arming wire is withdrawn from the fuze, allowing the air stream to turn the arming vanes. The rotating vanes acting through the reduction gear, turn the arming shaft. Rotation of the arming shaft first causes the arming nut assembly to rise (since it cannot turn because of the two pins which project into the detent carrier). When the two pins of the arming nut are fully clear of the detent carrier, the arming nut "washer" jams under the arming shaft preventing further rising. The arming shaft then turns the arming nut assembly and by means of the two pins, rotates the detent retaining cup approximately 85° until the two cutaway portions align themselves opposite the detents. The detents are then ejected, freeing the depth spring stem nut and thereby arming the fuze. (To limit the amount of water entering the sylphon bellows, the detents are prevented from jumping completely out of the detent carrier by the detent retaining pins which are fitted into the flange of the detent carrier). The inertia counterbalances prevent the fuze from functioning on impact with the surface of the water. After the bomb has submerged, water enters the fuze through two water ports in the body sleeve and the fuze fires at the predetermined depth setting. The use of the sealing cup above the detent carrier prevents water entry through the open end of the fuze in case the tail cone is broken off on impact.

REMARKS: (1) DO NOT DISASSEMBLE THIS FUZE WITHOUT REINSERTING THE SAFETY PIN THROUGH THE LOWER FUZE BODY AND FIRING PLUNGER

(2) *Earlier productions of these fuzes did not incorporate an undercut. In using the "O" Ring Gasket with these fuzes, a support ring (Steel washer, .120" thick) must be used to assure metal contact between the fuze and the fuze seat liner, thereby preventing distortion of the fuze on impact.

(3) The AN-Mk 230 Mod 5 is the same as the AN-Mk 230 Mod 4 except that the firing pin is welded to the booster cap as in the Mk 231, and the depth setting is emphasized for 25 ft. and relaxed for 50 ft.

(4) The AN-Mk 230 Mod 6 is the same as the AN-Mk 230 Mod 4 except that the depth setting is emphasized for 25 ft. and relaxed for 50 ft.



BOMB TAIL FUZE MK. 231 MOD. 0
(HYDROSTATIC)

RESTRICTED

U. S. NAVY FUZE

MK 231 MOD O
MK 240 MOD O

Hydrostatic Tail Fuze

BOMBS USED IN:	
Mk 231-0	AN-Mk 54-1 350 lb. Depth AN-M64 500 lb. G.P. AN-M64A1 500 lb. G.P.
Mk 240-0	AN-M65 1000 lb. G.P. AN-M65A1 1000 lb. G.P. AN-M66 2000 lb. G.P. AN-M66A1 2000 lb. G.P. AN-M66A2 2000 lb. G.P.
FUNCTIONING	Hydrostatic pressure at 25 feet.
ARMED CONDITION	No external indications of arming.
ARMING TIME	40-45 vane revolutions. 300-400 ft. air travel. 35-100 ft. vertical fall.
OVERALL LENGTH	Mk 231-0, 12.5 in.; Mk 240-0, 16.5 in.
MAXIMUM BODY DIAMETER .	3.375 in.
VANE SPAN	
MATERIAL	Steel, aluminum alloy, brass.

GENERAL: The Mk 231-0 and Mk 240-0 are tail hydrostatic fuzes in the general design scheme of the Mk 229 and Mk 230. However, they are considerably simpler in construction and easier to manufacture. The Mk 240-0 is four inches longer than the Mk 231-0 to assure proper arming in larger bombs, is otherwise identical with the Mk 231-0. A single depth setting is provided and the fuzes are expected to function in a depth range of 25-30 ft.

To provide positive action against fuze function on reverse impacts (particularly ricochets), these fuzes have an inertia ring which adds its weight to that of the piston assembly to counteract the force of the two counterbalances exerting a contrary pressure in such impacts. On normal impacts, the inertia ring merely rests on the firing pin housing.

OPERATION: Upon release of the bomb from the plane, the arming wire is withdrawn permitting rotation of the vane and the vane shaft. Rotating with the vane and threading out of the arming stem guide is the arming stem; after 40 to 50 vane revolutions the stem has risen sufficiently to allow the two arming balls to fall inward freeing the hydrostatic piston and arming the fuze.

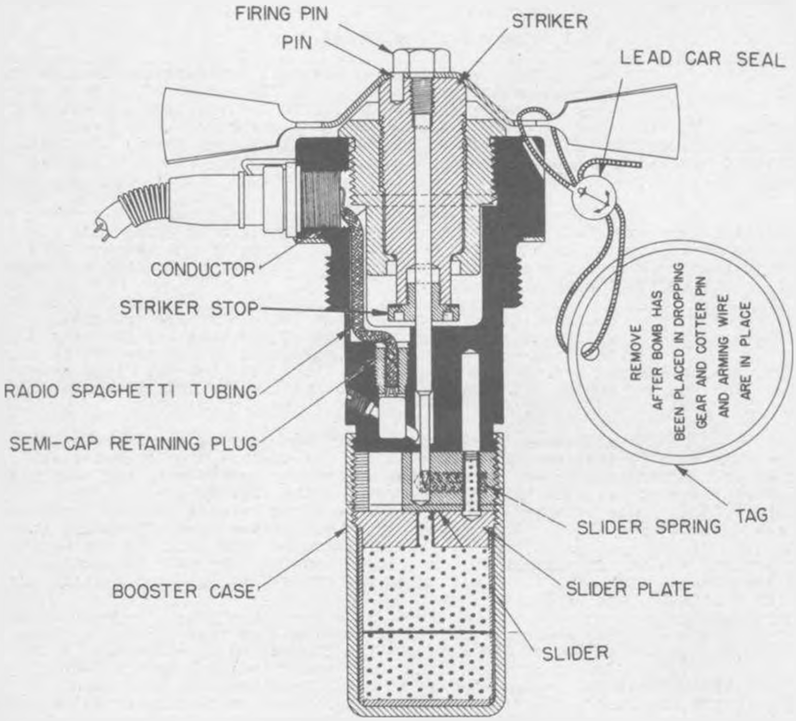
At normal impact with water, the inertia counterbalances prevent the fuze from firing, and on reverse impact the inertia ring operates as described above. After submersion, water flows around the baffle ring and into the fuze through the two ports. The baffle ring prevents the fuze from firing when subjected to sudden surges of water such as might occur on reverse impact. Hydrostatic pressure now extends the bellows, thus forcing the hydrostatic piston downward and compressing the firing spring. After the piston has moved 9/32 in., the six retaining balls locking the firing plunger to the plunger housing jump into the annular recess in the piston. The compressed firing spring thrusts the plunger against the firing point initiating the explosive train.

REMARKS: (1) The lower end of the arming stem is grooved for about .2 in. of its length. The purpose of this feature is to arrest arming of the fuze should the bomb be accidentally released in water without the arming wire as in crash landings. In this event water might rotate the vane initiating arming action. However, arming would be stopped once the grooved section faced the balls, since hydrostatic pressure on the piston assembly would force the balls into the grooves jamming the arming stem in place and preventing further rotation of the vane.

(2) The vane shaft is connected to the arming stem by a slip joint to remove the danger of arming the fuze by a blow damaging or carrying away part of the arming mechanism. In this connection it will be noted that the arming mechanism tube has a circumferential groove near its base which is provided to cause shearing at that point should the force of impact break off part of the arming mechanism.

(3) When the Mk 240-0 fuze is used in AN-M66 bombs, it is to be equipped with a special 26.5° pitch vane, to assure proper arming; the standard 20° pitch vane of the Mk 231-0 will be used when the Mk 240-0 is installed in AN-M65 bombs. The special pitch vane will be painted. (No color stated as yet).

(4) Production of the Mk231-0 fuze has been stopped because of adequate supplies of the AN-Mk230-5 and AN-Mk230-6 fuzes. The Mk240-0 will not be produced at all.



MK. 232 MOD. I NOSE FUZE

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

U.S. NAVY NOSE FUZE

MK. 232
MOD 1

IMPACT OR ELECTRICAL FIRING

(Special)

Data

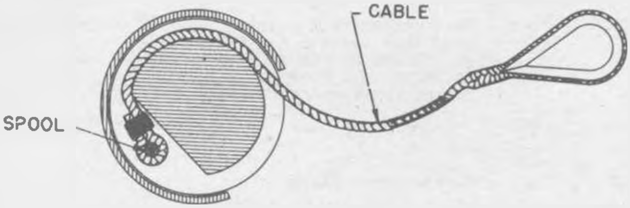
BOMBS USED IN	All G.P. & depth bombs, and old type demolition and L.C. bombs.
FUNCTIONING	Impact instantaneous or electrical impulse.
ARMED CONDITION	When vanes are 3/8 inch away from striker housing. NO ATTEMPT SHOULD BE MADE TO UNARM THIS FUZE BY ROTATING THE VANES BACKWARD.
FUZES USED WITH	Usually none
ARMING TIME	8 vane revolutions
OVERALL LENGTH	7"
MAX. BODY DIAMETER	2.5"
VANE SPAN	5.125" (16 vanes)
MATERIAL	Steel and brass.

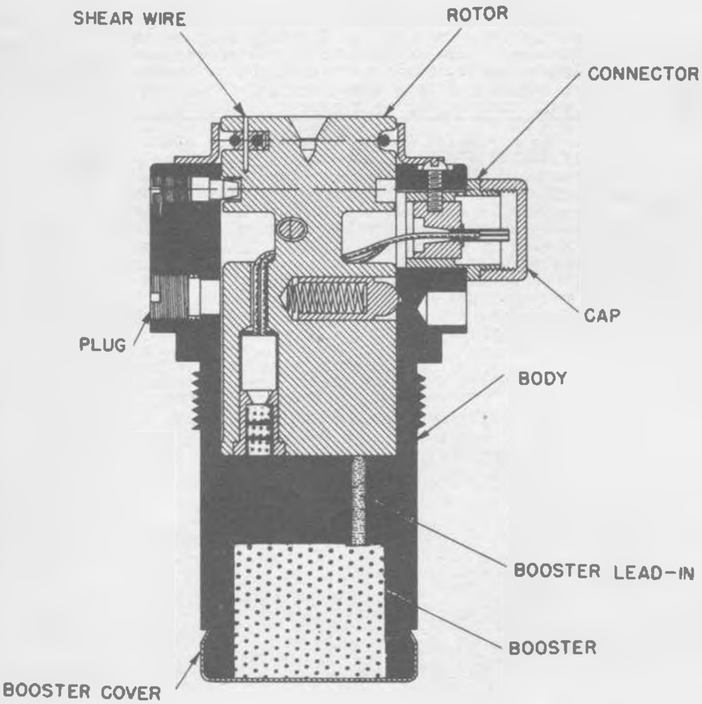
GENERAL: The Mark 232, Mod 1 is a bomb nose fuze of the arming vane type, requiring little air travel to arm. It may be initiated by an electrical impulse or impact on a hard surface, detonating instantaneously. The fuze has an electric semi-cap which, when fired by an impulse, blows through a hole leading to the detonator and sets it off. For electrical firing as well as impact, the fuze must first be armed, allowing the detonator slider to move over into a position where the detonator can be initiated by either the firing pin or explosion of the semi-cap.

OPERATION: (1) As an Impact Fuze: A cotter pin, which is wired in place with a small fuze wire, prevents the arming vanes from rotating. The arming wire is attached to this cotter pin and withdrawal of the arming wire breaks the light fuze wire. The vanes are then rotated by action of the wind stream, and this rotation is transmitted to the striker which advances on the threads in the striker housing. It advances until stopped by the striker stop coming up against the bottom of the striker housing. As the striker advances on its threads it withdraws the firing pin from the slider, which is then forced over by its springs lining the detonator up with the firing pin and booster lead-in. A detent locks the detonator slider in the armed position. Upon impact, the brass collar threads are sheared by the firing pin block and the firing pin is forced into the detonator.

(2) Electrical Firing: Detonation is initiated by means of the squib being directly fired by an electric current through the igniter bridge.

REMARKS: The fuze will not function on impact with water, but must strike a hard surface in order to strip the striker housing threads.





U.S. NAVY MK.233 NOSE FUZE

CONFIDENTIAL

U.S. NAVY NOSE FUZE

MK. 233

(Special)

ELECTRICAL FIRING

Data

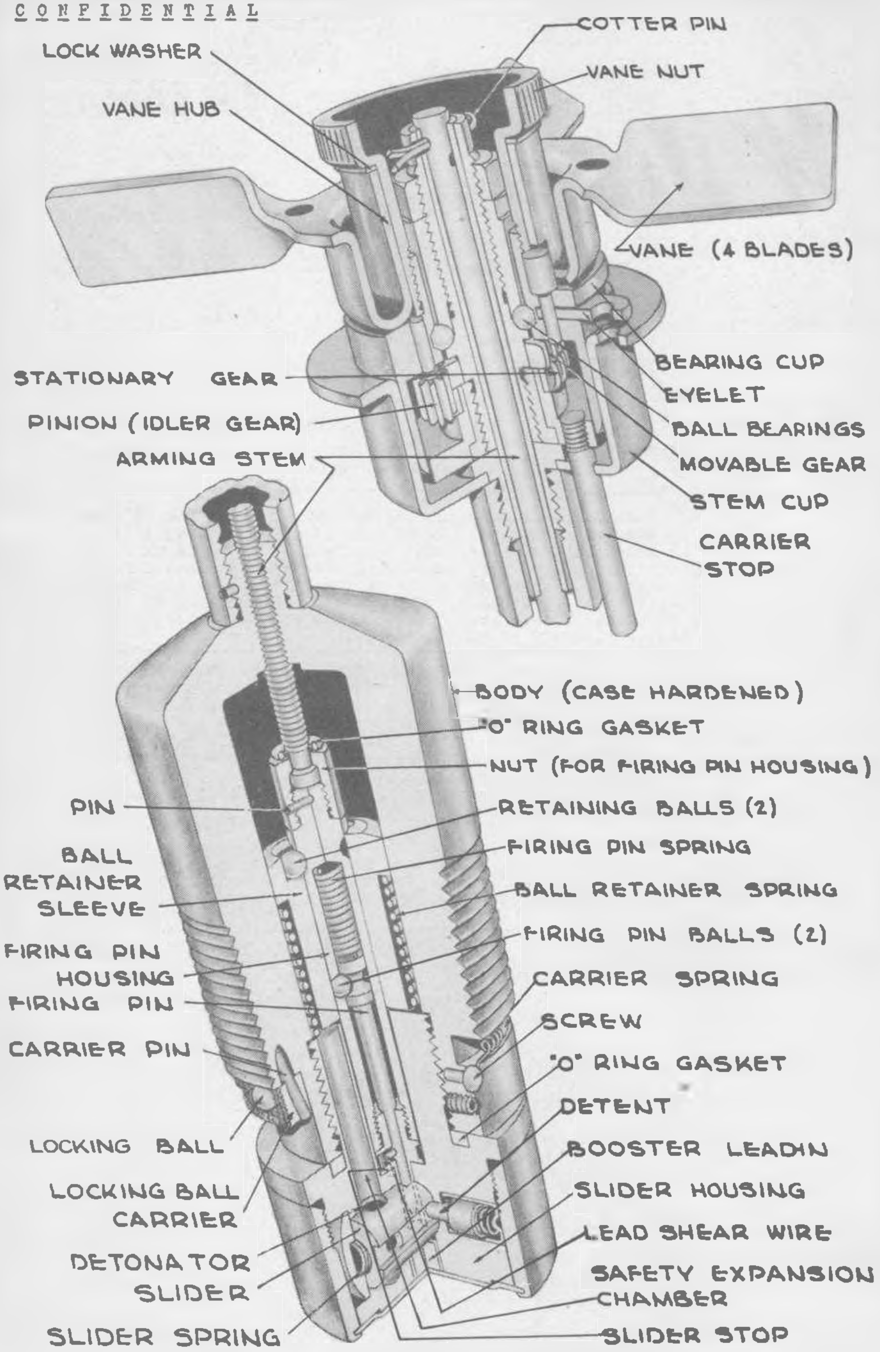
BOMBS USED IN	100 lb. G.P. Mk 4, Mod 4
FUNCTIONING	Electrical impulse
ARMED CONDITION	When cable is pulled free from rotor cap, and cap is in a locked condition.
FUZES USED WITH	Used in conjunction with bombs which are fuzed with U.S.N. Mk 232 Mod 1
ARMING TIME	Rotation of the rotor cap 180 degrees, when pulled by the cable attached to it.
OVERALL LENGTH	4.51"
MAX. BODY DIAMETER . .	2.375"
MATERIAL	Steel

GENERAL: The fuze will function instantly upon explosion of the electric semi-cap. It is mechanically armed by means of a motor in the plane. The body is that of an AN-Mk 219, in which the vanes, cap, and rotors have been removed, and a hole has been drilled in the shoulder for the accomodation of electric wiring. A rotor block has been inserted in the rotor cavity in the fuze body. The rotor block contains an electric semi-cap with lead-in wires and a detonator. These units are assembled, unarmed, 180 degrees from the booster lead-in in the fuze body.

OPERATION: In the unarmed position the detonator in the rotor is offset 180 degrees from the booster lead-in. To arm the fuze, the rotor is rotated 180 degrees at which point the detonator and booster lead-in are aligned. This is accomplished by means of a motor in the airplane, exerting a pull on one end of the arming cable. This pull rotates the pulley to which the other end of the cable is secured, and thereby rotates the rotor to the armed position. There it is locked by the lock detent. Continuing force of the motor's pull on the arming cable shears the 0.035" copper shear wire which secures the cable to the pulley.

The protective shipping cap covering the connector plug is removed when the fuze is assembled to the bomb and connection is made with the source of electrical current in the airplane. Closing the electrical circuit after the fuze is armed successively initiates the semi-cap, detonator, booster charges and explosive charge in the bomb.

REMARKS: The detonator consists of lead azide, and the booster lead-in and booster consist of tetryl.



BOMB TAIL FUZE MK 237 MOD 0 & MK 238 MOD 0

(LEAD SHEAR WIRE - LONG DELAY TIME)

CONFIDENTIAL

U.S. NAVY TAIL FUZE

MK 237, MK 238

(Service)

LEAD SHEAR WIRE
LONG DELAY TIME

BOMBS USED IN:	
Mk 237 Mod 0	AN-M64A1 500 lb. G.P.
Mk238 Mod 0	AN-M65A1 1000 lb. G.P. AN-M66A1,A2 2000 lb. G.P.
FUNCTIONING	Lead shear wire-long delay fuze:delays of 2, 10, 10 and 30 hours.
ARMED CONDITION	Partially armed after approximately 150 vane revolutions. Fully armed after impact.
FUZES USED WITH	None
ARMING TIME	Approximately 150 vane revolutions and impact requirement.
VANES SPAN	5 in.
MAX.BODY DIAMETER	2 in.
OVERALL LENGTH	Mk237-0, 13.6 in. Mk238-0, 17.6 in.
MATERIAL	Zinc or cadmium plated steel.

GENERAL: These fuzes differ only in the length of their arming stem. Delay arming is obtained by means of the 30 to 1 gear reduction system which is like that of the M115 series tail fuze. Upon completion of arming, the gear reduction assembly and the arming stem do not separate from the fuze, but cease rotation. Functioning time of these fuzes is determined by a lead shear wire (50% lead, 50% tin). The various delays are obtained by varying the diameter of the wire, i.e., increasing the diameter for longer delays. The slider carries a Mk 23 detonator which is made up of three explosive components; namely, azide priming mixture, lead azide, and tetryl. The fuze incorporates a tetryl booster lead-in, but does not have an integral booster.

OPERATION: The complete arming of the fuze is effected in two stages: air travel and impact. Upon withdrawal of the arming wire the vane assembly rotates, causing the arming stem to rotate via the 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 housing by two balls and the firing pin housing in turn is locked to the ball retainer sleeve by two balls. 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, 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. (A detent locks slider in 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 the 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, and the spring loaded striker is restrained only by 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.

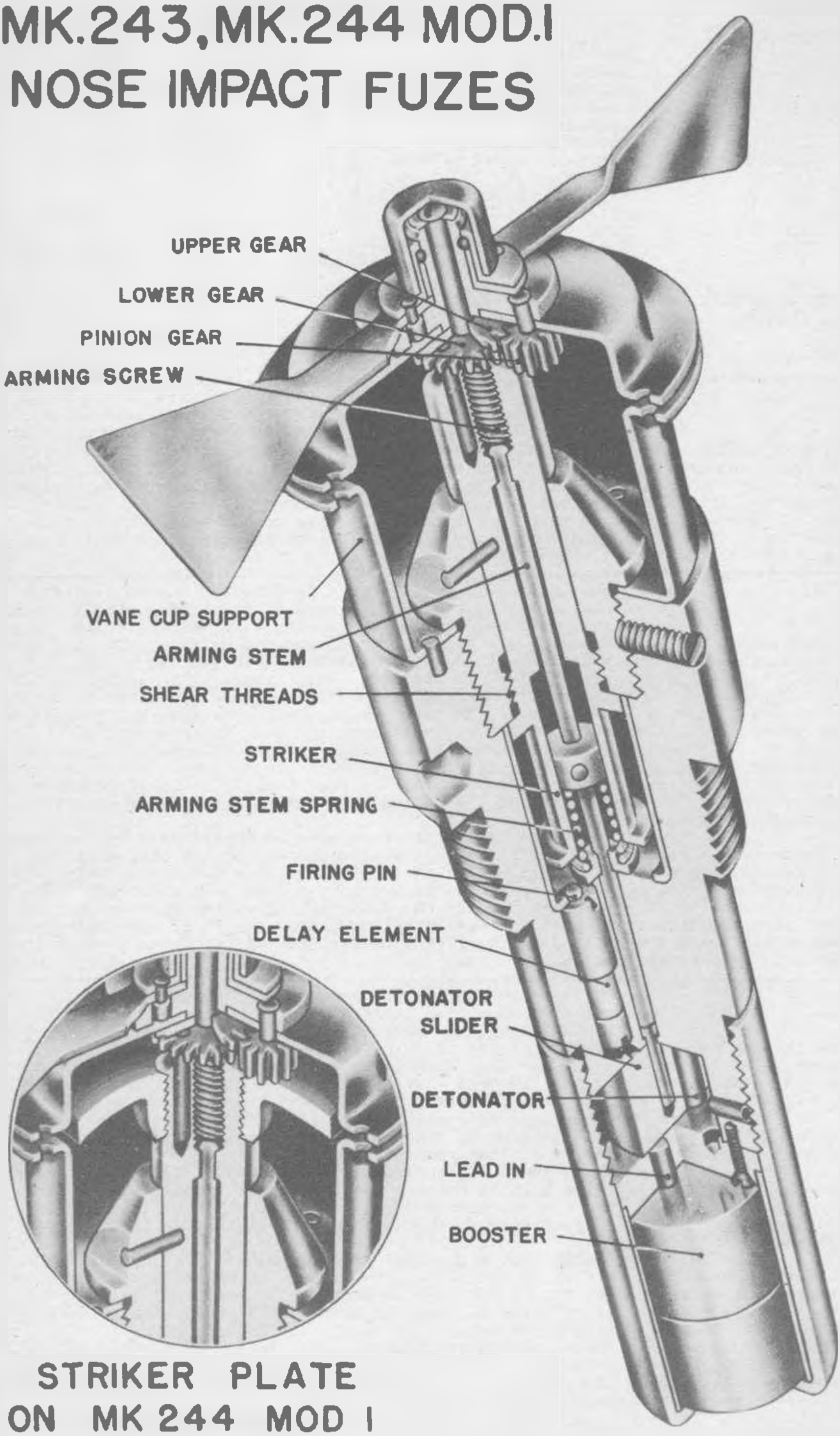
REMARKS: (1) These fuzes incorporate an anti-withdrawal feature, but no booby trap device like the M123 series. Under normal handling and installation, the anti-withdrawal feature does not function, since the locking ball and its carrier are held in place in the deep part of the eccentric groove, by a carrier pin and spring. Upon impact, however, the force of inertia is sufficient to withdraw the carrier pin from the fuze body, and allow the carrier spring to pull the ball carrier into the shallow part of the eccentric, locking the fuze in place. The fuze body is case hardened to prevent removal with a wrench after impact. Since these fuzes require impact to lock in place, bombs with these fuzes can be safely returned to the base or carrier, and fuzes removed for stowage.

(2) Since these fuzes have a 2" thread diamter, it is necessary to remove the inner sleeve of the M 115A1 adapter booster before installation. Fuzes should be screwed securely into adapter booster, otherwise dud may result. A special short length locking pin is shipped with these fuzes for securing the M 115A1 adapter booster to the base plate.

(3) Bombs fuzed with these fuzes should not be released at an altitude lower than that specified by ComInCh as the minimum safe altitude of release for instantaneous action fuzes, for if the bomb is subjected to multiple impact, the first impact would completely arm the fuze, and the second might shear the lead shear wire allowing the fuze to fire without delay.

(4) These fuzes are detonator safe. In the unarmed position, the detonator is lined up with the safety expansion chamber. If the detonator should function prematurely, the force of detonation is dissipated in this cavity, and will not set off the booster lead-in charge, or adapter booster charge.

MK.243, MK.244 MOD.I NOSE IMPACT FUZES



STRIKER PLATE ON MK 244 MOD I

CONFIDENTIAL

U. S. NAVY NOSE FUZE

MK 243 MOD 0
MK 244 MODS 0, 1

(Service)

Mechanical Impact

BOMBS USED IN . . . . . 500 lb. AN-M64 & 64A1 G.P.
500 lb. Mk 12, Mod 2 G.P.
1000 lb. AN-M64 & 65A1 G.P.
1000 lb. Mk 13, Mod 2 G.P.
2000 lb. AN-M66 & 66A1 G.P.

FUNCTIONING . . . . . Delay of .025 second.

ARMED CONDITION . . . . When space between vane cup and vane cup support is 5/16 in.

FUZES USED WITH . . . . AN-Mk 230 (Army Bombs), or Mk 229 (Navy Bombs) tail hydrostatic (set for 25' in high speed glide bombing); or AN-M100A2 series (with .24 sec. delay primer detonator for high angle drops).

ARMING TIME . . . . . 130 vane revolutions

GENERAL: The fuze resembles the AN-M103 in appearance, and has been designed specifically to be used against submarines or ships since it will not function on water, or at an impact angle of less than 45°. The blunt firing pin merely sets loosely over the primer in the cavity cup, and when struck by the striker shoulder is driven against the primer, initiating the delay. It is intended as a replacement for the hydrostatic fuzes.

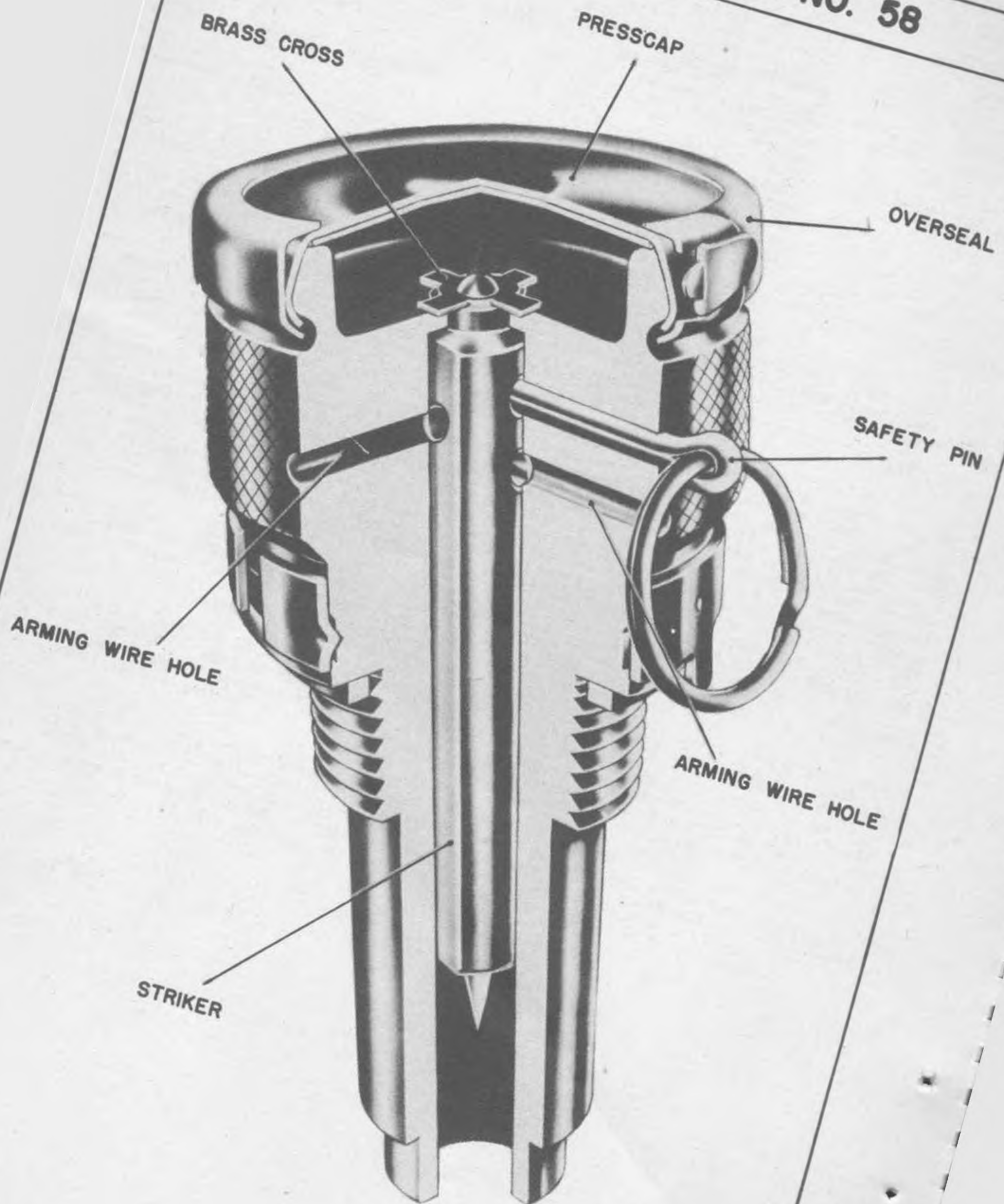
OPERATION: As the vanes rotate, the pinion gear revolves around the upper movable gear and lower stationary gear. Since the upper gear has 23 teeth and the lower gear has 22 teeth, the upper gear is pushed around clockwise with the pinion by the amount of one tooth per revolution of the vanes. The lower gear is prevented from rotating by the lower gear stop arm protruding into the striker. As the upper gear rotates, the arming screw unthreads from the striker, allowing the arming stem spring to lift the arming stem free of the detonator slider. After 130 vane revolutions the vanes fall away and the arming stem clears the detonator slider, which is moved across the fuze body by its spring and locked under the delay element by a detent and the slider locking pin. On impact with a hard surface, the striker body is forced inward, shearing both the locating pin and the shear threads and forcing the shoulder of the striker against the blunt firing pin. The firing pin sets off the primer delay of .025 second, detonator, booster lead-in, and the booster in succession.

REMARKS: When using this fuze the vanes should be checked by simply turning back and forth a few times in order to determine that the arming mechanism operates easily. The fuze will not function on water impact from altitudes of release up to 15,000 feet.

The Mk 244, Mod 0 incorporates a 4-second (minimum of 4, maximum of 5) delay instead of the 0.025 second delay of the Mk 243. Except for the delay, the two fuzes are identical. "4-Sec. Delay" is stamped in black letters on both sides of the vane cup support of the Mk 244-0 to provide easy visual identification of the fuze.

To function the Mk 243 type fuze on soft ground, a striker plate has been added and the number of shear threads reduced 50% in the Mk 244-1, which retains the delay of the Mk 244-0. The modification has been made to allow use of this type fuze against ground targets in the event no marine targets are encountered on a mission. The minimum dropping altitude over land is 1000 ft.

BRITISH TAIL PISTOL NO. 58



CONFIDENTIAL

BRITISH TAIL PISTOL

NO. 58

Mk I

(Service)

BOMBS USED IN	T10 12,000 lb. G.P. T14 22,000 lb. G.P.
FUNCTIONING	Delays of 0.05, 0.25, 0.5, 3.0, 11.0 seconds; 30, 60 minutes.
ARMED CONDITION	Safety pin and arming wire withdrawn.
FUZES USED WITH	None
ARMING TIME	Instantaneous upon release.
MAX. BODY DIAMETER	2 in.
OVERALL LENGTH	3-7/8 in.
IDENTIFICATION	Identical externally with No. 28 pistol; however, press cap and overseal will not have been removed.
COLOR	Brass.

DESCRIPTION: This pistol is a simple impact mechanism consisting of a brass body with a central channel to accommodate a heavy striker. The striker is retained by a small brass cross which is fastened to the top of the striker by a copper pin. In the normal condition, the four tabs of the brass cross extend outward over the top of the pistol body, preventing the striker from descending.

Two arming wire holes are drilled in separate planes at 90° to each other. The hole to be used is that which gives the more favorable angle of pull-off for the arming wire from the pistol to the fuzing unit. Parallel to one of these arming wire holes, and about 1/4" above it, is located a safety pin hole.

OPERATION: When the bomb is released from the aircraft the arming wire is withdrawn from the pistol, leaving the striker supported only by the brass cross. On impact, the inertia of the striker bends the tabs of the brass cross, allowing the striker to move forward and pierce the detonator.

REMARKS: 1. The use of this pistol is restricted to high level bombing operations, as there is danger of non-functioning from low altitudes.

2. Three of these pistols, located 120° apart in the base plate,are used with the G.P. 12,000 lb. bomb.

3. The striker used with this pistol is of the needle type, thus only sensitive type detonators can be used.

4. Early issues of the No. 58 Mk I pistol were conversions of No. 30 pistol bodies. A heavy brass plug was fitted into the top of the pistol body and held in place with four screws, while the later Mk I body is machined from one piece of brass. In addition, the early Mk I had a circumferential groove cut around the knurling on the outside of the pistol body, resembling the No. 30 pistol, except that the groove was not painted green.

INTRODUCTION TO PYROTECHNICS

GENERAL:

Pyrotechnics may be defined as modifications of fireworks displays designed for signalling, marking, or illuminating objects, each display having an operational function indicated by its color pattern, or effect. In this section only signalling and illuminating smokes will be considered, screening smokes being treated in the Chemical and Incendiary Section. This division follows in large part the allocation of responsibility for smoke munitions made between the Chemical Warfare Service and the Ordnance Department of the Army. CWS supervises matters relating to screening smokes and the Ordnance Department performs the same functions for signalling and illuminating items. Pyrotechnics may be fired from aircraft, surface vessels, submarines, or from the ground.

The effectiveness of pyrotechnics is generally dependent on three major factors:design, position, and the atmospheric conditions prevailing at the time of use. Variations of design govern the candlepower of the flare or signal, the color produced by the charge, and the continuity of the burning candle. The color and reflective characteristics of the objective often affect the visibility of pyrotechnics. Open ground, such as an airfield, will reflect three to four times as much light as will woods or deep water. Position, distance, relative position, background, or angle of observation also alter visibility , while the degree of light or darkness, fog, haze, or other atmospheric conditions have self-evident effects.

COMPOSITION:

(a) Pyrotechnic compositions are complex mixtures of chemical elements and compounds. On burning, they produce illuminations ranging in intensity from the "dark fire" used as an element of blinker signals to the brilliant flash produced by the photoflash bombs. Standard pyrotechnics, in general, consist of compounds to provide oxygen for burning, such as chlorates and nitrates;aluminum or magnesium for fuel;salts of barium , copper, or strontium for color; and agents such as asphalt and paraffin for binding and waterproofing.

(b)Pyrotechnics usually function by means of an igniter train similar to an explosive train. In general, ignition is initiated by a primer mixture and intensified by a "first-fire composition" which properly ignites the luminous candle.

IDENTIFICATION:

Complete identification of pyrotechnics is furnished by the painting, standard nomenclature of the items, and the lot numbers. The lot number is marked on all packings and on the item itself, unless the item is too small. The lot number is required for all purposes of record such as reports on the condition, functioning, or accidents in which the pyrotechnics are involved.

HANDLING AND STOWAGE:

All pyrotechnics should be handled with care. Rough handling may cause immediate functionining of the item or it may damage the item so that it will not function properly at the time desired. Much of the material is more dangerous than other types of ammunition.

Pyrotechnics should be stowed in the boxes or watertight containers in which they are shipped, shenever possible. They must not be stowed with other types of ammunition.

Pyrotechnics should never be stowed where the direct rays of the sun can strike them. They should be protected against excessive and variable temperatures. If possible, the stowage space should be be kept at a temperature below 100°F., and must be kept dry and ventilated.

Never open more containers than are needed for immediate use, and always issue the oldest ammunition first.

DISPOSITION:

When so directed by the Bureau of Ordnance pyrotechnics may be disposed of in one of two ways: dumping overboard or burning. Dumping is preferred and must be done ten miles off shore and in water at least 100 fathoms deep. Certain items must always be dumped, while other items may be either dumped or burned. For information regarding disposition of specific items refer to OCL Av4-45, and for specific methods of disposal refer to OP-5.

METHODS OF PROJECTION:

(a) Aircraft Pyrotechnics

1. Pyrotechnic Pistol, AN-M8. This pistol is used on aircraft with the M1 mount and fires through an opening in the fuselage. It can also be detached from its mount and fired by hand. It is generally used for signalling from aircraft in flight, to troops on the ground, or to other aircraft.

2. Hand Projectors, Mk3 and Mk4. This projector is fired by holding the barrel in one hand and pulling back on the firing pin handle with the other. It is used to fire Very's Signal light Mk2.

3. Signal Pistol, Mk5. This is a single action, single loading pistol that fires the Very's Signal Light Mk2.

4. Very Pistol M5. This is a single action, single loading pistol that fires the Very's Signal Light Mk2. It is not procured by the Navy.

5. Pyrotechnic Discharger, AN-M5. This is a double action, multi-barrel(6) discharger used on aircraft when installation of pistols is not practical. It is used for the same purpose as the AN-M8 pistol. It is not procured by the Navy.

6. Hand Pyrotechnic Projector, M9. This is a single action, single loaded projector which is fired by striking the firing pin with the hand or by striking the firing pin on the ground. It is used for projecting signals from the ground to aircraft in flight. It is not procured by the Navy.

7. Pyrotechnic Discharger, M10. This is a metal cylinder with a mushroom firing mechanism and a hinged locking stem. It is used to fire the Red Star Signal M73.

(b) Ground Pyrotechnics

1. Ground Signal Projector, M1A1. This is a single loaded, manually operated projector used to fire the High Bursting Range Ground Signal, M27.

2. Ground Signal Projector, M3. This is a single loaded, manually operated projector that is fired by holding the projector in the hand and striking the base on the ground. It is used to fire signals M17 through M22.

3. Ground Signal Projector, M4. This projector is similar to the M3 and is replacing it.

4. Grenade Launcher, M1, M2, M7, and M8. This is an extension to the barrel of a rigle or carbine. It is used to fire ground signals M17A1 through M22A1, M51A1, and M52A1.

5. Tree Suspension Device, T1, for Smoke Grenade. This is a cardboard attachment containing about ten feet of suspension cord. It is attached to a standard smoke grenade that is launched from a carbine or rifle. The device is used to cause grenades to become entangled in trees or foliage to permit emission of smoke above dense forests and foliage where it is readily visible to air observers.

(c) Ship and Submarine Pyrotechnics

1. Signal Projector Mk1 and Mk1, Mod 1. This is a barrel about 30 in. in length which fits into a tube mounted on a three legged stand. The firing pin is part of a metal disc which acts as a valve. It is used to fire Ship's Emergency Identification Signals Mks 1, 2, 3, and 4.

2. Submarine Rocket Pistol. This is a single load breech loaded pistol used to fire Pistol Rocket Signals.

3. Submarine Emergency Identifcation Signal Ejector. This ejector is similar to a miniature torpedo tube arrangement. It is used to fire Submarine Emergency Identifcation Signals, Submarine Float Signal Mk1, Mk1Mod1, or Mk2 Mod 0, and False Target Shell, Mk1.

4. Other projectors are the Hand Projectors, Mk3 and Mk4, and Pyrotechnic Pistol, AN-M8, which are described above under Aircraft Pyrotechnics.

PART I

AIRCRAFT PYROTECHNICS

RESTRICTED

U. S. ARMY SIGNAL

RED STAR AIRCRAFT PARACHUTE SIGNAL

M11

Data:

LENGTH OF OUTER CASE.	7.69 in.
DIAMETER OF OUTER CASE.	1.58 in.
BURNING TIME	30 seconds
INTENSITY OF LIGHT	20,000 candle power
COLOR OF LIGHT	Red
FUNCTIONING HEIGHT	200 - 250 ft.

USE:

Designated to be used as a distress signal from grounded planes.

METHOD OF PROJECTION:

The Pyrotechnic Pistol, AN-M8, is used for firing the flare.

DESCRIPTION:

The cylindrical, aluminum outer case has an extraction groove at the end containing the primer. A press fit identification top is cemented to the end opposite the primer and has the embossed letters "RP" for night identification. This cartridge is classified by the Army as the rimless type.

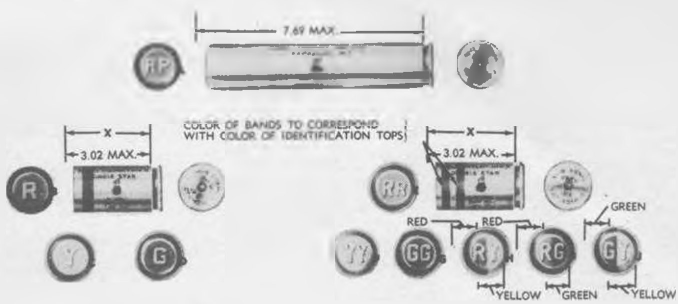
OPERATION:

The firing pin of the pistol sets off the primer igniting the propelling charge. The propelling charge ignites the delay fuse and propels the inner case outward. The delay fuse burns for 2.5 seconds and ignites the expelling charge which in turn ignites the candle and expels the candle and parachute from the inner case.

REMARKS:

The Army has other parachute signals which are similar to the M11. These are obsolete or limited standard.

	Embossed Letter
1) White Star, Parachute, M10	WP
2) White Star, Blinker Parachute, M15	WB
3) Green Star, Blinker Parachute, M16	GB
4) Red Star, Cluster, M14	RS



IDENTIFICATION TOP FOR	COLOR	IDENTIFICATION TOP FOR	COLOR
A—SIGNAL, AIRCRAFT, PARACHUTE, RED STAR, M11	RED	F—SIGNAL, AIRCRAFT, DOUBLE STAR, AN-M29	YELLOW-YELLOW
B—SIGNAL, AIRCRAFT, SINGLE STAR, AN-M34	RED	G—SIGNAL, AIRCRAFT, DOUBLE STAR, AN-M30	GREEN GREEN
C—SIGNAL, AIRCRAFT, SINGLE STAR, AN-M35	YELLOW	H—SIGNAL, AIRCRAFT, DOUBLE STAR, AN-M31	RED-YELLOW
D—SIGNAL, AIRCRAFT, SINGLE STAR, AN-M36	GREEN	I—SIGNAL, AIRCRAFT, DOUBLE STAR, AN-M32	RED GREEN
E—SIGNAL, AIRCRAFT, DOUBLE STAR, AN-M28	RED-RED	J—SIGNAL, AIRCRAFT, DOUBLE STAR, AN-M33	GREEN-YELLLOW
		X—ALUMINUM (MARKING IN BLACK)	

AIRCRAFT SIGNALS (RIMLESS TYPE)

RESTRICTED

ARMY - NAVY SIGNALS

AIRCRAFT SIGNALS, DOUBLE STAR

AN-M28
to
AN-M33
Series

Data:

LENGTH OF CARTRIDGE . . . . 3.02 in.
DIAMETER OF OUTER CASE . . . . 1.58 in.
BURNING TIME . . . . 7 seconds
ALTITUDE AT ZENITH OF TRAJECTORY. . 250 feet

USE:

Double star aircraft signals used as a method of emergency identification aircraft.

METHOD OF PROJECTION:

The Pyrotechnic Pistol, AN-M8, is used for firing the signal.

DESCRIPTION:

The signal cartridge has an aluminum, plastic or steel barrel with an extraction groove at the closed end which houses the primer. A press fit identification top is cemented into the opposite end finished with embossed letters to identify the colors of the stars. Appropriately colored bands around the outer case also identify the colors of the stars. The identification top is also appropriately colored. These signals are classified by the Army as the "Rimless Type."

Identification of the series AN-M28 to AN-M33 is as follows:

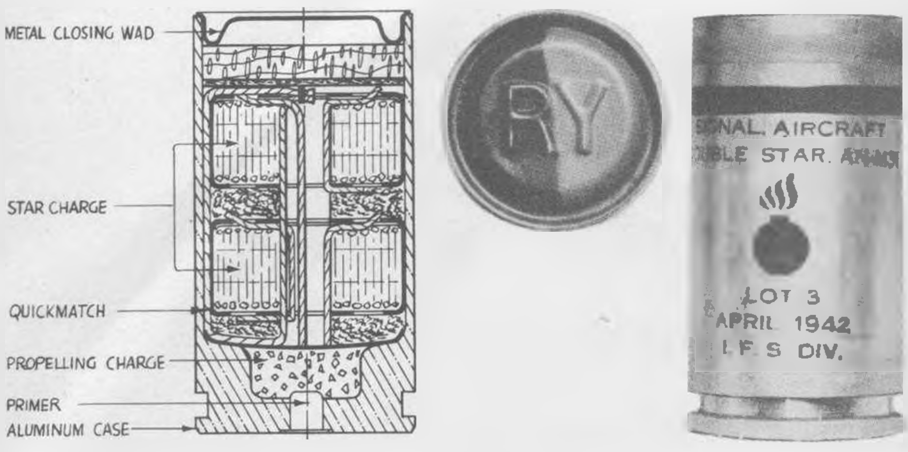
Designation	Color Stars	Embossed Letter
AN-M28	Red-Red	RR
AN-M29	Yellow-Yellow	YY
AN-M30	Green-Green	GG
AN-M31	Red-Yellow	RY
AN-M32	Red-Green	RG
AN-M33	Green-Yellow	GY

OPERATION:

The firing pin of the pistol strikes the primer igniting the propelling charge. As the stars are expelled from the pistol they are ignited by the propelling charge through the quickmatch. The stars reach full brilliance after traveling 40 or 50 feet and rise to a height of approximately 250 feet.

REMARKS:

This series of signals is obsolescent.



AIRCRAFT SIGNAL, DOUBLE STAR AN-M31

AIRCRAFT SIGNAL

AN-M37
to
AN-M42
series

Data:

LENGTH OF CARTRIDGE	3.85 in.
DIAMETER OF CASE	1.54 in.
BURNING TIME	7 seconds
ALTITUDE OF ZENITH OF TRAJECTORY. .	250 feet

USE:

Used as a method of emergency identification of aircraft.

METHOD OF PROJECTION:

The pyrotechnic pistol, AN-M8 is used to fire this signal.

DESCRIPTION:

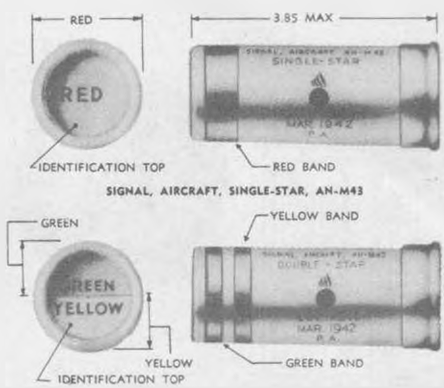
A metal or plastic head containing the primer is crimped to the paper board shell case, the opposite end of which is closed with a cardboard wad. The colors of the stars are printed and painted on this wad, there being no means of night identification. Colors of stars are also indicated by the appropriately colored and number of bands on the case near the forward end. These signals are classified by the Army as the "Cartridge Type."

Identification of the AN-M37 to AN-M42 series of signals is as follows:

Designation	Color of bands and Identification Top
AN-M37	Red-Red
AN-M38	Yellow-Yellow
AN-M39	Green-Green
AN-M40	Red-Yellow
AN-M41	Red-Green
AN-M42	Green-Yellow

OPERATION:

Similar to the AN-M28 to AN-M33 series.



AIRCRAFT SIGNALS (CARTRIDGE TYPE)

RESTRICTED

ARMY - NAVY SIGNAL

SINGLE STAR AIRCRAFT SIGNAL

AN-M34 - AN-M36
Series

Data:

Same as the AN-M28 to AN-M33 series. (see page 271)

DESCRIPTION:

This series has the single star instead of the double star of the AN-M28 to AN-M33 series.

Identification of the AN-M34 to AN-M33 series:

Designation	Color of Star	Embossed Letter
AN-M34	Red	R
AN-M35	Yellow	Y
AN-M36	Green	G

REMARKS:

This series is not procured by the Navy.

ARMY - NAVY SIGNAL

SINGLE STAR AIRCRAFT SIGNAL

AN-M43 - AN-M45

Data:

Same as the AN-M37 to AN-M42 series. (see page 272)

DESCRIPTION:

This series has a single star instead of the double star of the AN-M37 to AN-M42 series.

Identification of the AN-M43 through AN-M45 series:

Designation	Color of Star and Identification Top
AN-M43	Red
AN-M44	Yellow
AN-M45	Green

U. S. NAVY SIGNAL

TWO STAR SIGNAL CARTRIDGE

Mk 3 Mod 3

Data:

Same as the AN-M37 to AN-M42 series.

DESCRIPTION:

Interchangeable with the AN-M37 to AN-M42 series. There is no means of night identification.

Color combinations available are:

1. Red-Red
2. Yellow-Yellow
3. Green-Green
4. Red-Yellow
5. Red-Green
6. Green-Yellow

OPERATION:

Same as the AN-M37 to AN-M42 series except that the Navy Stars are ejected at the peak of the trajectory.

ARMY - NAVY SIGNAL

AIRCRAFT SIGNAL

AN-M53 to AN-M58
series

Data:

Similar to Mk 4 series.

DESCRIPTION:

Similar to the Mk 4 series.

Color combinations:

Designation	Star	Tracer
AN-M53	Red-Yellow	Yellow
AN-M54	Red-Red	Green
AN-M55	Green-Red	Green
AN-M56	Green-Green	Red
AN-M57	Red-Red	Red
AN-M58	Green-Red	Red

RESTRICTED

U. S. NAVY SIGNAL

SIGNAL CARTRIDGE (TRACER WITH TWO STARS)

Mk 4 series

Data:

LENGTH OF CASE . . . . 3.85 in.
DIAMETER OF CASE . . . . 1.52 in.
BURNING TIME . . . . 5 seconds
BURNING TIME OF TRACER . . . . 3 - 4 seconds
ALTITUDE AT ZENITH OF TRAJECTORY . . . 250 feet

USE:

Double star aircraft signals used as a method of emergency identification of aircraft.

METHOD OF PROJECTION:

The Pyrotechnic Pistol, AN-M 8, is used to fire the signal.

DESCRIPTION:

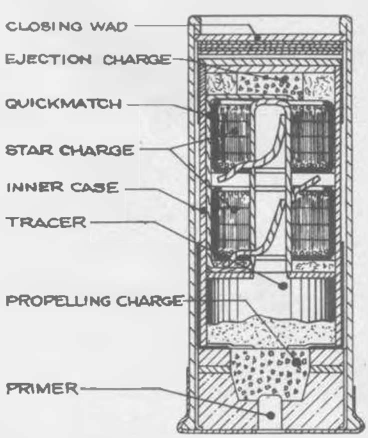
The outer case is similar to that of the Mk 3. The star charges are contained in an inner case which also houses an ejector charge and tracer element. Star color bands are the same as the bands on the Mk 3 and, in addition, a narrower band forward of the star identification bands, indicates the color of the tracer.

Color combinations are:

Red-Red	with	Red Tracer
Green-Green	with	Red Tracer
Red-Red	with	Green Tracer
Red-Yellow	with	Yellow Tracer
Red-Green	with	Red Tracer
Red-Green	with	Green Tracer

OPERATION:

The firing pin strikes the primer igniting the propelling charge which, in turn, ignites the tracer in the inner case and expels the inner case from the barrel. The tracer becomes visible after traveling about twenty feet. At approximately 250 feet altitude the tracer ignites the ejection charge through the quickmatch, the stars being ignited by the ejection charge through quickmatch as they are expelled from the inner case.



SIGNAL CARTRIDGE (TRACER & TWO STARS)
MK 4 SERIES

RESTRICTED

U. S. NAVY SIGNAL

VERY SIGNAL LIGHT

Mk 2

Data:

STANDARD VERY'S CARTRIDGE

1. Red Star
   a) Burning time . . . . 7 seconds
   b) Candle power 300

2. White Star
   a) Burning time . . . . 6 seconds
   b) Candle power 250

3. Green Star
   a) Burning time . . . . 5 seconds
   b) Candle power 600

USE:

Very's cartridges are used primarily as distress signals..

DESCRIPTION:

The Very's cartridge is similar in appearance to a 10-gauge shotgun shell. The star charge is a tightly-packed cylinder of pyrotechnic material reinforced with wire and wrapped with quickmatch. The propelling charge is composed of about 25 grains of black powder separated from the star charge by a hard felt pad.

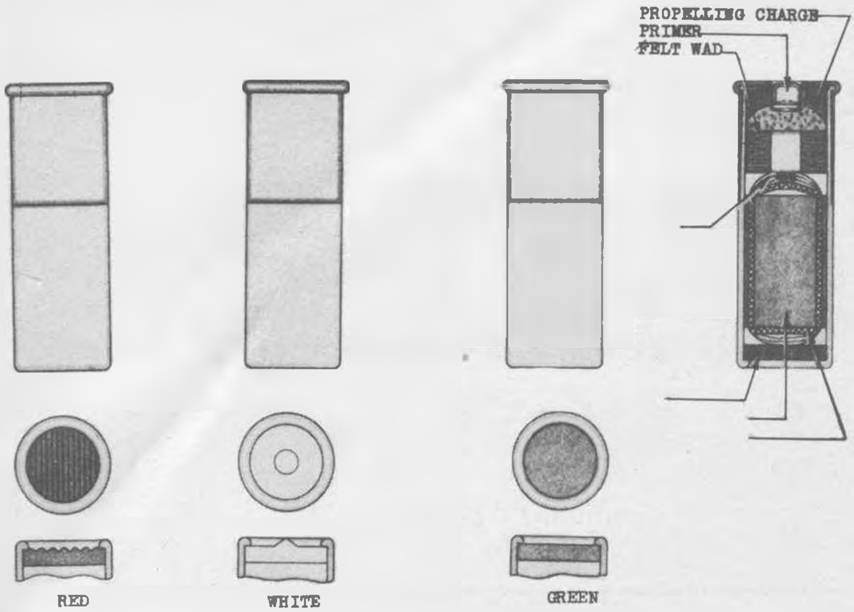
Identification of the three types:

1. Red Star
   a) Paper wrapping is red
   b) Closing wad is corrugated
2. White Star
   a) Paper wrapping is white
   b) Closing wad has a small cone in the center
3. Green Star
   a) Paper wrapping is green
   b) Closing wad is smooth

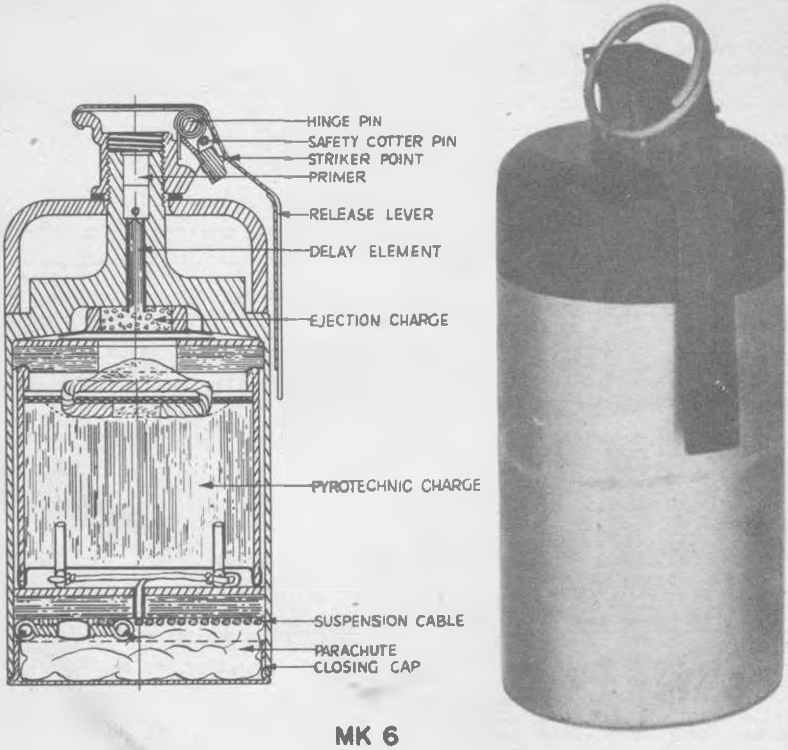
OPERATION:

The Signal Pistol (Very) Mk 5 may be used as well as the hand projectors, Mk 3 or Mk 4.

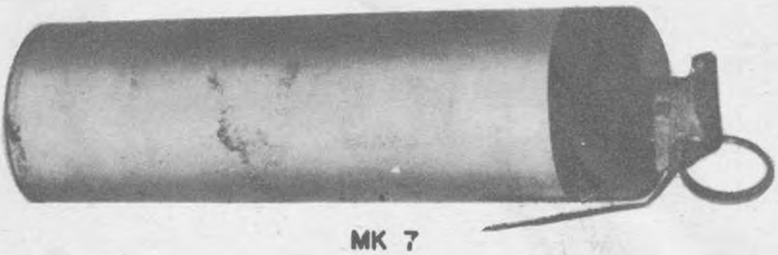
The primer ignites the propelling charge expelling the star out of the projector and igniting the quickmatch which ignites the star as it leaves the barrel and burns as it rises to a height of about 200 feet.



VERY SIGNAL LIGHT MK 2



MK 6



MK 7

AIRCRAFT E. I. SIGNAL

RESTRICTED

U. S. NAVY SIGNAL
AIRCRAFT EMERGENCY IDENTIFICATION STAR SIGNAL
Mk 6

Data:

LENGTH OF CYLINDER	6.0 in.
DIAMETER OF CYLINDER	2.5 in.
WEIGHT OF SIGNAL	1.4 lb.
BURNING TIME	25 seconds
INTERVAL BETWEEN LAUNCHING AND SUSPENSION.	2.75 seconds

USE:

Used primarily for identification purposes at night.

DESCRIPTION:

The body of the signal is an aluminum cylinder with a bouchon type of grenade firing mechanism on one end and a metal cap on the other. Contained in the body are the ejection charge, the pyrotechnic candle, and a silk, rayon, or paper parachute. The type and color of the signal star is printed on the side of the cylinder.

The closing cap on the lower end of the signal is embossed for night identification as indicated:

a) Red Star	one dot
b) White Star	straight line
c) Green Star	a wide "V"

All three signals have an arc of a circle one inch in length embossed near the edge of the cap.

OPERATION:

The signal is initiated in the manner prescribed for all bouchon fuzed grenades. The 2.75 second delay, having been ignited by the primer, ignites the ejection charge. The ejection charge pushes off the closing cap, expelling the pyrotechnic candle and the parachute, at the same time igniting the starting mixture through a quickmatch. The parachute opens and suspends the candle which burns for 25 seconds.

U. S. NAVY SIGNAL
AIRCRAFT EMERGENCY IDENTIFICATION SMOKE SIGNAL
Mk 7

Data:

LENGTH OF CYLINDER	10.0 in.
DIAMETER OF CYLINDER	2.5 in.
WEIGHT OF SIGNAL	2.5 lb.
COLOR OF SIGNAL	Red, Yellow, Green, or Black
BURNING TIME	25 seconds

USE:

Emergency identification for use in daylight.

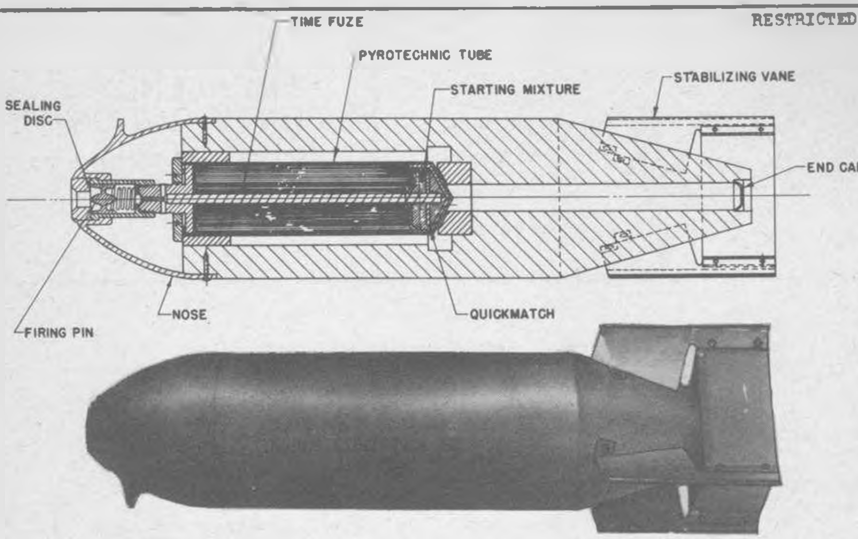
DESCRIPTION:

Same as the Mk 6 except for the length and the composition of the pyrotechnic candle.

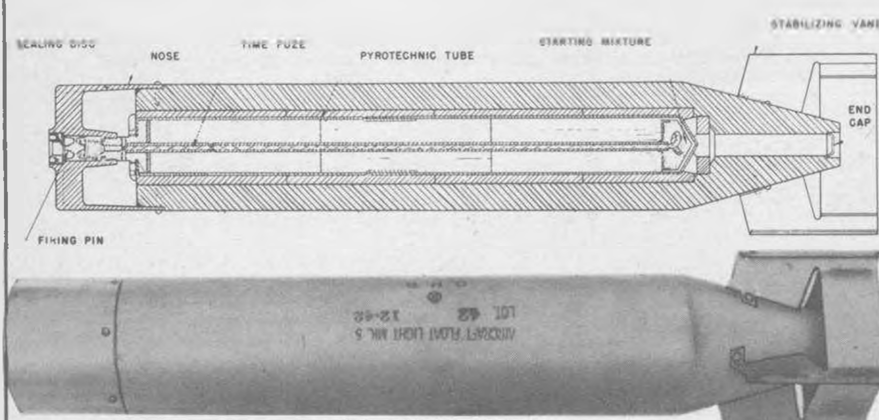
The closing cap of the smoke signal is not embossed but is painted the approximate color of the smoke produced.

OPERATION:

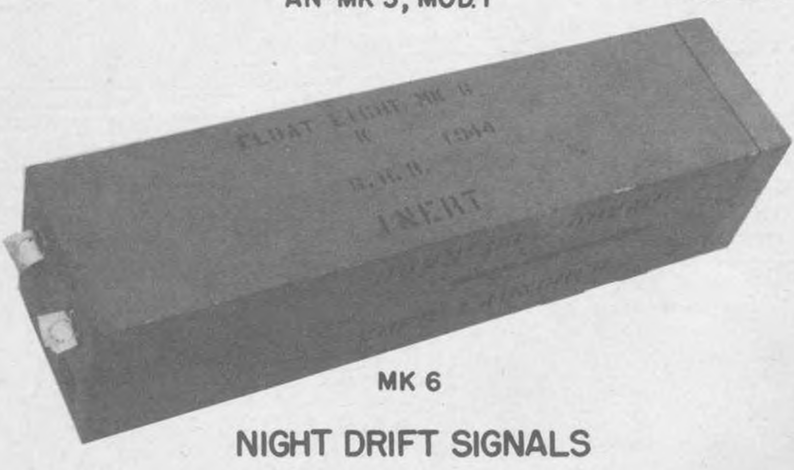
Same as described for the Mk 6.



AN-MK 4



AN-MK 5, MOD. I



MK 6

NIGHT DRIFT SIGNALS

RESTRICTED

Data:

	AN-Mk4	AN-Mk5-Mod 1
OVERALL LENGTH	13 in. . . .	19 in.
DIAMETER OF BODY	3 in. . . .	3 in.
WEIGHT	2 lb. . . .	4 lb.
BURNING TIME	3-3.5 min.	15-17min.
TIME FROM IMPACT TO IGNITION	8-12 sec.	
EFFECTIVE RELEASE ALTITUDE	Under 500 feet	
VISIBILITY	Night - 6 - 7 Mis.	

ARMY - NAVY SIGNALS

NIGHT DRIFT SIGNALS

AN-Mk 4
AN-Mk 5 Mod 1

AIRCRAFT FLOAT LIGHT

Mk 6
(And Mods)

USE:

To determine the drift of the plane from which it was dropped.
To mark the initial point of contact with a submarine.
To mark an object to which an aircraft desires to call the attention of a surface vessel.
To determine the wind direction before landing.
To mark the landing deck on aircraft carriers for night landings.
To mark the location of the surface of the water for emergency night landings.

DESCRIPTION:

The appearance of these signals differs in that the AN-Mk 4 has an ogival shaped, die cast nose with a lug on one side side so that the signal will turn and not strike the bottom in shallow water, while the AN-Mk 5 Mod 1 has a flat die cast nose and its overall length is 6 inches greater. In both cases the die cast nose contains a water impact fuze. The bodies of both signals are made of hollow wooden cylinders 3 inches in diameter, with one end tapered to a one inch diameter on which the tail assembly is mounted.

The pyrotechnic mixture is formed into pellets approximately four inches long and 1.25 inches in diameter with a .022 inch hole concentric with the longitudinal axis through which the delay fuse passes. One pellet is used in the AN-Mk 4 and three pellets are used in the AN-Mk 5 Mod 1. The pellets are enclosed in a pyrotechnic tube to keep the hygroscopic material from absorbing moisture through the wooden body. Originally pure tin was used for this purpose, but in recent lots lead and zinc have been substituted. The nose end of the signal is closed with a paraffin treated sealing disc, while the tail is sealed with a metal cap.

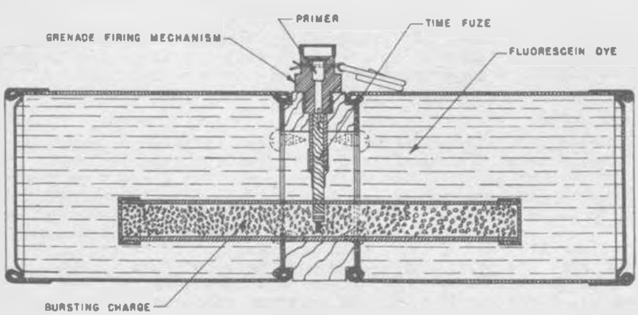
Aircraft Float Light, Mk 6 Mod 0 consists of four AN-Mk 5 Mod 1 drift signals which are contained in a square wooden body and burn successively. The box is 20.25 inches long and 5.125 inches square. The weight is 16 pounds and the burning time is 45 minutes. The float light is released by hand from an altitude of from 300 to 5000 feet. It gives off a flame 10 or 12 inches high and grey smoke. The AN-Mk 6 Mod 2 is ignited by a pull igniter which is pulled when released. The light can be dropped from an altitude over 5000 feet.

OPERATION:

When launched from aircraft the drift signal falls nose down. On impact with the surface of the water the paraffined paper sealing disc is broken and the water drives the firing pin up against the primer. The flame from the primer ignites the time fuse which runs the length of the hole through the center of the pyrotechnic pellets and give the drift signal enough time to return to the surface and right itself. The time fuse ignites a length of quickmatch which in turn ignites the starting mixture and then the pyrotechnic pellets. The gases evolved break open the pyrotechnic tube and force out the cap which seals the discharge tube in the tail. A bright flame 12 - 15 inches high and a white smoke are produced which are visible for six to seven miles on a clear night.

REMARKS:

These signals may be used for day signals but under certain conditions observation is difficult.



DEPTH CHARGE MARKER (DAY)
MK I & MODS.

RESTRICTED

U. S. NAVY MARKER

DAY DEPTH CHARGE MARKER

Mark 1, Mod 1

Data:

OVERALL LENGTH	11.88 in.
DIAMETER OF CASE	3.46 in.
WEIGHT	3.5 lbs.
WEIGHT OF DYE	2.75 lbs.
WEIGHT OF BURSTING CHARGE. .	30 grams
EFFECTIVE RELEASING ALTITUDE	Up to 1000 ft.
VISIBILITY	3000 yds from deck of ship; 5 mi. from aircraft.

USE:

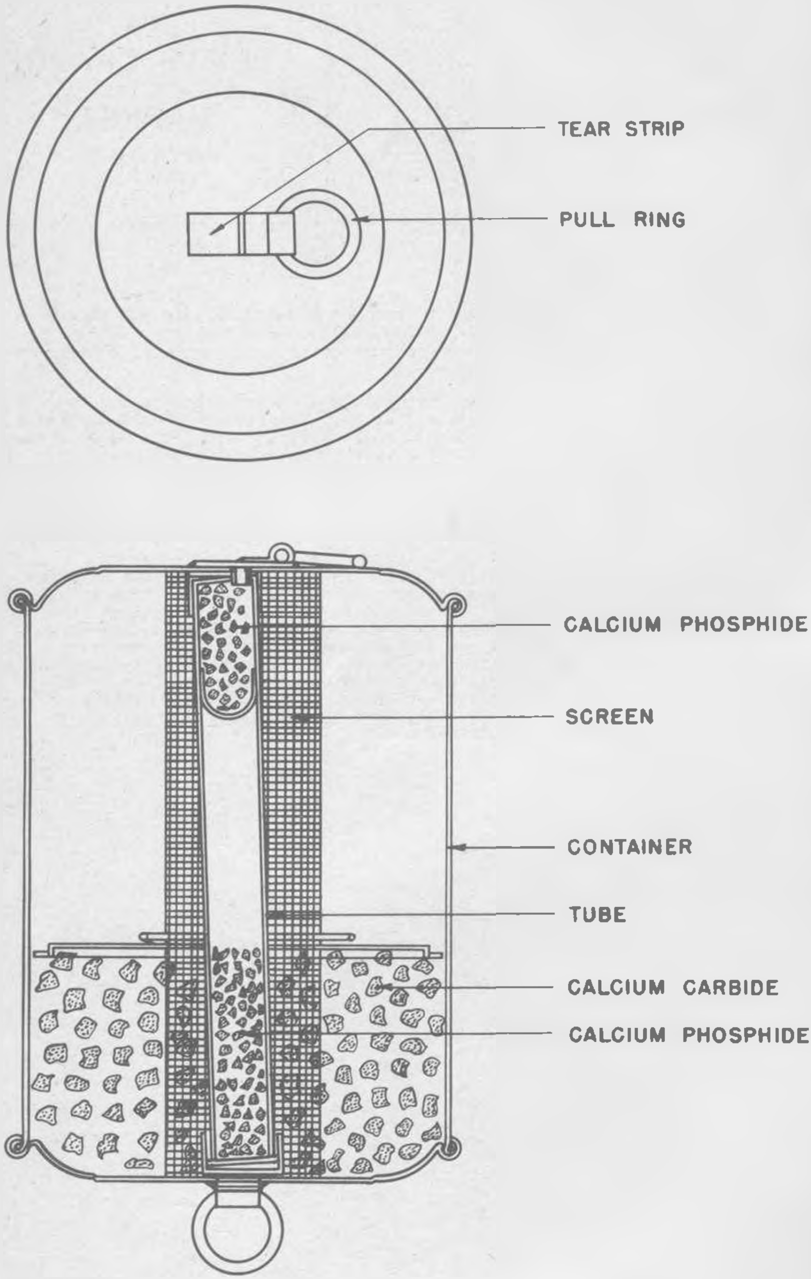
To indicate the initial point of contact with submarines and provide a reference point for further search and attack during day operation.

DESCRIPTION:

The marker consists of a circular wooden block on which is mounted a grenade - firing mechanism with a 15 second delay. Fluorescein dye is contained in two cylindrical paper cans, one attached to each flat side of the wooden block, and a celluloid tube containing the black powder bursting charge is attached to the delay element and extends through the wooden block into the paper cans. The dye is rusty red in color when dry, but a water solution of the dye is yellow-green.

OPERATION:

The marker is clasped firmly in one hand being sure that the release lever is held against the body of the marker. With the other hand, the safety ring which is attached to the safety cotter pin is pulled and the marker is launched by throwing it over the side. When the marker is released, the spring loaded striker forces the release lever off and the striker rotating about a hinge pin hits the primer that ignites the 15 second delay fuse. The delay gives the marker sufficient time to reach the water and float on the surface, and then ignites the bursting charge. The gases evolved burst the dye containers and spread the dye on the water forming a yellow-green slick about 40 feet in diameter that lasts for 45 to 60 minutes.



DEPTH CHARGE MARKER (NIGHT) MK 2

RESTRICTED

U. S. NAVY MARKER

NIGHT DEPTH CHARGE MARKER

Mark 2

Data:

OVERALL LENGTH	7 in.
DIAMETER OF CASE	5 in.
WEIGHT	2.5 lbs.
EFFECTIVE RELEASING ALTITUDE	Up to 3000 ft.
VISIBILITY . . .	4 miles from deck of ship.
. . .	10 miles from aircraft.
BURNING TIME	55 min.
IGNITION TIME (after impact)	70 - 90 sec.

USE:

To indicate the initial point of contact with submarines and provide a reference point for further search and attack during night operations.

DESCRIPTION:

The marker is a sealed, cylindrical, metal container that has a centrally located tube which is sealed on both ends by tear strips with a pull ring attached and contains calcium phosphide. The main charge is calcium carbide that surrounds the central tube and is held in one end by a screen. This produces a concentration of weight at one end and allows the marker to float in an upright position.

OPERATION:

After the two tear strips are pulled off, the marker is launched by throwing it overboard. Water enters through the small holes in the bottom and reacts with both the calcium carbide producing an inflammable gas, acetylene; and calcium phosphide producing a spontaneously ignited gas, phosphine. Both gases escape from the small holes in the top and ignite within 70 - 90 seconds after impact with the water. In extremely cold weather, the ignition delay may be somewhat longer. The resulting flame is about 9 inches high and if it should be put out by rough water, the gases will ignite again.

RESTRICTED

Data:

LENGTH OF BODY	10.0 in.
GREATEST DIAMETER (nose) . . .	3.5 in.
THICKNESS OF CASE.	0.07 in.
COLOR OF POWDER SLICK.	Chrome yellow

USE:

This signal may be used for a reference point for air navigation.

ARMY - NAVY SIGNAL

DAY DRIFT SIGNAL

AN-Mk 1

DESCRIPTION:

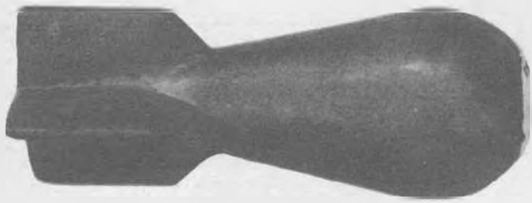
The case is composed of a waterproofed paper pulp shell pressed in the form of a tear drop with four fins formed on the tail cone with a diameter approximately the same as the greatest diameter of the nose section. The only other element of this signal is the very fine metallic powder filling which nearly fills the cavity.

OPERATION:

When the signal is dropped into the water the shell breaks allowing the powder filling to spread out on the surface and form a slick visible to 15,000 feet.

REMARKS:

1. The Drift Signal, Day. AN-Mk 1 is a BuAer and not a BuOrd Item.
2. This marker has replaced the Drift Signal M25 which is now obsolete.



RESTRICTED

Data:

LENGTH OF SIGNAL	5.75 in.
DIAMETER OF CARTRIDGE.	0.85 in.

USE:

To be used in the following miniature practice bombs: AN-Mk5 Mod 1, Mk19, Mk19 Mod 1, AN-Mk23, Mk39, AN-Mk43.
To indicate the point of impact of practice bombs.

ARMY - NAVY SIGNAL

MINIATURE PRACTICE BOMB SIGNAL

AN-Mk 4

DESCRIPTION:

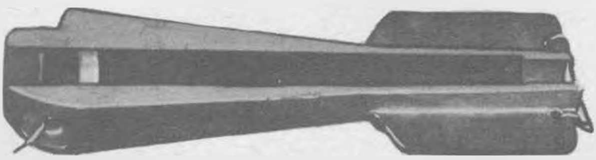
The signal cartridge is a 10 gauge paper shotgun shell of extra length containing a primer, black powder expelling charge, paper disc and 10 gauge gun wad, pyrotechnic smoke charge, and felt wad.

OPERATION:

On impact the material of the target forces the bomb firing pin into the primer igniting the expelling charge which expels and ignites the signal charge as it leaves the open tail section of the bomb. A reddish flash and white smoke puff are produced..

REMARKS:

Used in the same practice bombs as the AN-Mk4 is the Miniature Practice Bomb Signal, AN-Mk5 Mod 0 consisting of a plastic cylinder 1.75 in. long containing flourescein dye released on the water's surface when the case is broken on impact.



RESTRICTED

ARMY - NAVY CARTRIDGE

SLICK MARKER CARTRIDGE

AN-Mk 1

Data:

LENGTH OF CARTRIDGE	3.8 in.
DIAMETER OF CARTRIDGE	1.5 in.
MUZZLE VELOCITY OF PROJECTILE	300 ft/sec.
WEIGHT OF DYE FILLING	28 grams

USE:

Primarily to provide reference points for aircraft engaged in anti-submarine warfare.

DESCRIPTION:

The cartridge is composed of a shotgun type case containing a primer, a black powder propelling charge, and the projectile. The projectile has a thin aluminum case and contains 28 grams of flourescein dye and a black powder bursting charge initiated by a Bickford type fuse.

METHOD OF LAUNCHING:

The marker cartridge is fired in the AN-M 8 pyrotechnic pistol which may be held in the hand or mounted in the M1 mount.

To obtain a vertical drop of the projectile relative to a point on the water surface the pyrotechnic pistol is pointed downward and aft at the following angles from the vertical depending on the ground speed.

Speed in knots:	25	50	75	100	125	150	175
Angle from vertical:	8°	16°	23°	34°	45°	58°	90°

OPERATION:

When the cartridge is fired the black powder in the head of the case propels the projectile from the pistol and at the same time ignites the Bickford fuse. The fuse burns for about eleven seconds before igniting the bursting charge which expels the flourescein dye out into the water. The projectile has a positive buoyancy and will remain near or at the surface until a small, bright green slick is created.

REMARKS:

This cartridge should not be fired from altitudes greater than 500 feet except in case of an emergency.

RESTRICTED

ARMY - NAVY MARKER

SLICK MARKER

AN-M59

Data:

LENGTH OF MARKER	10.875 in.
DIAMETER OF CASE	3.375 in.
WEIGHT OF MARKER	2.9 lbs.

USE:

Standard all purpose sea marker for daylight use:

1. To provide reference points
2. Aid in determining drift.
3. Provide practice bombing targets on water.

DESCRIPTION:

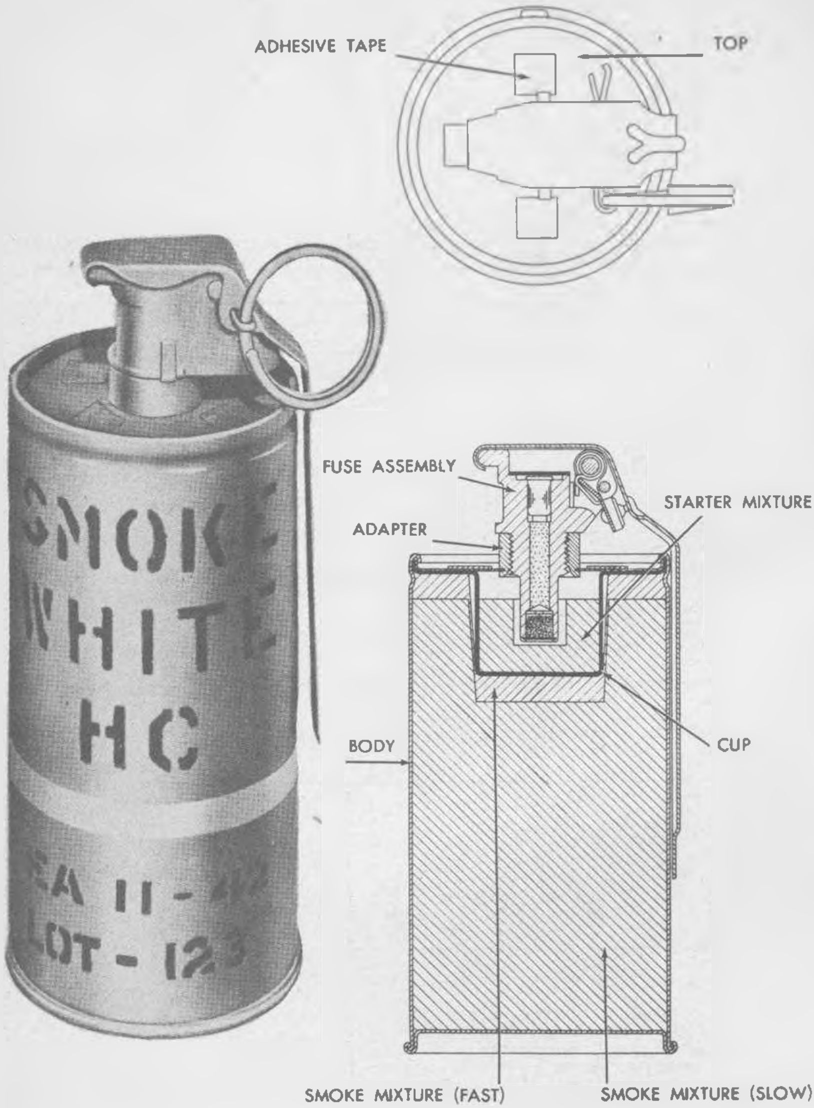
This marker consists of a paper composition case filled with a flourescein dye. It is protected by a cylinder of paper-mache which does not interfere with its function.

METHOD OF LAUNCHING:

Dropped by hand from a plane.

OPERATION:

Upon impact with water the case shatters and the dye spreads upon the surface.



WHITE SMOKE GRENADE, HC, AN-M8

RESTRICTED

ARMY - NAVY GRENADE

WHITE SMOKE GRENADE

HC, AN-M8

Data:

LENGTH OF SIGNAL . . . . 5.7 in.
DIAMETER OF SIGNAL . . . . 2.57 in.
WEIGHT OF SIGNAL . . . . 1.68 lb.
BURNING TIME . . . . 3.5 minutes
DELAY TIME . . . . 3 seconds

USE:

To attract attention to aviation personnel who have made a forced landing.

DESCRIPTION:

The cylindrical sheet metal case is nearly full of a solid smoke mixture. A circular zinc cup containing a starting mixture is located in a depression left in the top of the smoke mixture, and is desgined to be initiated by a bouchon type of grenade firing mechanism. Adhesive tape covers four 1/4 inch holes in the top of the case until the signal is ready for firing.

The grenade is painted gray and marked in yellow with one band, the symbol of the filler, "HC", and the word "smoke".

OPERATION:

The release lever cotter pin having been removed the release lever is freed by the operator as the grenade is thrown, and is forced off by the striker which is at all times under tension of its spring. The striker moves on its hinge and fires the primer which ignites a delay element that in turn ignites the starting mixture.

The starting mixture burns through the zinc cup and starts a chemical reaction in the smoke mixture generating considerable heat with the formation of zinc chloride. The zinc chloride escapes into the air as a gray-white smoke composed of finely divided solid particles. These particles are highly hygroscopic and become very obscuring liquid particles. The grenade burns for about three and a half minutes at full volume.

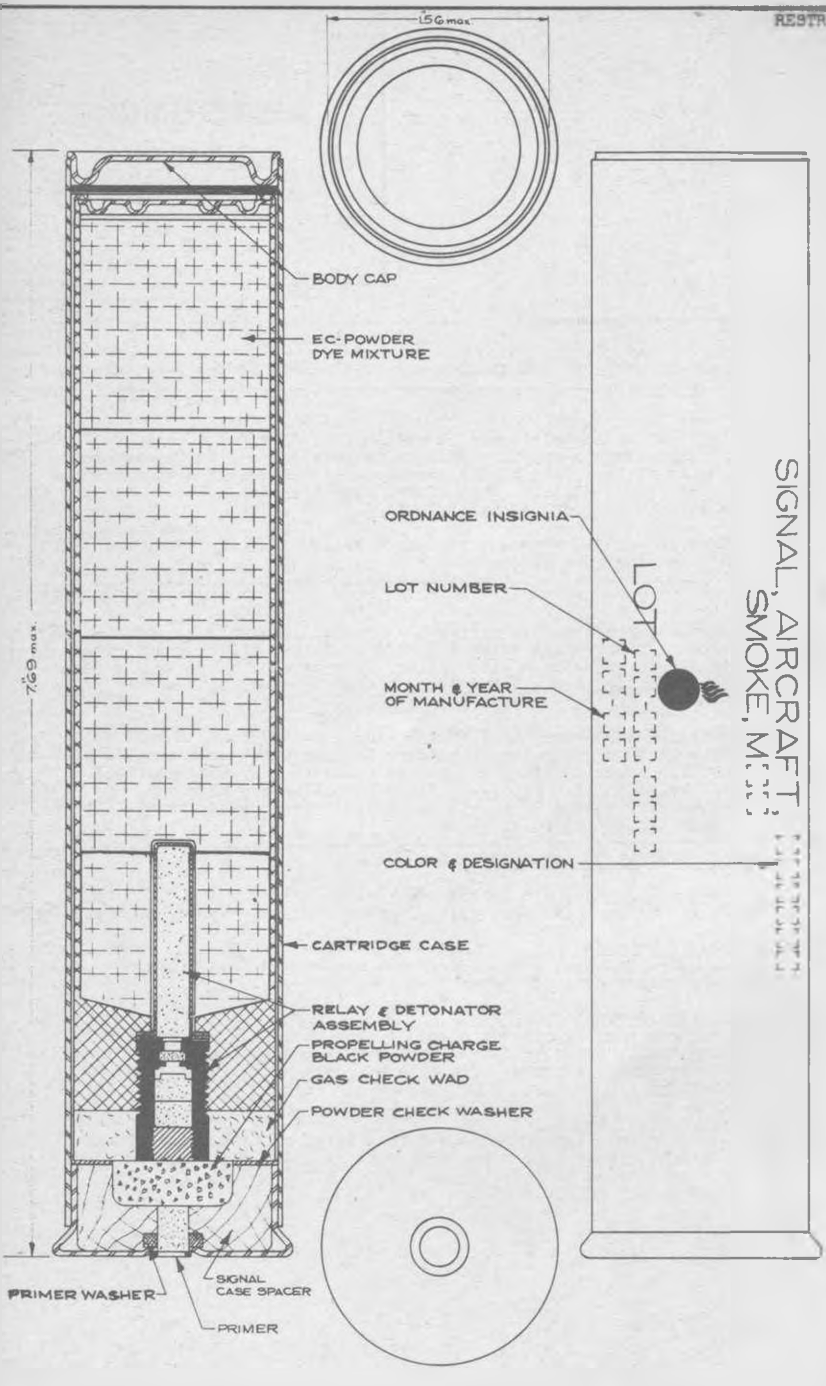
OTHER SMOKE GRENADES SIMILAR TO AN-M 8

Colored Smoke Grenade, M16 (obsolescent)
Same as AN-M8, may have red, yellow, green, orange, violet, or black smoke

Colored Smoke Grenade, M18
Same as M16 with burning reduced to one minute for a more dense smoke. Available colors are red, green, yellow, violet.

Colored Streamer Smoke Bomb, M87
Eight M18 grenades are inserted into a tube to form a grenade train providing a colored smoke stream type bomb for use as a visual signal for Oboe equipped aircraft. For complete data and illustration see page 323 .

Red Smoke Grenade, AN-M4
Has a shorter fuze lever and issued in a metal container with three flaps designed to be bent outward to provide additional bearing surface for use in mud or snow.
The AN-M4 is not procured by the Navy.



AIRCRAFT SMOKE SIGNAL T43-T47 SERIES

RESTRICTED

U. S. ARMY SIGNAL

AIRCRAFT

SMOKE SIGNALS

T43 - T47 Series

Data:

OVERALL LENGTH OF CARTRIDGE .	7.69 in.
DIAMETER OF TUBE	1.56 in.
PERSISTENCE OF SMOKE	30 seconds
DIAMETER OF SMOKE PUFF . . .	20 - 25 ft.
FUNCTIONING DELAY	2 - 3 seconds
SMOKE COLORS AVAILABLE . . .	
T43	Red
T44	Orange
T45	Yellow
T46	Green
T47	Violet

USE:

Assembly marker (planes' squadron leader designates his position by using the smoke signal and the remainder of the planes can thus readily assemble in the required formation.)

METHOD OF LAUNCHING:

The signal is fired from the pyrotechnic pistol AN-M8.

DESCRIPTION:

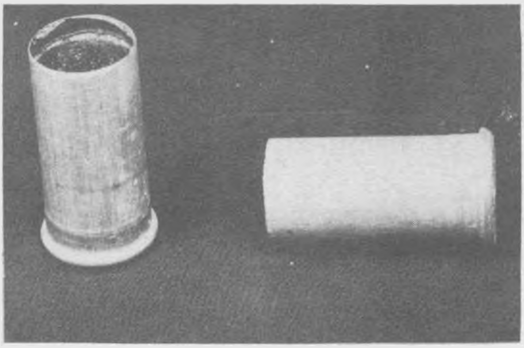
The cartridge is composed of an aluminum outer tube containing a primer, the propelling charge, and the inner tube which houses the delay and relay elements, the detonator, and smoke charge. The smoke charge is made up of 1.5 ounces of EC powder and 1.5 ounces of dye.

OPERATION:

When the signal is fired from the pistol the primer ignites the expelling charge ejecting the inner case and simultaneously ignites the delay and relay, firing the detonator. The detonator sets of the EC-dye mixture.

REMARKS:

This signal is much more dangerous to handle than other pyrotechnics, its action being comparable to an HE grenade.



RED STAR SIGNAL, M73

2 RED STAR DISTRESS SIGNAL, T49

RESTRICTED

Data:

LENGTH OF CARTRIDGE	5.0 in.
DIAMETER OUTER CASE	1.125 in.
ALTITUDE OF TRAJECTORY.	100 - 200 ft.
BURNING TIME	6 - 8 sec.
COLOR OF STARS	Red

U. S. ARMY SIGNAL

TWO RED STAR DISTRESS SIGNAL

T49

USE:

Emergency rescue signal (life raft).

DESCRIPTION:

The signal is contained in a cylinder which houses the stars and the firing mechanism. This mechanism consists of a pull release fork and a spring loaded firing pin.

OPERATION:

The tape is removed from the top cover and the cover is removed. The release fork is pulled, the firing pin is released and hits the primer initiating the delay. After two to four seconds the first red star is ejected and after three to five seconds the second red star is ejected.

REMARKS:

This signal is not procured by the Navy.

RESTRICTED

Data:

LENGTH	2.25 in.
DIAMETER	1.0 in.
ALTITUDE OF TRAJECTORY.	200 ft.

U. S. ARMY SIGNAL

SINGLE RED STAR DISTRESS SIGNAL

M73

USE:

Emergency signal.

DESCRIPTION:

The signal is composed of an aluminum cylinder, one end of which contains a primer and the other a cork plug. The pyrotechnic composition is located below the cork plug.

OPERATION:

The firing pin of the Pyrotechnic Discharger, M10 strikes the primer and the signal star is projected to the altitude of 200 feet.

REMARKS:

This signal is not procured by the Navy.

RESTRICTED

U. S. NAVY CARTRIDGE

AIRCRAFT ENGINE STARTER CARTRIDGE

Data:

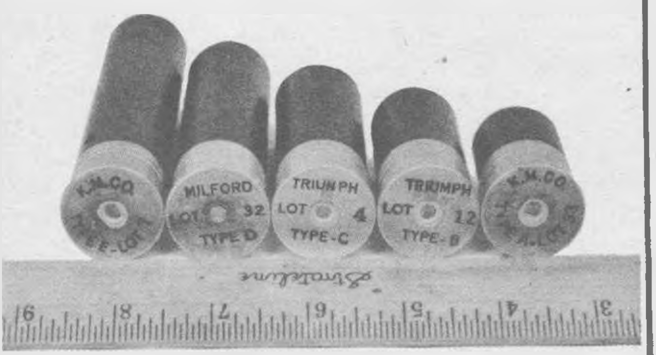
Type	Length (in)	Powder Charge (grams)
Type A	2.25	14
Type B	2.25	17
Type C	4.0	22
Type D	4.0	30
Type E	4.75	35

USE:

Designed to furnish power for starting aircraft engines.

DESCRIPTION:

Similar to shotgun cartridge in appearance. Consists of a paper tube inserted into a brass head containing an electric primer element and a small charge of black powder. Explosive charge is smokeless powder.



AIRCRAFT ENGINE
STARTER CARTRIDGES

RESTRICTED

U. S. NAVY FLARE

MK I FLARE

(And Mods)

Data:

OVERALL LENGTH	18.75 in.
DIAMETER OF CASE	2.44 in.
WEIGHT	4.31 lb.
BURNING TIME	1.5 min.
LIGHT INTENSITY	110,000 candle power
COLOR	White
MAXIMUM EFFECTIVE RELEASE ALTITUDE	1200 ft.
RATE OF FALL AFTER IGNITION	550 ft./min.

USE:

It is used to illuminate an area for emergency night landings by certain commercial type aircraft in use by the Navy.

DESCRIPTION:

The flare is issued in a hermetically sealed aluminum case called a projector tube. One end of this tube is closed by a metal cap and sealed by a gasket. The other end narrows down into a small knob with an electrical terminal in the extreme end. The tube is cylindrical for most of its length.

The projector tube contains an inner case and a propelling charge of black powder. The inner case contains an ejection charge, the pyrotechnic candle and a parachute. The ejection charge is in the after end of the inner case and the delay fuse and interrupter mechanism are mounted on the outside of the same end of the inner case.

The electrical terminal at the end of the projector tube is connected through a toggle switch in the pilot's compartment to the lighting system of the plane.

RELEASING METHOD:

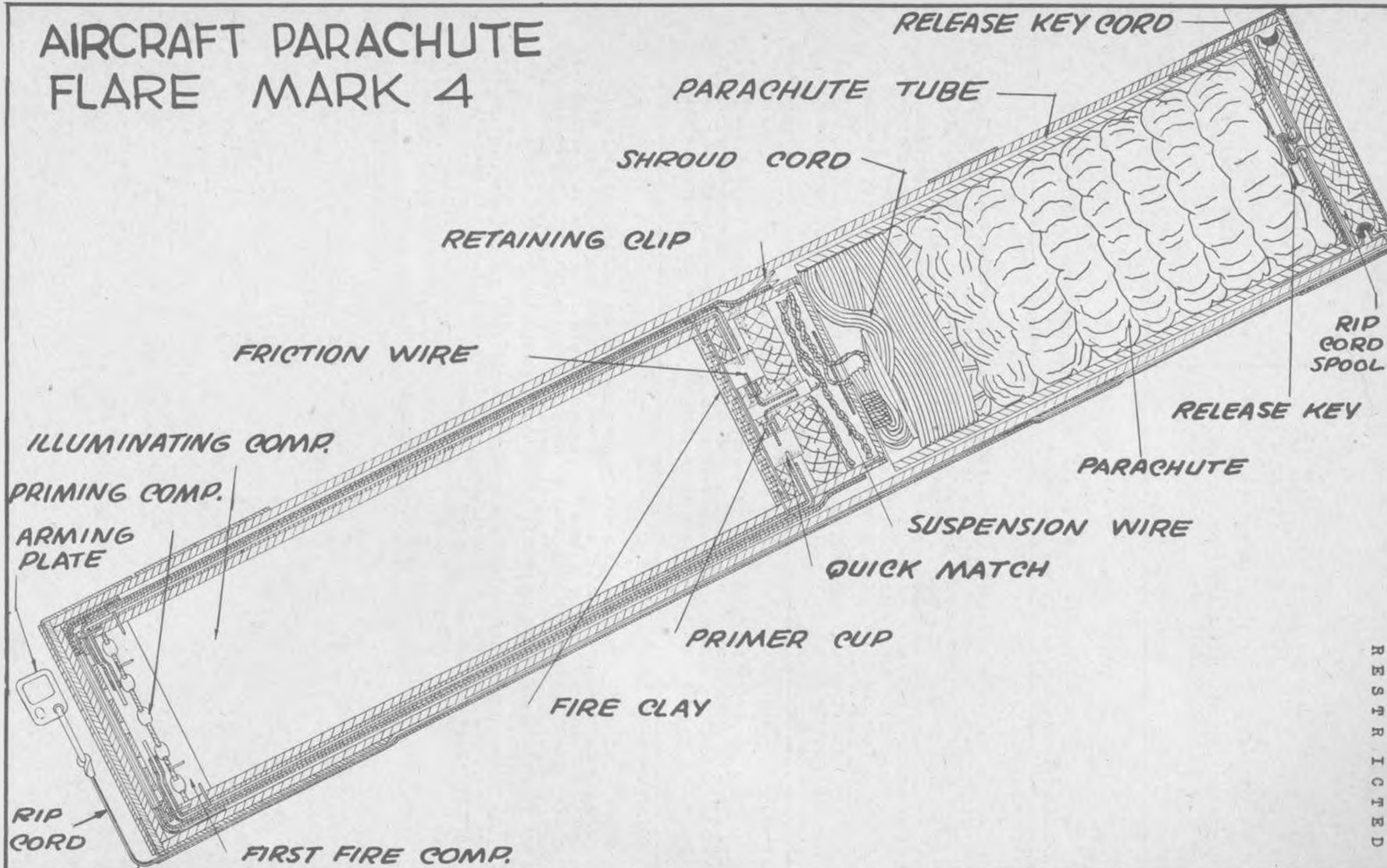
The projector tube which is constructed as an integral part of the flare is fixed by clamp bands to a bracket in the after end of the fuselage where the firing circuit is connected when the flares are loaded. The projector tube remains in the bracket when the flare is released or expelled by closing the switch in the cockpit.

OPERATION:

When the electrical circuit is completed in the cockpit the propelling charge is ignited and the inner case is forced out of the projector tube. The propellant ignites the delay fuse which burns until the inner case is approximately 40 feet from the plane and then, through an explosive lead in, ignites the ejection charge which, in turn, forces the pyrotechnic candle and attached parachute from the inner case and, simultaneously, the ejection charge ignites the candle.

An interrupter mechanism between the delay fuse and the ejection charge in the inner case prevents the functioning of the flare until the inner case has left the projector tube and is clear of the plane.

AIRCRAFT PARACHUTE FLARE MARK 4



RESTRICTED

U. S. NAVY FLARE

MK. 4 FLARE

(AND MODS)

Data

OVERALL LENGTH	27 in.
DIAMETER OF CASE	4.75 in.
WEIGHT	18 lb.
BURNING TIME	3 min.
INTENSITY	300,000 candle-power.
COLOR	White.
EFFECTIVE RELEASING ALTITUDE	1200 - 5000 ft.
RATE OF FALL AFTER IGNITION	350 ft/min.

USE:

1. Primarily, it is used to illuminate an area to permit the landing of aircraft.
2. Occasionally, it is used for reconnoitering, bombing, and blinding anti-aircraft defenses.

DESCRIPTION:

The complete flare consists of a parachute and illuminant contained in a shellac-impregnated chip board tube closed at the ends by chip board discs which are held in place by gummed cloth and sealed with paraffin. There are two metal steadying bands fastened around the case against which the steadying forks of the bomb rack rests. The complete flare is issued in a water-proof metal container.

RELEASING METHODS:

1. Bomb rack or shackle release: Mk 50 and Mk 51 racks; Mk 3 (and Mods.) shackles; Mk 4, Mod. 2 and above shackles; Mk 5 and Mods. shackles.

   For this type of release support bands are required, being shipped with the flare and attached in positions indicated on the flare. The Mk 35 and Mk 41 racks are not designed to operate with less than 100 lb. load and should not be used with this flare.

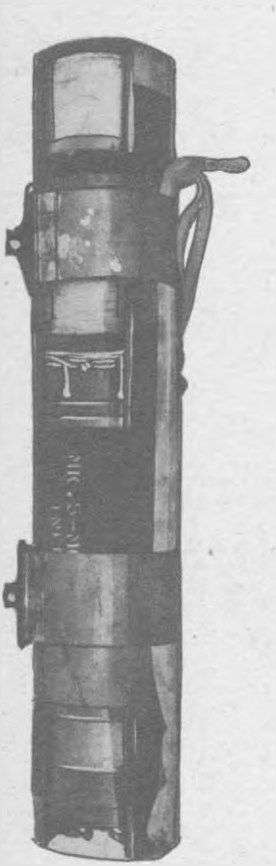
2. Adapter Release (chute or holder): The flare is inserted into the adapter with the heavy end down and the rip cord is secured on a hook in the plane. The flare is released by a switch from the cockpit.
3. Cockpit Release (Not recommended except in emergency): An additional 10 feet of rip cord is attached to the arming plate of rip cord and the other end is secured to some substantial part in the plane. The flare is released in a vertical position, heavy end down, with as much downward velocity as possible so that it will be well clear of the plane when rip cord is taut.

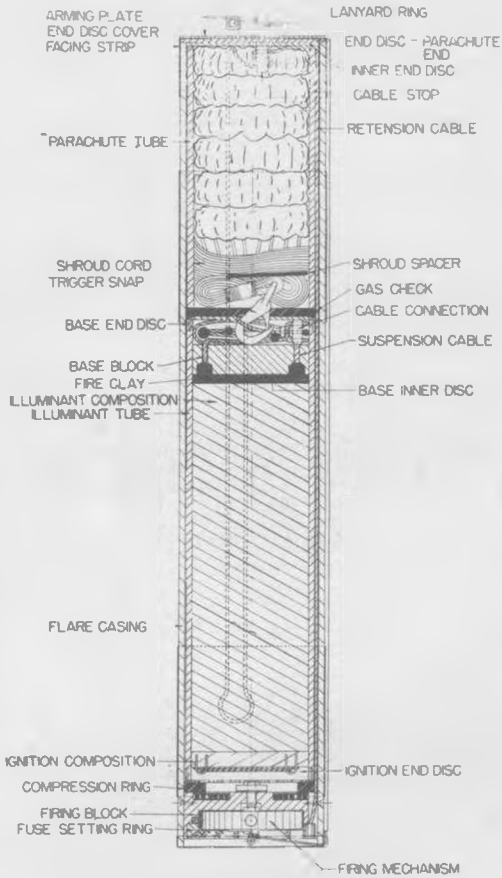
OPERATION:

As the flare is dropped from the plane, the arming plate of the rip cord is retained by the plane and the rip cord is pulled from the side of the flare case to which it is fastened by gummed cloth tape. As the flare continues to fall, the rip cord, which is wound around a wooden spool inside the end of the flare case, is unwound tearing away the end of the flare case. The end disc and spool fall away as the parachute tube is pulled from the flare case and retained by the rip cord. The parachute is pulled out of its tube by the weight of the illuminant and flare case and causes the parachute and parachute shrouds to straighten out. When the parachute and parachute shrouds are fully extended, a small cord attached to the release key pulls the release key down allowing the rip cord to slip through the key and the flare falls free.

An ignition wire is attached to the suspension cable in such a manner that it is pulled before the cable is fully extended. Four friction wires are attached to the ignition wire and run through primer cups of match compound. This ignites a double quickmatch train which burns down the outside of the illuminant case and ignites the primer composition which in turn ignites the first fire and illuminant. When the parachute opens, the illuminant is pulled out of the flare case, and flare case falls clear. Full suspension and ignition occur about 30 - 50 feet below the plane.

RESTRICTED





AIRCRAFT PARACHUTE FLARE

MK 5 & MODS.

R E S T R I C T E D

U. S. NAVY FLARE

MK. 5 FLARE (AND MODS.)

Data

OVERALL LENGTH	27 in.
DIAMETER OF FLARE CASE	4.75 in.
WEIGHT	18 lb.
BURNING TIME	3 min.
INTENSITY	750,000 candle-power.
COLOR	Mk 5 and Mk 5 Mods 1 & 2 are white; Mk 5 Mods 3-7, yellow.
EFFECTIVE RELEASE ALTITUDE	3500 - 15000 ft.
TERMINAL VELOCITY (Before ignition)	225 ft/sec.
RATE OF FALL (After ignition).	450 ft/ min.

USE:

To illuminate an area for reconnoitering, bombing, or landing.

DESCRIPTION:

The complete flare consists of a parachute and illuminant and impregnated chip board case. It is closed on the parachute end by several layers of chipboard discs held in place by gummed cloth tape and sealed with paraffin, and on the fuze end, which contains the Ensign Bickford fuze, by a metal cover. There are two metal steadying bands fastened around the case against which the steadying forks of the bomb rack rests. The complete flare in its case is issued in a water-proof metal container.

OPERATION:

The setting of the Ensign Bickford time delay fuze is made by turning the lock screw on the metal firing mechanism housing to the desired delay, which is indicated on the bevel of the fuze setting ring. The numbers indicates the vertical distance the fuze will drop before igniting. When the correct setting is obtained, the firing mechanism is secured by screwing the lock screw until its point is buried in the flare case.

When the flare is released from the plane, the arming plate is retained on the plane, the rip cord is torn from the side of the flare case and the cover on the fuze end is flipped off. The rip cord is attached to the snap cord that passes around a lug on the firing lever and is secured to the fuze block. As the flare continues to fall, the snap cord is pulled, overcoming the lever spring and cocking the firing lever. When a tension of approximately 38 pounds is reached in the snap cord, it breaks releasing the firing lever and the lever spring then drives the firing lever back against the fulminate of mercury primer. The flare now falls free.

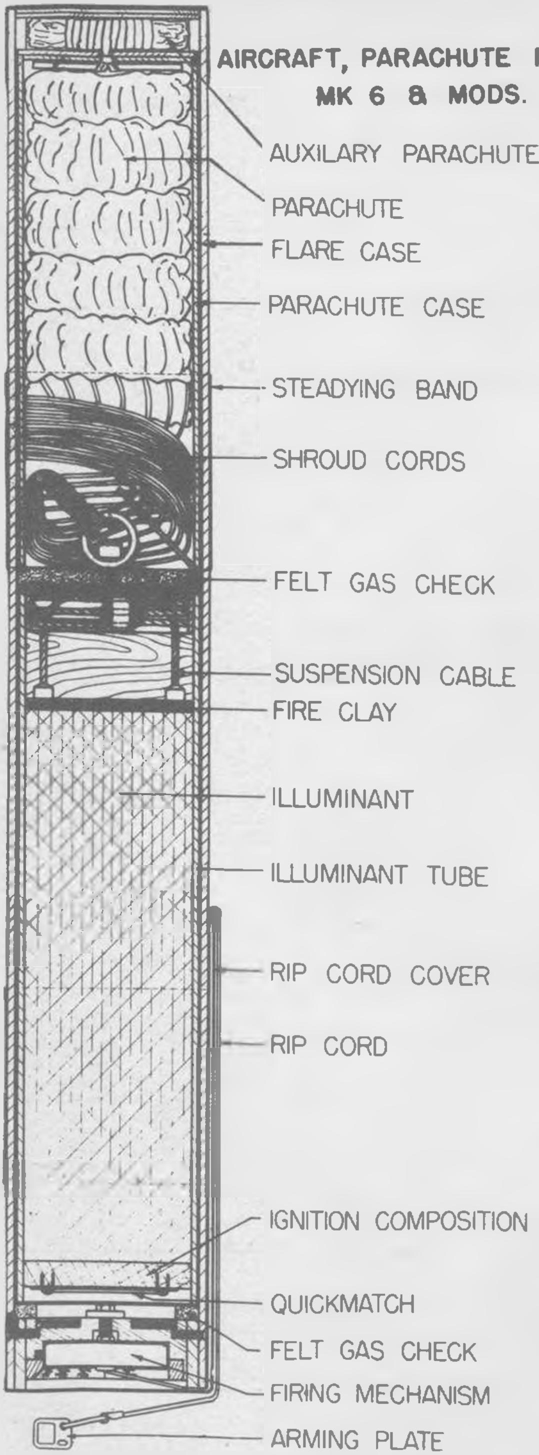
The primer ignites the black powder pellets in the fuze plunger and the expanding gases from the burning black powder propells the sharp point of the plunger radially outward into the Ensign Bickford time fuze. There are three small holes near the point of the plunger which allow some of the flame to escape from the inside of the plunger into the powder of the Engisn Bickford fuze that causes its ignition. The time fuses burns its predetermined length at the rate of approximately 12 inches per 60 seconds, and ignites the quickmatch under the firing block.

The flash produced by the quickmatch, ignites the fire cracker fuse stapled to the ignition composition. The gases evolved when the ignition composition begins to burn force the end discs out at the parachute end then the parachute and illuminant. The parachute tube which is of split construction falls away, the parachute opens and the retention cable slides through trigger snap on the end of the shroud lines until it reaches the cable stop. A short length of cable on one side of the cable stop suspends the flare case, and a longer length on the other side suspends the illuminant. This keeps the case from dropping as a missile hazard. The sudden shock caused by the cable stop making contact with the trigger snap is taken up by a shock absorber. This is done by pulling a cable contain lead balls called snubbers through a hole which is of smaller diameter than the diameter of the snubbers, and as each snubber passes through the hole, part of it is sheared off, thus absorbing part of the shock. The last ball is of much greater diameter and acts as a stop.

REMARKS:

In later models a new type of shock absorber eliminates the use of lead snubbers. The cable pulls through a connection in which friction absorbs the shock of the parachute opening.

AIRCRAFT, PARACHUTE FLARE MK 6 & MODS.



RESTRICTED

U. S. NAVY FLARE

MK. 6 FLARE
(AND MODS.)

Data

OVERALL LENGTH	37.75 in.
DIAMETER OF CASE	5.4 in.
WEIGHT	30 lbs.
BURNING TIME	3 - 3.5 min.
INTENSITY	1,000,000 candlepower.
COLOR	Yellow
EFFECTIVE RELEASE ALTITUDE . . .	3500 - 15000 ft.
TERMINAL VELOCITY (Before ignition) . .	225 ft/sec.
RATE OF FALL (After Ignition). .	450 ft/min.

USE:

To illuminate a large area for reconnoitering and bombing, and also as a blinding effect on the operators of anti-aircraft weapons.

DESCRIPTION:

The complete flare consists of the illuminant, a parachute, and an auxiliary parachute contained in a shellac impregnated chipboard case. The case is closed on the parachute end by several layers of chipboard discs held in place by gummed cloth tape and sealed with paraffin and on the illuminant end by an Ensign Bickford time fuze and a metal cover. To the snap cord of the Ensign Bickford fuze is attached the rip cord which is taped down along the side of the flare case. There are two metal steadying bands around the case against which the steadying forks or sway braces of the bomb racks rest. The flare is issued in a water-proof metal container and should be kept there at all times when not installed in an aircraft.

RELEASING METHODS:

1. Aircraft Flare container-- see page 301

2. Bomb Rack or Shackles - Mk 50 and Mods Racks, Mk 51 Mods Racks; Mk 3 and Mods Shackles, Mk 4 and Mods Shackles, Mk 5 and Mods Shackles

For this type of release, support bands are required, which are shipped with the flare and attached in positions indicated on the flare. The flare is suspended on the racks and shackles with the fuze end forward. The Mk 35 and Mk 41 racks are not designed to operate with a load less than 100 lbs., and should not be used with this flare.

3. Adapter Release - Due to the size of this flare, it cannot be installed in the flare adapter used for the Mk 5 flare.

4. Cockpit Release - (Not Recommended except in emergency) - An additional 10 feet of rip cord is attached to the arming plate on the rip cord and the other end is secured to some substantial part in the plane. The flare is launched by throwing it over the side in a vertical position with the fuze end up.

OPERATION:

When the flare is released, the arming plate is retained by the plane and the rip cord is torn from the side of the case, flipping the metal cover off of the Ensign Bickford fuze. (The operation of the fuze is the same as given in the Mk 5 flare).

The gases evolved when the ignition composition begins to burn, forces the end out of the flare case, followed by the auxiliary parachute, the parachute in its case, and the illuminant. The flare case falls clear. The auxiliary parachute opens and retards the parachute in its case to which it is attached, and the illuminate pulls the parachute out of its case. The auxiliary parachute and parachute case fall away and the parachute opens.

REMARKS:

This flare also incorporates a shock absorber as used in the Mk 5 with either lead balls passing through a hole of smaller diameter than the lead balls, or a special connection utilizing friction to absorb shock of the parachute opening.

The AN-Mk 6 Mod 5 differs from the Mk 6 in that the arming wire has swivel loops instead of an arming plate; the AN-Mk 6 Mod 5 will replace the AN-M 26.

FLARE CONTAINER
MK.I MOD.I

RESTRICTED

U. S. NAVY

AIRCRAFT FLARE CONTAINER

Mk 1 Mod 0

USE:

The Mk 1 Mod 0 is an electrically operated jettisonable container for carrying six Aircraft Parachute Flares of the Mk 6 type only, which may be released one at a time by electrical impulses from a 24 v battery. The container may be suspended from any standard single or double hook bomb rack.

CONSTRUCTION AND LOADING:

It is necessary to cock the mechanism manually before the container can be loaded or unloaded. The container holds six flares, three on each side of the vertical panel, and one above the other. The dividing panel assembly supports the flares by metal arms or chocks. The flares are loaded with the fuze end aft and the end of the lanyard is secured to the container. The energy for the operation of the container is stored in torsional springs and released by a solenoid.

By wiring in series, several containers can be operated to secure an uninterrupted release of a series of more than six flares.

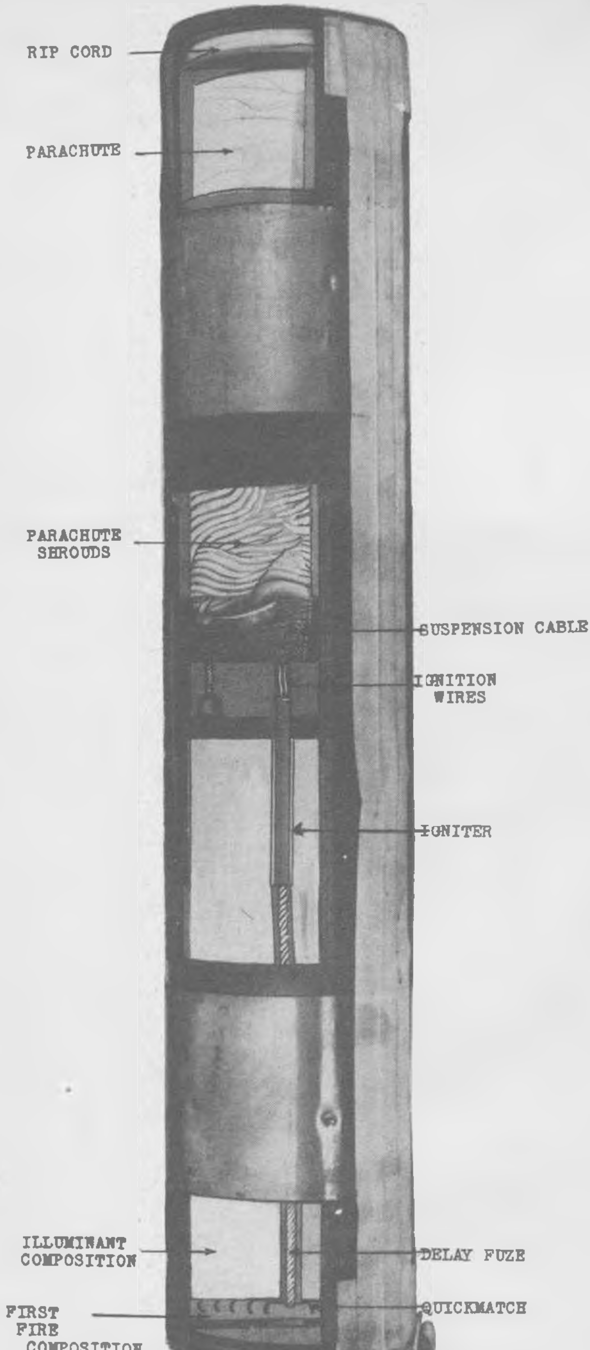
OPERATION:

When the solenoid is energized, the spring loaded plunger, which is linked mechanically to the release rack, retracts completely, thereby effecting the release of one flare. The solenoid plunger will remain retracted so long as the current is on. To release another flare, the circuit must be broken long enough to allow the spring loaded plunger to return to the normal position before applying the next impulse. The maximum rate of release is about 10 flares per second which is the highest rate practicable in order to prevent interference between the individual flares.

The cocking lever should always be in the 'safety' position when on the ground and only switched over to the 'operational' position before the plane takes off. Correctly loaded flares are a fire hazard since they are always armed.

REMARKS:

When the container is used in a bombay, it is intended that it be used without the nose and tail fairings, and if desirable, the spring doors may also be removed.



AIRCRAFT PARACHUTE FLARE
AN-MK 8, MOD. 1

RESTRICTED

ARMY - NAVY FLARE

AN-MK 8 PARACHUTE FLARE

(And Mods)

Data:

OVERALL LENGTH	26.0 in.
DIAMETER OF CASE	4.75 in.
WEIGHT AS DROPPED	16.0 lb.
BURNING TIME	3 - 3.5 min.
COLOR OF LIGHT	Yellow (pale)
INTENSITY OF LIGHT	600,000 candle power
MINIMUM EFFECTIVE RELEASE ALTITUDE	2500 ft.
RATE OF FALL AFTER IGNITION	500 ft/min.

USE:

This flare was developed specifically for night anti-submarine warfare.

DESCRIPTION:

This flare is the same as the Mk 4 flare (see page 296) except that the overall length is 2 inches shorter and the illuminant in the MOD 0 and MOD 1 has a 90 second delay fuse through its center or a 120 second delay in the MOD 2.

RELEASING METHODS:

Same as for the Mk 4 flare (see page 295).

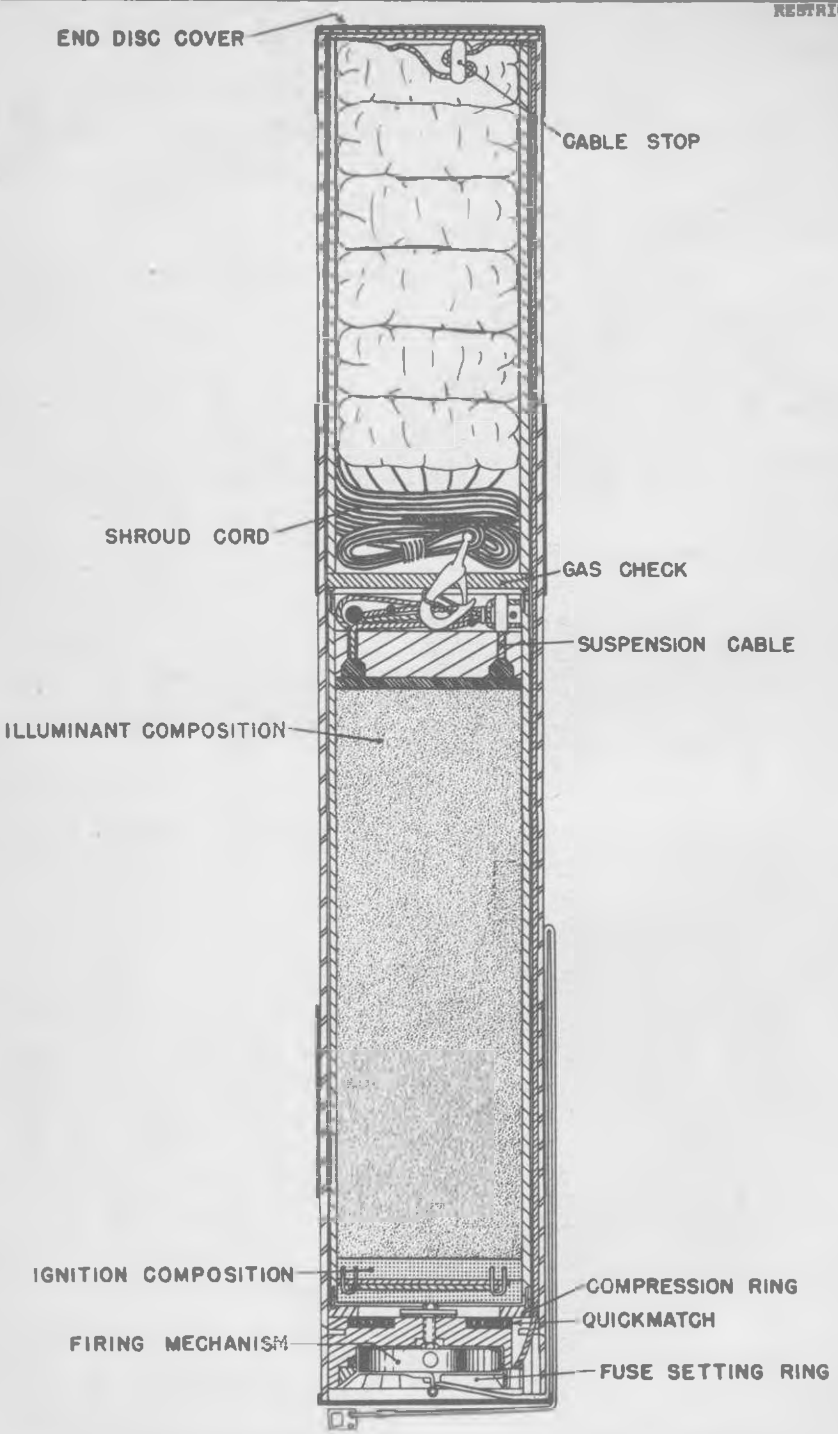
OPERATION:

Similar to the Mk 4 flare, except that when the ignition wire attached to the suspension cable is pulled it pulls the friction wires in the Ensign Bickford Fuze igniter, igniting the delay fuse running through the center of the illuminant. When the parachute opens, the illuminant is pulled out of the flare case, and the flare case falls away. The sudden shock caused by the opening of the parachute is taken up by a shock absorber of the solder balls and aperture type employed on the Mk 4 flare. Full suspension of the flare occurs approximately 30 - 50 feet below the plane and 90 or 120 seconds later the first fire of the illuminant is ignited by the delay.

REMARKS:

The Mark 8 MOD 1 and 2 flare can be launched at speeds up to 220 knots, but the Mark 8 flare which does not have the snubbers for the shock absorber effect should not be launched at speeds greater than 150 knots.

Further developments are in progress in an attempt to incorporate a selective delay fuse with a range of delay up to 165 seconds.



AIRCRAFT PARACHUTE FLARE MK. 10 MOD. 0

RESTRICTED

U. S. NAVY FLARE

AIRCRAFT PARACHUTE FLARE MK 10 MOD 0

Data:

OVERALL LENGTH	37.75 in.
DIAMETER OF CASE	5.4 in.
WEIGHT.	30 lb.
BURNING TIME	3 min.
LIGHT INTENSITY	750,000 candle power
COLOR	Pale Yellow
EFFECTIVE RELEASE ALTITUDE .	3500 - 15,000 ft.
TERMINAL VELOCITY . . . . . (Before ignition)	225 ft/sec.
RATE OF FALL . . . . (After ignition)	450 ft/min.

USE:

To illuminate an area for reconnoitering, bombing, or landing.

DESCRIPTION:

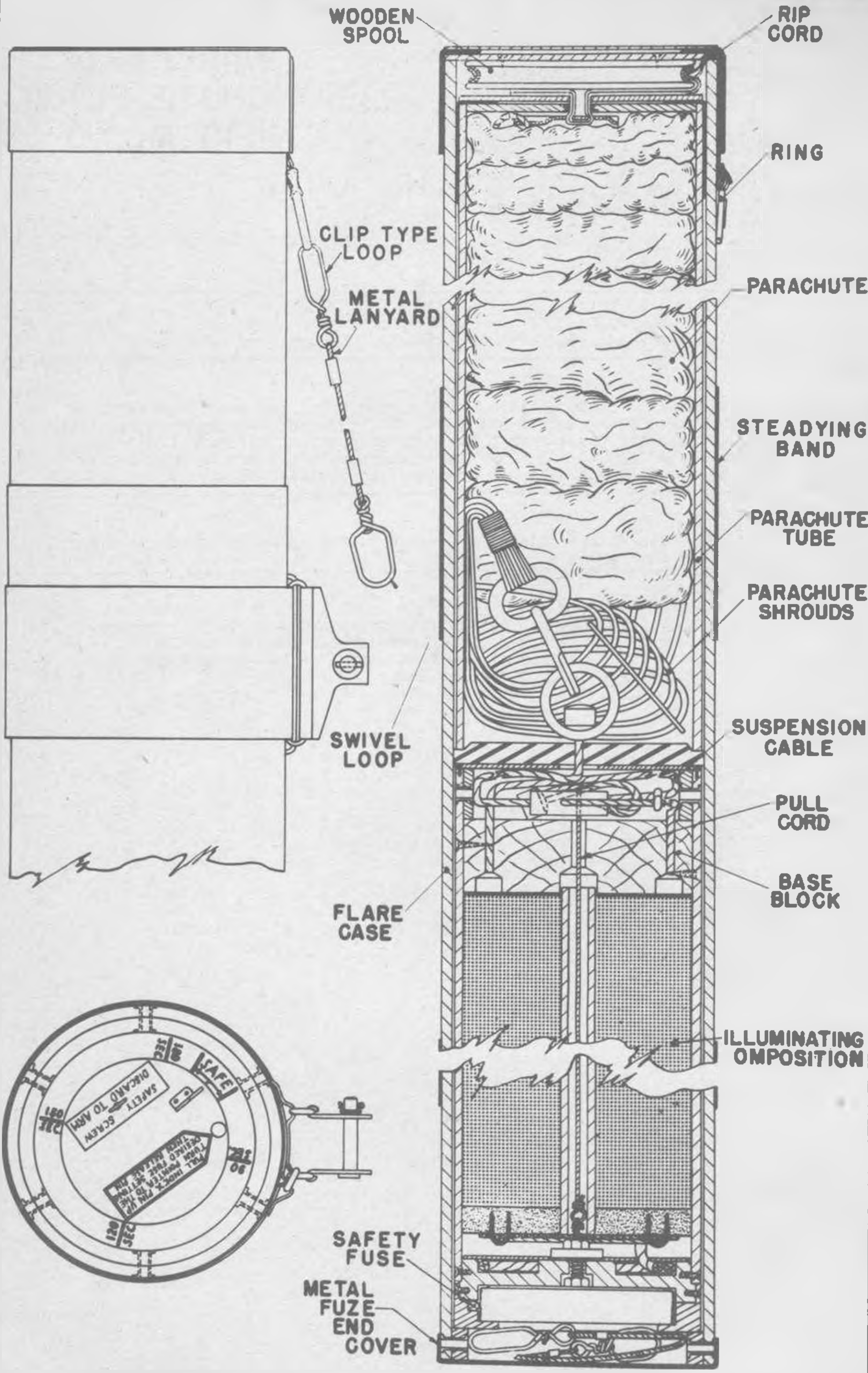
The Aircraft Parachute Flare, Mark 10 Mod 0 has the same dimensions as the Aircraft Parachute Flare Mark 6 and Mods. The internal construction is similar to the Aircraft Parachute Flare Mark 5 and Mods except that the Mark 10 Mod 0 has a metal suspension cup to which the suspension cable and pyrotechnic candle is fastened, and the Mk 5 and Mods has a wooden suspension base block.

OPERATION:

The operation of this flare is similar to the Aircraft Parachute Flare, Mk 5 and Mods. See page 297.

REMARKS:

Though this flare has a specified light intensity of 750,000 candle power, tests have shown that it has a light intensity of 800,000 to 850,000 candle power. In the future it may be manufactured so as to have a light intensity of approximately 1,000,000 candle power.



AIRCRAFT PARACHUTE FLARE MK. II MOD. O

RESTRICTED

U. S. NAVY FLARE

AIRCRAFT PARACHUTE FLARE MK II MOD O

Data:

LENGTH OF CASE	35.75 in.
DIAMETER OF CASE	5.37 in.
WEIGHT OF FLARE	30 lbs
BURNING TIME	3 minutes
COLOR OF LIGHT	Pale Yellow
INTENSITY OF LIGHT	1,000,000 candle power
FUNCTIONING DELAY	90 - 180 seconds selective before takeoff
MINIMUM RELEASE ALTITUDE	2500 - 4000 ft.

USE:

The Aircraft Parachute Flare, Mark 11 Mod O will supplement the Aircraft Parachute Flare, Mark 8 and Mods. for use in night anti-submarine warfare.

DESCRIPTION:

The shellac impregnated chip-board case of this flare has two metal steadying bands fastened thereto and is closed at the parachute end by a chip-board disc held in place by a gummed cloth and sealed with paraffin. The rip cord is wound around a spool at the parachute end of the flare and 's attached to the parachute tube through a release key. The parachute and parachute shrouds are enclosed in the parachute tube. The shrouds are attached to a suspension cable which in turn in attached to the illuminant assembly.

The fuze end of the flare is closed by a metal fuze and cover which must be removed when setting the fuze. Immediately below the cover is a firing lanyard with a swivel loop on one end and a clip type loop on the other.

The selective delay ignition device is similar to the fuze used in the Mk 5 and Mk 6 type of aircraft parachute flares, the chief difference being that the fuze is initiated by a pull cord running through the center of the illuminant instead of by a firing lanyard. The pull cord is attached to the suspension cable. A safety screw keeps the firing lever of the fuze in position during shipping. A friction type snubber is employed at the lower end of the suspension cable.

OPERATION:

The metal fuze end cover is removed and the firing lanyard withdrawn. The clip type loop of the metal lanyard is attached to the ring on the end of the rip cord, and the swivel loop is attached to the arming wire retainer of the launching gear. A selective delay setting is made by pulling up on the index pin, turning the indicator to the required delay, and then releasing the index pin. The safety screw is removed.

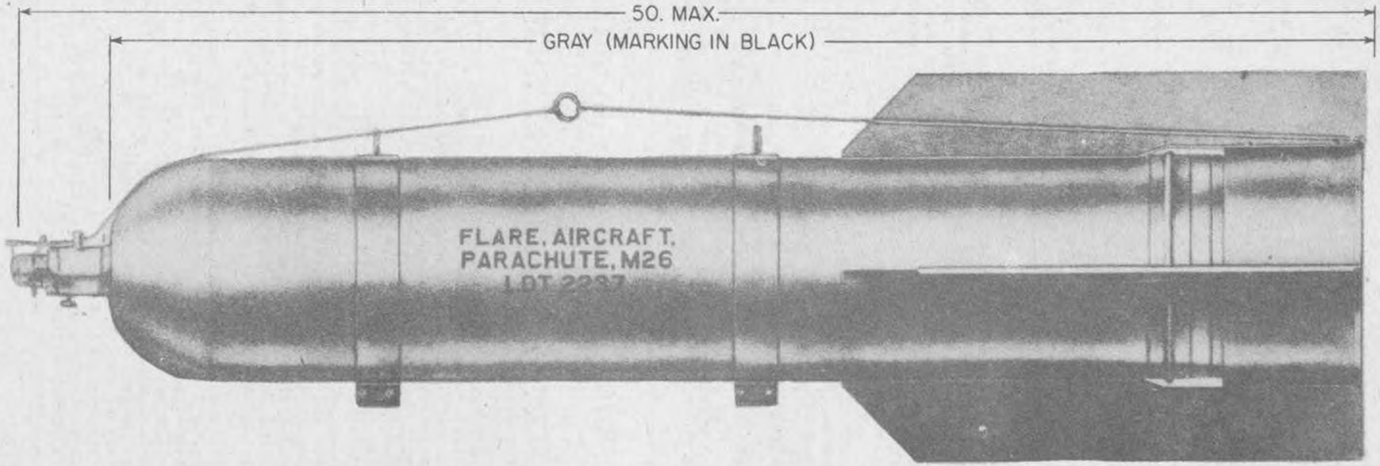
As the flare falls away from the aircraft the swivel loop of the firing lanyard is held by the arming wire retainer. The rip cord, which is fastened to the metal lanyard through the clip type loop, unwinds from the wooden spool inside the end of the flare casing, thus tearing away the end of the flare casing. The rip cord then pulls out the spool and the parachute tube containing the parachute. The spool falls away. Since the parachute tube is held by the rip cord, the pyrotechnic candle and flare case fall away. The weight of the candle pulling on the suspension cable and parachute shrouds draws the parachute out of the tube. When the parachute and shroud lines are fully extended, the release key cord becomes taut and pulls one end of the release key down. This allows the rip cord to pull through the key and become detached from the parachute and tube which falls clear. The rip cord and metal lanyard are retained by the aircraft. The parachute opens and suspends the flare 30 - 50 feet below the aircraft. The parachute pulls the candle out of the flare case which falls free.

The selective delay ignition device functions in a manner similar to the fuze used in the Mk 5 and the Mk 6 flares. The fuze is initiated by a wire pull cord which passes through a hole through the center of the candle. The pull cord is attached to the suspension cable in such a manner that it is pulled away from the primer and then released, striking the primer and igniting the powder pellets in the fuze plunger. The burning powder forces the pointed end of the plunger into the Bickford Fuse which is ignited by flame through holes in the plunger. The time fuse ignites the quickmatch under the fuze block which in turn ignites the quickmatch and firecracker fuse stapled to the ignition composition. The ignition composition ignites the candle.

REMARKS:

This flare differs from the Mk 8 and Mods in that there is a selective delay between the opening of the parachute and ignition of the pyrotechnic candle. The selective delay allows a single patrol plane to drop a flare near the target and then get into position for the attack before the flare discloses his position.

AIRCRAFT PARACHUTE FLARE M26



AN-M26 FLARE

Data

OVERALL LENGTH	50 in.
DIAMETER OF CASE	8 in.
WEIGHT	53 lbs.
BURNING TIME	3 - 3.5 mins.
INTENSITY	800,000 candle-power.
COLOR	White light.
EFFECTIVE RELEASING ALTITUDE . .	4000 - 25000 ft.
RATE OF FALL (after ignition). .	700 ft/min.

USE:

To provide illumination for night bombardment; also may be used to blind anti-aircraft defenses.

FUZING:

M 111A2; M 111 A1; M 111; AN-M 146, M155, M 144.

DESCRIPTION:

The flare is enclosed in a metal cylindrical case with a rounded nose and tail fins. In the nose a M 111A2 fuze can be inserted and the tail end is closed with a shipping cover that has a handle attached and sealed by a strip of tape. The case is equipped with two suspension lugs 14 inches apart.

RELEASING METHOD:

This flare may be dropped from any bomb rack or shackle in general service except the Mk 35. For single suspension racks and shackles the aft suspension lug is used, being located at the center of gravity.

OPERATION:

When the flare is dropped, the arming wire is pulled allowing the vanes of the M 111A2 fuze to rotate. The hangwire is retained and pulls off the cover of the stabilizing sleeve compartment. As the flare continues to drop, the tear wire and tear wire cord pull out the stabilizing sleeve, and the cover lock cord attached to the shrouds of the stabilizing sleeve unlocks and pulls out the cover lock. When the sleeve is fully extended, the tear wire breaks allowing the flare to fall free stabilized in flight by its fins and stabilizing sleeve.

When the nose fuze functions, the gases of the black powder booster forces the releasing cup cover out of the detachable cover, releasing the retaining pins from the groove in the flare case and freeing the detachable cover. As the detachable cover is pulled out by the stabilizing sleeve, a pull out cord pulls out the parachute. When the parachute opens, the flare stops with a jerk breaking the pull out cord which allows the stabilizing sleeve assembly to fall free and pulling the entire flare assembly out of the flare case which then falls away. The sudden stop also pulls the friction wires through the igniters, starting the 6 second delay through the center of the candle which allows full opening of the parachute.

The shock caused by the opening of the parachute is taken by the shock absorbers, made of copper tubing in a spiral or coiled shape, and straightens out in absorbing the shock. After the parachute is opened, the delay ignites the first fire which ignites the candle. When the first fire is ignited, the gases formed by burning forces the rib retainer down and the spring loaded ribs jump out opening the glass cloth spade.

REMARKS:

The AN-M 26 flare can be dropped at air speeds up to 240 knots, but above that the stabilizing sleeve is apt to tear away. The M 26 flare cannot be dropped at air speeds greater than 130 knots for the same reason.

RESTRICTED

U. S. ARMY FLARE

M24 FLARE

Data:

LENGTH	37.0 in.
DIAMETER	8.0 in.
WEIGHT	47.0 lbs.
BURNING TIME	3 minutes
INTENSITY	800,000 candle power
COLOR	Yellow
EFFECTIVE RELEASE ALTITUDE	2500 - 3000 ft. not over 200 mph.
RATE OF FALL AFTER IGNITION	700 ft./min.

USE:

Substitute standard for night observation and bombardment.

DESCRIPTION:

Simple cylinder without hemespherical nose or tail fins. Otherwise similar throughout to the AN-M26 without the nose time fuze.

OPERATION:

Similar to the AN-M26 except that the hang wire acts directly to pull the parachute from the flare case.

REMARKS:

This flare is not procured by the Navy.

GRAY (MARKING IN BLACK)

36.95 MAX.

RESTRICTED

U. S. ARMY FLARE

M8A1 FLARE

Data:

LENGTH	25.5 in.
DIAMETER OF CASE	4.25 in.
WEIGHT	18.0 lbs.
INTENSITY OF LIGHT	350,000 candle power
COLOR OF LIGHT	Yellow
BURNING TIME	3 min.
RATE OF FALL AFTER IGNITION	500 ft./min.

USE:

Emergency night landings.

DESCRIPTION:

Cylinder containing an unshaded candle.

OPERATION:

Similar to M24.

REMARKS:

M8 flare is similar to the M8A1 except that the candle burns with a white light of approximately 250,000 candle power.

RESTRICTED

U. S. ARMY FLARE

M9, M9A1 FLARE

Data:

	M9	M9A1
LENGTH OF CASE . . .	13.8 in. . .	15.05 in.
DIAMETER OF CASE . .	2.0 in. . .	
WEIGHT	1.9 lb. . .	2.1 lb.
INTENSITY OF LIGHT .	60,000 candle power	
COLOR OF LIGHT . . .	Yellow . . .	
BURNING TIME	1 minute . .	
RAT E OF FALL AFTER IGNITION . . .		400 ft/min.

USE:

This flare was designed to satisfy the requirement for a small parachute flare for reconnaissance.

DESCRIPTION:

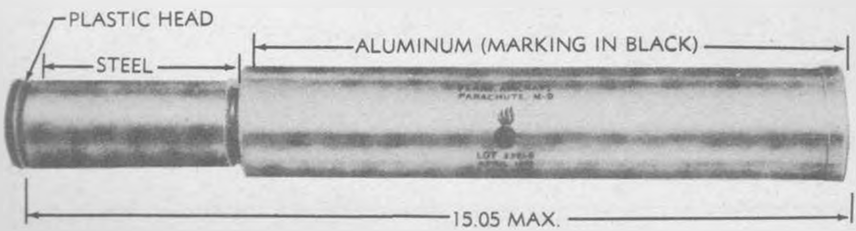
Cylinder containing a candle and desgined to be projected with the AN-M8 pyrotechnic pistol.

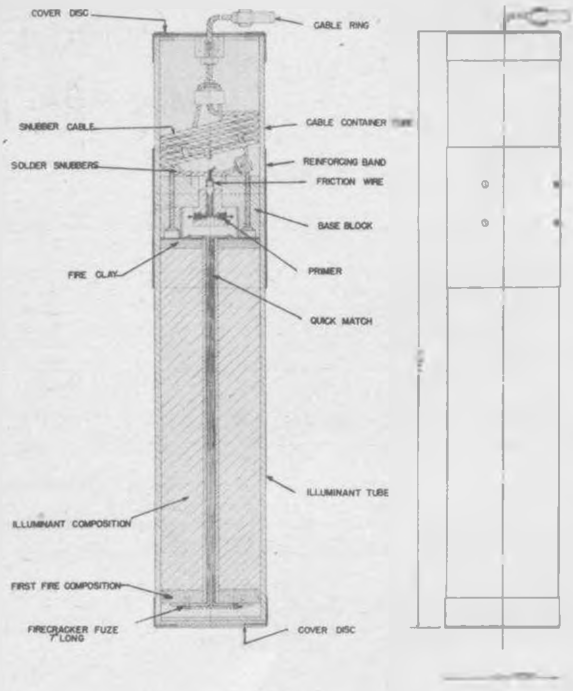
OPERATICN:

The flare is discharged from the pistol and the delay fuse is ignited. The fuse burns for 2.5 seconds and ignites the expelling charge which expels the candle and parachute simultaneously igniting the candle.

REMARKS:

This flare is not procured by the Navy.





MK I

M 50

TOW TARGET FLARE

RESTRICTED

Data:

LENGTH OF CASE	21.4 in.
DIAMETER OF CASE	3.8 in.
WEIGHT	12 lbs.
BURNING TIME	3 minutes
INTENSITY OF LIGHT	280,000 candle power

U. S. NAVY FLARE

TOW TARGET FLARE

Mk 1

USE:

Provides a target for both day and night practice firing of anti-aircraft guns.

DESCRIPTION:

The flare consists of an illuminant tube and a cable container tube made of rocket paper and are joined end to end under the external metal reinforcing band. Both ends are closed by chipboard discs held in place with tape. The cable ring is attached to the snubber cable at the end which protrudes through the cover disc of the flare assembly. The snubber cable is attached to the base block with staples.

Friction wire is attached to the end of the snubber cable and extends through the primer composition which is adjacent to the quick match which runs through a cardboard tube in the center of the illuminant. At the end of the quickmatch tube is a firecracker fuze terminating in the first fire composition which is in contact with the main illuminant charge.

METHODS OF STREAMING:

Designed to be used with a tow target release attached to the end of a steel cable. This type of release mechanism is used only for streaming targets from the plane after the cable has been reeled out. Release mechanisms which may be found in service are:

1. Tow Target Release Mark 6 Mod 1. (obsolete)
2. Tow Target Release Mark 6 Mod 2. (obsolete)
3. Tow Target Release Mark 7 (obsolescent)
4. Tow Target Release Mark 7 Mod 1. (current)

May be streamed from any plane from which an aircraft or anti-aircraft target reel can be mounted.

OPERATION:

The flare slides back along the tow cable until the cable ring is stopped by the target release mechanism. Force exerted on the snubber cable pulls off the end of the cable container tube and the five solder snubbers are stripped off. The staples holding the snubber block to the base block are withdrawn by the pull exerted. Friction wire attached to the end of the snubber block is pulled through the primer. The flame from the primer ignites the quickmatch which in turn ignites the fire cracker fuse igniting the first fire charge. The first fire composition ignites the illminant.

CONFIDENTIAL

Data:

	M50	M77	M78	M79
LENGTH OF CASE (in.)	22.8	-	-	-
DIAMETER OF CASE (in)	2.5	-	-	-
WEIGHT OF FLARE (lb.)	7.13	-	-	-
COLOR OF LIGHT	White	Red	Amber	Green
INTENSITY OF LIGHT (Candlepower)	50,000	207,000	80,600	108,500

U. S. ARMY FLARES

M 50

TOW FLARES

M 77 (T 18)
M 78 (T 19)
M 79 (T 20)

USE:

M 50: Same as the Mark 1.

M77, M78, M79: Assembly markers from which succeeding elements of a forming squadron or group of aircraft can form under conditions of poor visibility and congested traffic patterns.

METHODS OF LAUNCHING:

M50: Same as for the Mark 1.

M77, M78, M79: Standard tow cable is not to be used by markers shall be launched from plane on one end of 60 feet of 3/8 inch manila line the other end of which is attached to the plane fuselage, the bight of the line to be coiled in the fuselage.

DESCRIPTION AND OPERATION:

Same as for the Mark 1.

REMARKS:

Not presently procured by the Navy.

RESTRICTED

U. S. NAVY FLARE

FLOAT FLARE

Mk 17
Mod 0
&
Mod 1

Data:

LENGTH OF CASE	60.75 in.
DIAMETER OF CASE	9.5 in.
WEIGHT	88.0 lbs.
COLOR OF LIGHT	Yellowish white
INTENSITY OF LIGHT	1,000,000 candle power
BURNING TIME	4.5 - 5 min.
DELAY BETWEEN LAUNCHING AND IGNITION OF THE MOD 0	1 min. (approx.)
DELAY BETWEEN LAUNCHING AND IGNITION OF THE MOD 1	5.5 minutes

USE:

1. To silhouette ships for torpedo bombing or surface attack.
2. To illuminate ships lying in a harbor or roadstead for both aerial and surface attack.
3. To outline areas that contain surface units.
4. To illuminate enemy surface craft shielded by land from radar.
5. To illuminate beach installations.
6. For illumination of surface craft for attack under overcast.
7. For diversionary purposes.

DESCRIPTION:

Cylindrical body of sheet metal tapered at one end from 9 1/2 inches to approximately 4, which section has a lead weight and four membrane covered ports approximately two inches in diameter. The after end of the flare case is closed by a canvas bag containing a parachute. The candle is in a central tube so mounted as to keep the burning mixture at the top of the flare by spring action.

OPERATION:

When the flare is removed from the box the adhesive tape on the cover is pulled off and membranes covering the ports in the nose are punctured.

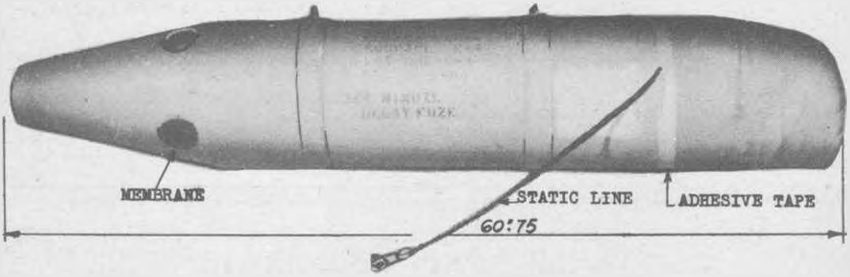
The flare is loaded into the bomb rack with the pointed end of the flare toward the forward end of the plane.

Sufficient static line is pulled from the pocket in the parachute canvas bag to allow the ring attached to the end of the line to be secured to the arming wire retainer on the rack or shackle.

On launching, a combination type fuze causes a delay before the pyrotechnic candle burns.

REMARKS:

1. Flares having a one minute delay fuze may be released at elevations between 100 and 4000 feet.
2. 5-1/2 minute delays may be released from greater altitudes.
3. Descent is at a rate of between 80 and 100 feet per minute.
4. A continuous illumination of nine (9) minutes duration may be obtained by dropping a MOD 0 and a MOD 1 together.



FLOAT FLARE MK 17

RESTRICTED

U. S. ARMY BOMB

PHOTOFLASH BOMB M23A1

Data:

OVERALL LENGTH	25.4 in.
DIAMETER OF CASE	4.25 in.
WEIGHT	10.6 lb.
WEIGHT OF FLASH POWDER	7.75 lb.
FIXED DELAY	15 seconds
DURATION OF FLASH.	1/5 second
INTENSITY OF FLASH	150,000,000 candle power
MOST EFFECTIVE RELEASE ALTITUDE	4000 - 7000 ft.

USE:

To provide light of high intensity and short duration for night photography from low altitudes.

DESCRIPTION:

The bomb case is made of cardboard and closed with metal ends, one of which is marked "Front" to insure proper loading in the rack. This end contains the hang wire assembly just forward of the fuze assembly (M23A1). The fuze assembly is made up of the friction wires attached to the hang wire, match composition, quickmatch, delay element, upper and lower rings, and the base ignition charge immediately adjacent to the flashlight powder charge. The hangwire is attached to the arming wire retainer.

METHODS OF RELEASE:

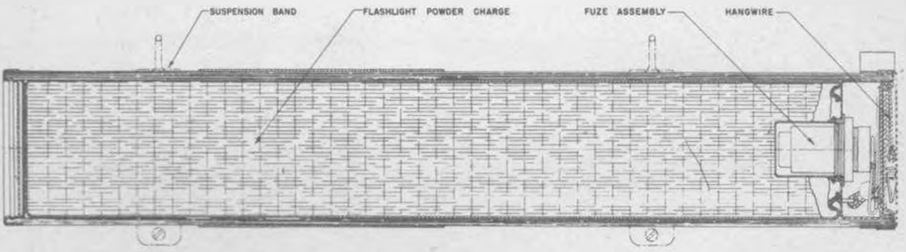
1. If the bomb has suspension lugs it may be released from a shackle or bomb rack.
2. Without suspension lugs it may be released from a flare chute.

OPERATION:

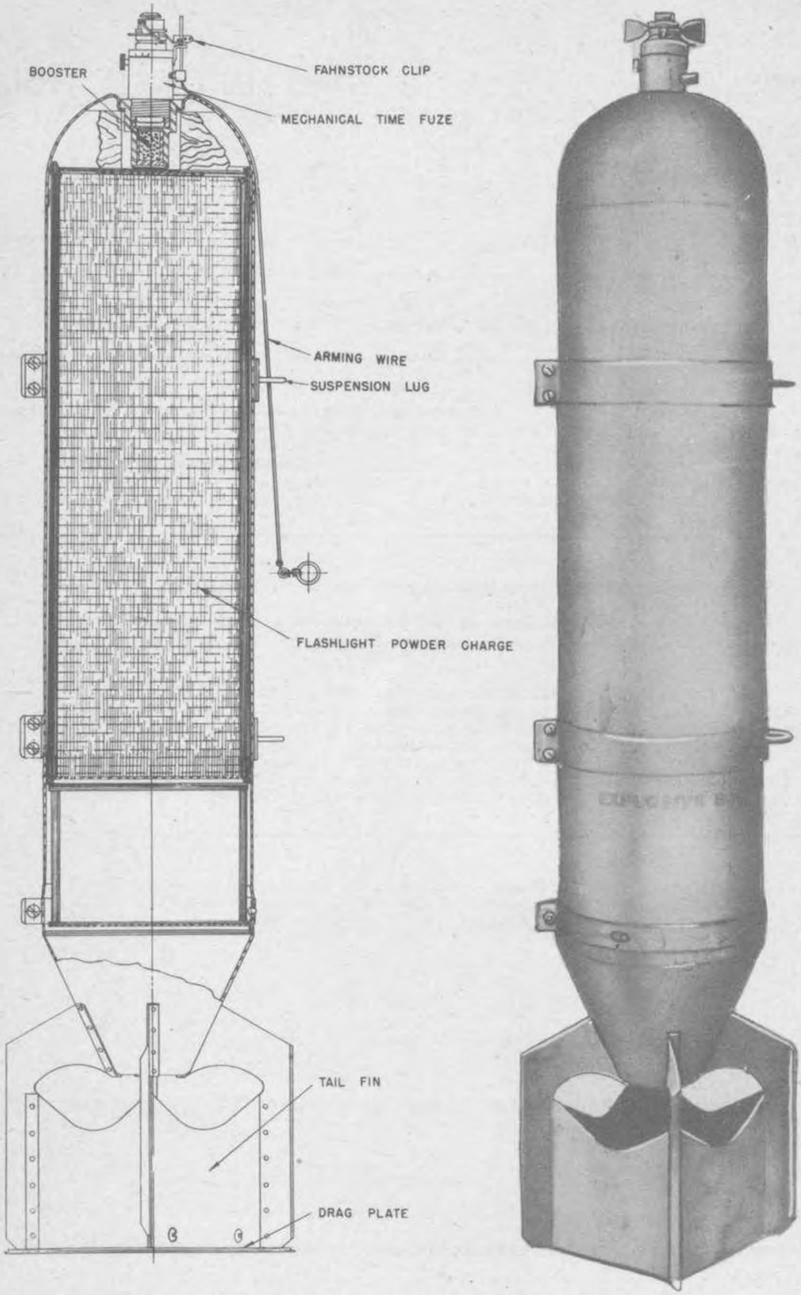
When the bomb is released the hangwire remains attahced to the arming wire retainer. As the bomb drops the hang wire pulls the friction wires through the match composition of the fuze. The hang wire also pulls out the hang wire container allowing both the hang wire container and the bomb to fall free. The flame from the match composition ignites a piece of quickmatch which in turn ignites a delay element. After 15 seconds the delay element ignites the base charge of the fuze which sets off the flashlight powder charge. The flash lasts 1/5 of a second.

REMARKS:

1. Although the photoflash bomb M23A1 is considered to be obsolete by the Navy it has been included as the bomb may still be encountered in the field.



M23A1 PHOTOFLASH BOMB



100 LB. PHOTOFLASH BOMB, AN-M46

RESTRICTED

Data:

OVERALL LENGTH	48.4 in.
DIAMETER OF BODY	8 in.
WEIGHT	51.9 lbs.
WEIGHT FLASH POWDER.	25 lbs.
BURNING TIME	.20 seconds
PEAK INTENSITY	500,000,000 candlepower

ARMY - NAVY BOMB

AN-M46 PHOTOFLASH BOMB

USE:

For night photography. (Developed so that planes engaged in night photography reconnaissance need not be limited to low altitudes.)

FUZING:

M 111 A2, AN-M 146, M 155, M 144.

DESCRIPTION:

In appearance it resembles a conventional light case bomb. Uses an M 111A2 fuze in the nose, but it is issued unfuzed. It also has two suspension bands for rack and shackle suspension. Has box type tail with square drag plate closing off the tail vane assembly.

RELEASING METHODS:

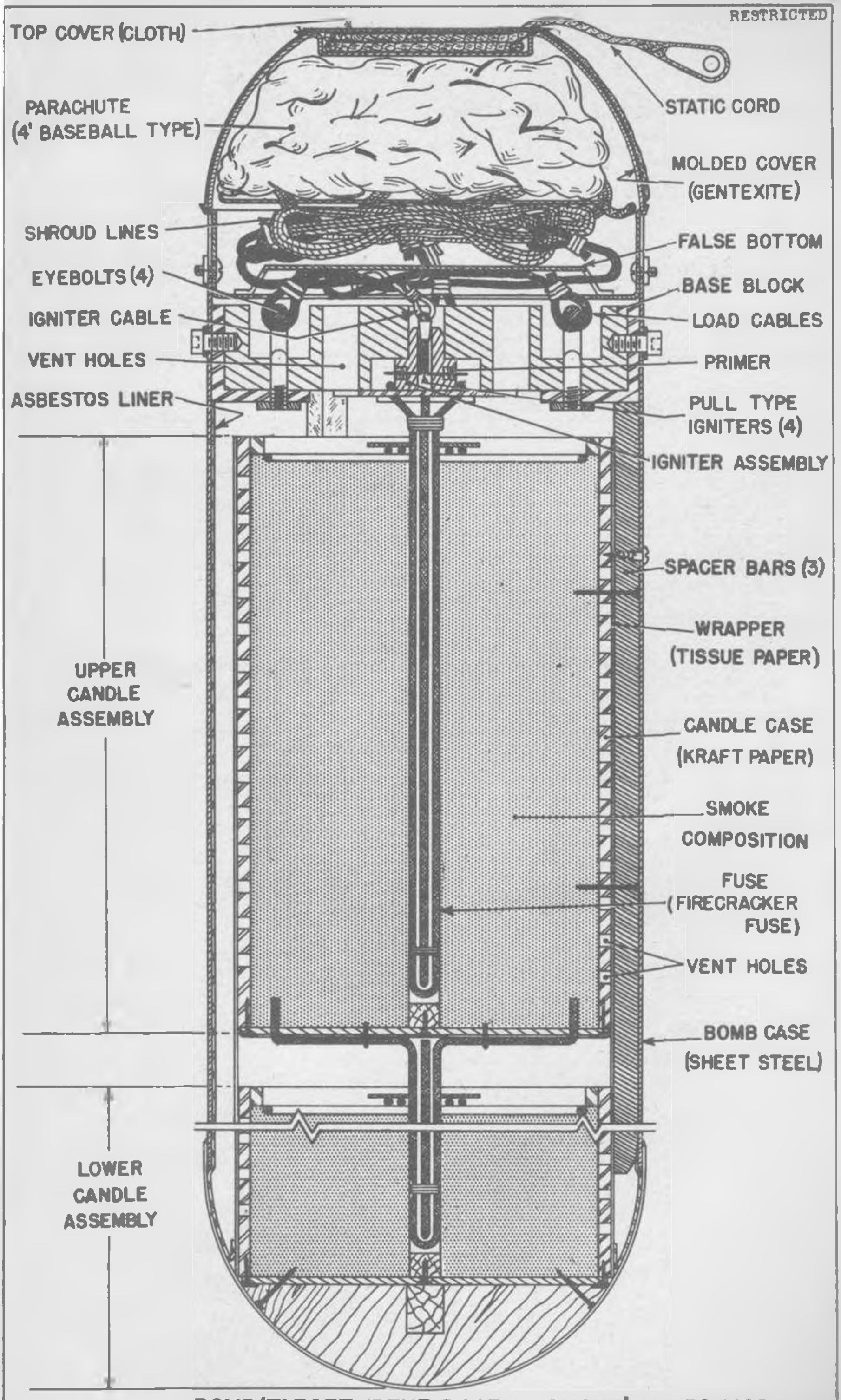
This bomb can be dropped from any bomb rack or shackle except the Mk 35 rack.

OPERATION:

When the bomb is dropped the arming wire is pulled, starting the mechanical time fuze. When the time set on the fuze has elapsed, the flashlight powder is ignited by the fuze booster. The resulting flash of light lasts for about .20 sec. and has a peak intensity of approximately 500,000,000 candlepower.

REMARKS:

Because of the brilliance of the flash it is detrimental to the vision to watch the explosion of photoflash bombs. Extreme care should be exercised in handling these bombs, because the charge is very sensitive to friction, shock, and temperature. Bomb should not be jettisoned over friendly territory, as it may function on impact.



BOMB (TARGET IDENTIFICATION SMOKE) MK. 72 MOD. 1

RESTRICTED

U. S. NAVY BOMB

TARGET IDENTIFICATION SMOKE BOMB

Mk 72 Mod 1

DATA:

OVERALL LENGTH	36 in.
BODY LENGTH	36 in.
BODY DIAMETER	8-3/4 in.
WALL THICKNESS	.031 in.(appr)

WEIGHTS:

Type of Filling . . . Smoke Composition (68% Fire Orange Dye, 15% Lactose, 12% Potassium Chlorate, and 5% Asbestos shorts)
Total Weight . . . . . 45 lbs. (approx.)

FUZING:

4 Pull Type Igniters

BOMB CONSTRUCTION:

Bomb consists essentially of two units, a sheet steel bomb body casing, and a parachute assembly packed in a molded container or pack which is attached to the bomb body by means of four bayonet joints. The parachute pack houses a 4-foot baseball type parachute, the chute shroud lines, load cables, igniter cable, and static cord which extends out of top of pack. Bomb body casing contains a base block in the tail which incorporates the igniter assembly, 12 vent holes, and 4 eye bolts. Load cables are attached to the eye bolts; igniter cable is attached to the pull type igniters. Between base block and nose are the upper and lower candle assemblies.

SUSPENSION:

Horizontal suspension by two lugs 14" apart, welded onto suspension bands which are bolted to the bomb case.

OPERATION:

Upon release of bomb, the static cord is retained by rack or shackle to which it is attached. The static cord, through a series of short lines inside the pack, removes the molded cover of the pack and pulls the parachute out. After the parachute is out, the static cord separates from the parachute and is retained by the rack or shackle. As parachute opens, the igniter cable jerks out the four pull igniters which ignite the primers. The primers ignite the firecracker fuse running through the upper candle which in turn ignites the candle. The candle burns from the inside toward the outside, evolving colored smoke that permeates through holes in the candle case and escapes through vent holes in the bomb case. The lower candle is ignited by the firecracker fuse about the time the upper candle burns out.

Total burning time is approximately 5 minutes, during which time the bomb produces a red-orange smoke in sufficient volume to be seen at 15,000 feet for 10 miles, under normal conditions.

COLOR AND MARKINGS:

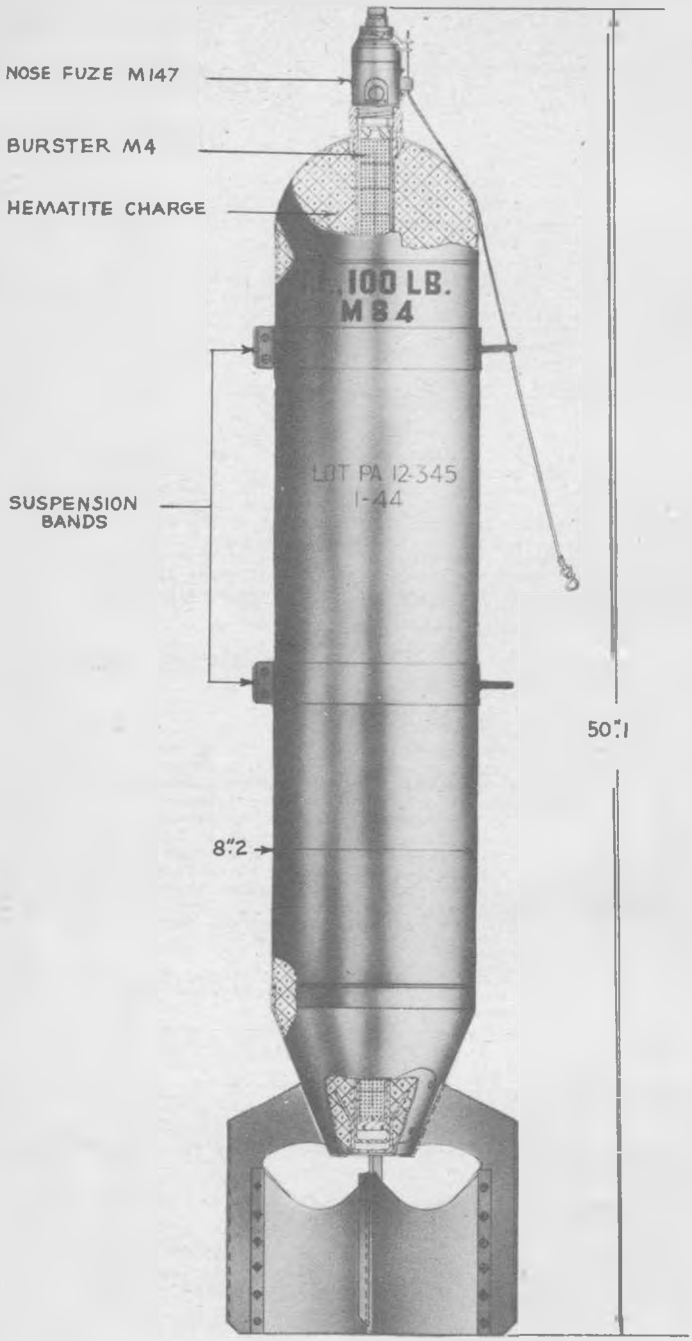
Olive Drab overall.

REMARKS:

Bomb is used by air coordinator or by scout planes from battleships to pin point shore targets.

Greatest accuracy can be obtained by releasing bomb from altitudes of 500 to 1000 feet.

Bomb can be carried on all external double suspension racks and shackles and can be released from external suspension on all types of planes in any flight attitude. They can successfully withstand catapult launching and arrested landing.



100 lb. TARGET IDENTIFICATION BOMB M84

DATA: **M84A1, M75A1**

OVERALL LENGTH	53.1 in.
BODY LENGTH	39.0 in.
BODY DIAMETER	8.2 in.
WALL THICKNESS	0.06 in.
TAIL LENGTH	12.9 in.
TAIL WIDTH	10.9 in.
TAIL WEIGHT	

U. S. ARMY BOMB

100 LB. TARGET IDENTIFICATION BOMB

M84A1
M75A1

WEIGHTS:

Type of Filling	Red iron oxide (hermatite)
Weight of Filling	72 lbs.
Total Weight	102 lbs.
Chg / Wt. Ratio	

FUZING:

M84A1	AN-M147
M75A1	M108

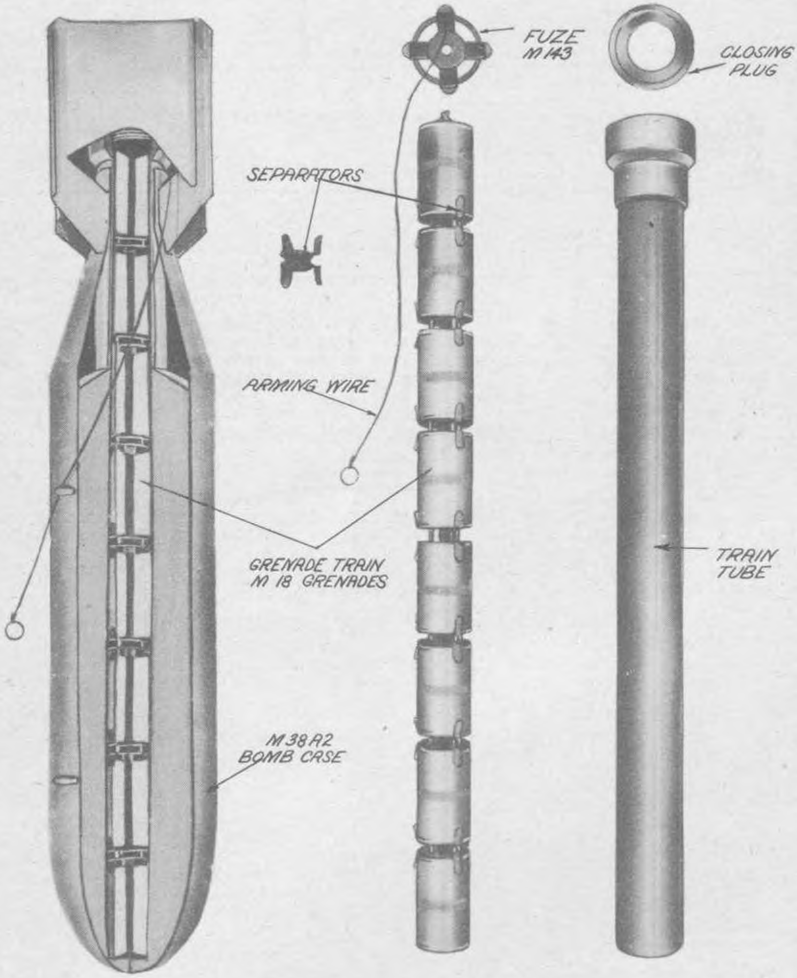
BOMB CONSTRUCTION:

The M84A1 and M75A1 are identical with the exception of the fuze, and the two bombs are similar in construction to the AN-M47A2 chemical bomb. The body is of sheet metal with box type tail fins welded to the conical section. 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 the hermatite charge (red iron oxide). The fuze fits into the forward end of the burster.

REMARKS:

The M84 is intended for release by the lead or "Pathfinder" plane to indicate the bomb release line for bombers in formation when operations are carried out above an overcast and ground targets are not visible. The bomb was designed to produce a red smoke cloud which would remain at the bursting point for a period of ten minutes under normal air conditions and would be visible for a distance of 15 miles at an altitude of 25,000 feet.

The M75 is used for target identification in practice to mark targets on snow covered bombing ranges.



BOMB, SMOKE, COLORED STREAMER, M87

DATA:

OVERALL LENGTH	47.5 in.
BODY LENGTH	40.5 in.
BODY DIAMETER	8 in.
WALL THICKNESS	0.06 in.
TAIL LENGTH	11.5 in.
TAIL WIDTH	10.75 in.
TAIL WEIGHT	

U. S. ARMY BOMB

100 LB. SMOKE STREAMER
100 LB. PRACTICE

M87
M38A2 (practice)
M85 (practice)

WEIGHTS:

	M87	M38A2
Type of Filling	8 M18 grenades	sand and spotting charge
Weight of Filling		84.3 lbs.
Total Weight	100 lbs.	100 lbs.
Chg / Wt. Ratio		84.3 %

FUZING:

The fuze employed in the M87, the M143, consists of a fuze body support mounting four bouchon grenade type fuzes and an arming washer, and is threaded to fit the fuze adapter of the tube train. The four bouchon fuzes are modified by removing the standard delay and substituting a short delay mixture. The arming washer is 2.5 in. in diameter and has four arms .75 in. wide and 1 in. long. The arming wire holds the arming washer over the bouchon levers until it is withdrawn.

BOMB CONSTRUCTION:

The bomb body consists of a sheet steel case with a filling plug in the base. The four tail vanes are welded to the truncated cone with box-type interior struts.

The M87 consists of an M38A2 bomb case, a train tube, a grenade train, a closing plug, and a fuze. The tube train is a seamless steel tubing 3 inches in diameter and 40 inches long with a fuze adapter brazed to the aft end. Eight modified M18 grenades filled with fast burning 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 ends at the top to receive the fuze flash. The eight grenades are held apart by spring steel separators. A threaded closing plug seals the tube and protects the grenade train from moisture. This plug must be removed just prior to use. The bomb is brought up to the weight of approximately 98 lbs. by filling the balance of the internal space with sand.

The M38A2 is a sand filled practice bomb with a spotting charge assembly, M1A1, fitted in the base. The primer and igniting charge are in the form of a blank loaded 28gauge shotgun shell fitted to the fuze. The spotting charge consists of 3 lbs. of black powder loosely assembled in a container.

OPERATION:

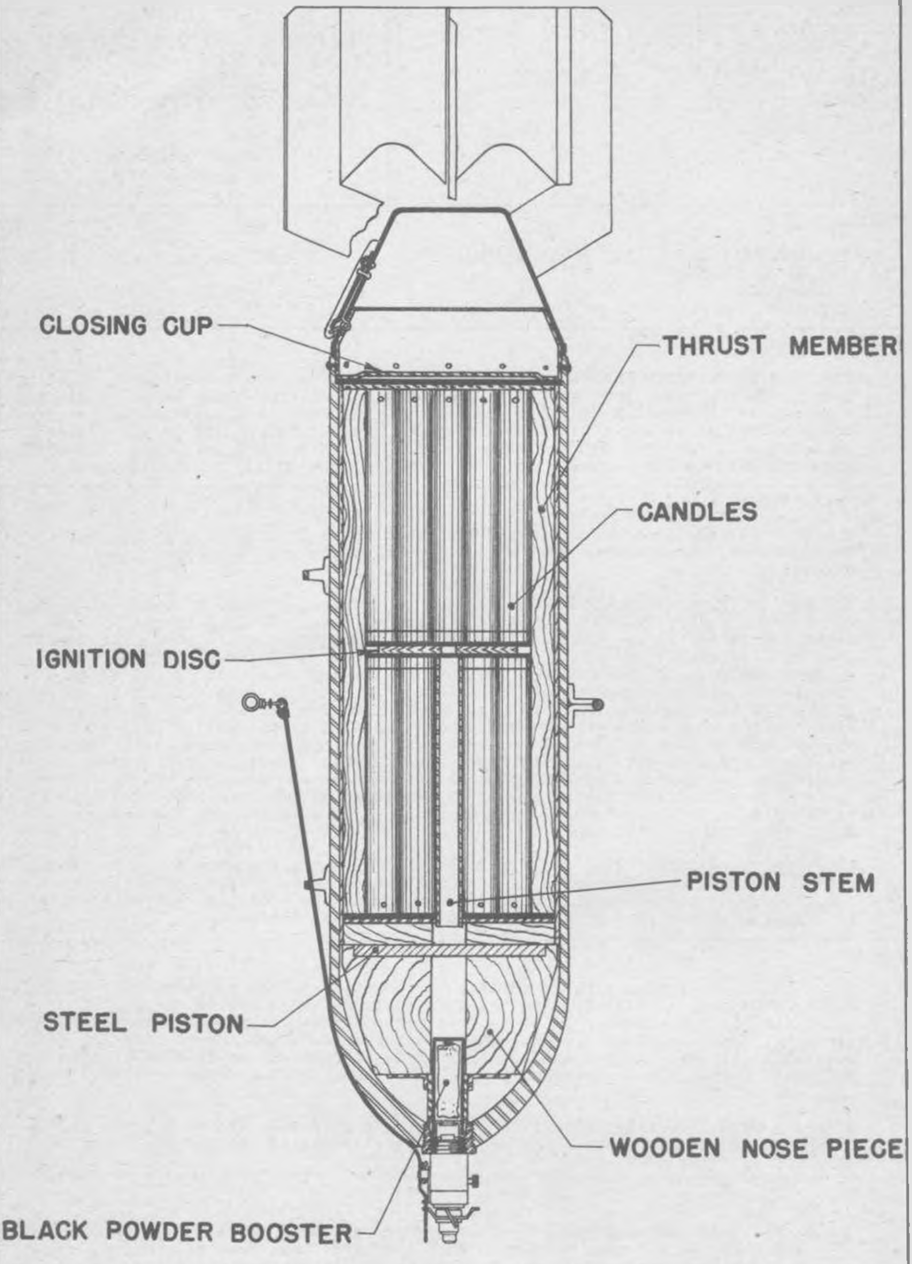
M87: - When the arming wire is pulled, the bouchon springs throw off the arming washer and handles, allowing the bouchons to fire. This action ignites the quickmatch in the center hole of the top grenade which in turn is ignited and gives off a thin smoke streamer. When the top grenade has burned through, the quickmatch between the top and second grenade is ignited and in turn ignites the second grenade. This process continues until the eight grenades have been ignited.

M38A2: - When the arming wire is withdrawn, the spring-loaded arming pin of the fuze is ejected. On impact, the striker fires the blank shotgun shell and in turn the spotting charge.

REMARKS:

The M87 colored streamer smoke bomb is used as a visual signal to be dropped by the lead plane of a bomber formation when the target has been determined. Smoke emission begins approximately one second after release from the plane and continues for approximately 7,000 to 10,000 feet. The M38A2 is a practice bomb, sand filled, which is fitted with a spotting charge.

A 100 lb. reinforced concrete practice bomb with the same contour, weight, and center of gravity as the 100 lb. AN-M30A1 is being made to alleviate a temporary shortage of the M38A2 practice bombs. This is the M85.



M89, M90, M98, 250 LB. TARGET IDENTIFICATION BOMB

DATA:

	M89, M90, M98
OVERALL LENGTH	51.8 in.
BODY LENGTH	35.8 in.
BODY DIAMETER	10.8 in.
WALL THICKNESS . . .	0.27 in.
TAIL LENGTH	15.7 in.
TAIL WIDTH	14.9 in.
TAIL WEIGHT	7.7 lbs.

U. S. ARMY BOMB

250 LB. TARGET IDENTIFICATION BOMB

M89, M90, M98

WEIGHTS:

Type of Filling . . . 61 pyrotechnic candles (Red, Green, or Yellow)
Weight of Filling . . 95 lbs.
Total Weight
Chg / Wt. Ratio

FUZING:
AN-M146, M144,

BODY CONSTRUCTION:

The body is a modified AN-M57 250 lb. G.P. body with a metal closing cup riveted to the base. An integral booster of four ounces of black powder is placed immediately behind the fuze seat liner and serves as an expelling charge. A wooden nose piece fits around this booster and a steel piston in turn is seated in the base of the nose piece. A steel tube or piston stem is welded through a hole in the piston and extends from the black powder booster to the plywood ignition disc in the center of the bomb. Six wooden thrust members reach from the piston plate to the tail closing cup and serve to transmit stress to this cup without imposing any of the force on the candles. An 1/8 inch thickness of felt lines the entire interior cylindrical surface of the bomb. The 61 candles are in two banks of 30 and 31 and have their ignition ends facing toward the quickmatch strands stapled on the ignition disc which separates the two banks.

TAIL CONSTRUCTION:

The tail, in appearance, is a standard box type tail. It is attached to the bomb by means of four spring latches fitting into cutouts in the tail closing cup and which can be locked in place by stamped steel strips pivoting over the ends of the springs.

SUSPENSION:

Horizontal suspension by standard lugs, 14" apart.

OPERATION:

When the aerial burst fuze functions, the fuze booster ignites the black powder booster or expelling charge in the bomb. The force of the expanding gases from the booster acting through the piston and thrust members throws off the fin assembly and expels the candles.

Simultaneously, flash from the booster passes through the piston stem to the plywood ignition disc, and the quickmatch, igniting the candles.

REMARKS:

The bombs are used to form a pattern of red, green, or yellow colored light approximately 100 yards in diameter around or on a target; the light should be visible from altitudes of 25,000 to 35,000 ft. day or night. They are used to spot individual targets once the general target area has been marked by flares dropped by Pathfinder planes. The explosive charge in the T6 candles is ignited by the flare composition at the end of burning. These charges serve to prevent any removal of the candles by the enemy once the candles are on the ground.

The M89, M90, and M98 are identical, differing only in the type and number of candles:

(1) The M89 contains 61 non-delay T4 candles.
(2) The M90 contains 57 non-delay T4 candles; 2 exploding T6 candles burning for one minute; and 2 exploding candles burning for two minutes.
(3) The M98 contains 31 non-delay T4 candles; 10 exploding T6 candles burning for one minute; 10 exploding T6 candles burning for 1.5 minutes; and 10 exploding T6 candles burning for two minutes.

PART II

GROUND PYROTECHNICS

RESTRICTED

RESTRICTED

Data:

LENGTH OF SIGNAL
(without tail assembly) . . . . . 6.0 in.
DIAMETER . . . . 1.6 in.
DELAY . . . . 6 seconds
HEIGHT OF TRAJECTORY . . . . 600 ft.

U. S. ARMY SIGNALS

GROUND SIGNALS (PROJECTOR TYPES)

M 17 through M 22 Series
M 27 High Bursting Range Ground Signal

USE:

Primarily designed for ground use.

DESCRIPTION:

The signal is assembled in a cylindrical case, and equipped with a finned tail assembly for stabilization purposes. The primer is located in the head of the signal, and the propelling charge is contained in a small cavity under the head. The end opposite the primer is closed by a press-fit cap to which the tail assembly is attached. The signal has a solid tail stem and an X-shaped fin. Embossed letters on the fin indicate the color and type of star(s).

Identification of M17 through M22 series is as follows:

Designation	Weight	Color of Fin	Embossed Letters	Color and Type of Star(s)
M 17	0.68 lbs.	White	WP	White-Parachute supported star
M 18	0.74 lbs.	White	WS	White-Cluster of five stars
M 19	0.66 lbs.	Green	GP	Green-Parachute supported star
M 20	0.76 lbs.	Green	GS	Green-Cluster of five stars
M 21	0.64 lbs.	Yellow	AP	Amber-Parachute supported star
M 22	0.71 lbs.	Yellow	AS	Amber-Cluster of five stars

OPERATION:

The signal is inserted nose first into Ground Projector, M3 or M4. The projector is struck smartly on the ground, causing the primer to strike the projector firing pin. The primer ignites the propelling charge which projects the signal tail first for approximately 100 feet. The signal then reverses itself and reaches an altitude of approximately 600 feet.

REMARKS:

The M27 High Bursting Range Ground Signal is similar to above signals except that it has no tail assembly. It is fired only from the Ground Signal Projector M1A1. The signal explodes at the top of its rise producing a flash and a puff of smoke.

SIGNALS, GROUND M17

RESTRICTED

U. S. ARMY SIGNALS

GROUND SIGNALS (LAUNCHER TYPE)

M17A1 through M22A1; M51A1; M52A1

Data:

OVERALL LENGTH . . . . 10.5 in.
DIAMETER . . . . 1.6 in.
DELAY . . . . 6 seconds
HEIGHT OF TRAJECTORY . . . . . 600 feet

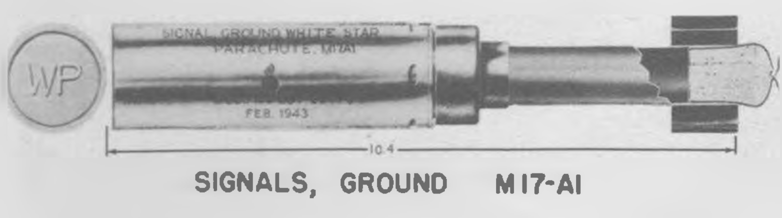
USE:
Primarily designed for ground use.

DESCRIPTION:
The signal is assembled in a cylindrical case and equipped with a finned tail assembly for stabilization purposes. It is similar to the projector type but modified to be fired from a service rifle or carbine. This type has a hollow stem, which is closed by a cork plug and a wheel shaped fin. "A1B2" series is the same as the "A1" series except that the former indicates steel construction. Special cartridges are used to ignite the propelling charge. Embossed letters on the closing cap indicate color and type of star(s).
Identification of M17A1 through M22A1 Series, M51A1, and M52A1, is as follows:

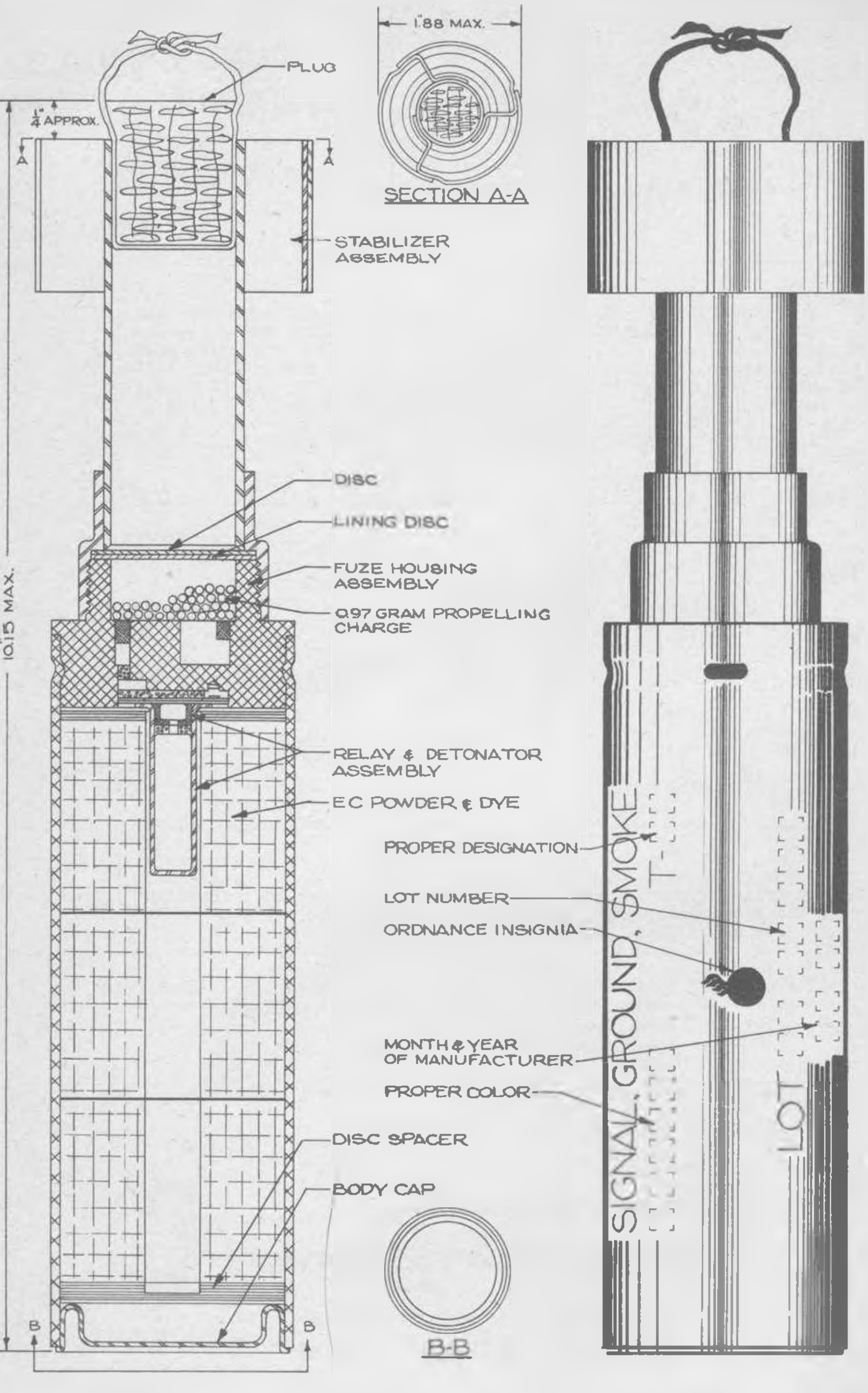
Designation	Weight	Color of Fin	Embossed Letters	Color and Type of Star(s)
M17A1	1.04 lbs.	White	WP	White-Parachute supported star
M18A1	1.10 lbs.	White	WS	White-Cluster of five stars
M19A1	1.02 lbs.	Green	GP	Green-Parachute supported star
M20A1	1.10 lbs.	Green	GS	Green-Cluster of five stars
M21A1	1.00 lbs.	Yellow	AP	Amber-Parachute supported star
M22A1	1.07 lbs.	Yellow	AS	Amber-Cluster of five stars
M51A1	1.02 lbs.	Red	RP	Red-Parachute supported star
M52A1	1.02 lbs.	Red	RS	Red-Cluster of five stars

OPERATION:
Remove cork plug from tail and place signal on rifle launcher. Place the butt of the rifle on the ground as far away as practical. When rifle is fired the cartridge fires the primer which in turn ignites the propelling charge. The signal travels approximately 100 feet and then reverses itself and reaches an altitude of approximately 600 feet.

REMARKS:
Use only .30 caliber rifle **grenade** cartridge when launching from a .30 caliber rifle. Use only .30 caliber carbine grenade cartridge when launching from a .30 caliber carbine.



SIGNALS, GROUND M17-A1



SIGNAL, GROUND, SMOKE
T38-T42 SERIES

RESTRICTED

Data:

LENGTH.	10.15 in.
DIAMETER.	1.88 in.
PERSISTENCE OF SMOKE.	20 to 30 sec.
BURSTING ALTITUDE	600 feet

U. S. ARMY SIGNALS

SMOKE GROUND SIGNAL

T38E1 - T42E1 Series

USE:

By artillery observers to signal or lay in a line of fire.

DESCRIPTION:

The external appearance is similar to ground signals M17A1 series, and the internal description is similar to aircraft smoke signals of the T43-T47 series. T38 to T42 inclusive will produce red, orange, yellow, green, and violet smoke.

OPERATION:

The signal is launched in the same manner as the M17A1 series. The fuze delay ignites a relay and detonator which in turn detonates the EC powder and dye at a minimum altitude of 600 feet.

RESTRICTED

Data:

LENGTH OF BODY	14.0 in.
DIAMETER OF BODY	1.5 in.
BURNING TIME	22 seconds
WEIGHT	1 lb.

U. S. NAVY SIGNAL

ROCKET PISTOL SMOKE SIGNAL

Mk 2

REMARKS:

For description and operation refer to Rocket Pistol Signal, Mk 1, Comet, page 351.

RESTRICTED

U. S. NAVY SIGNAL

HAND SMOKE DISTRESS SIGNAL

Mk 1

Data:

LENGTH OF SIGNAL . . . . 3.875 in.
DIAMETER OF CASE . . . . 1.625 in.
WEIGHT . . . . 0.37 lb.

USE:

Hand smoke distress signal.

DESCRIPTION:

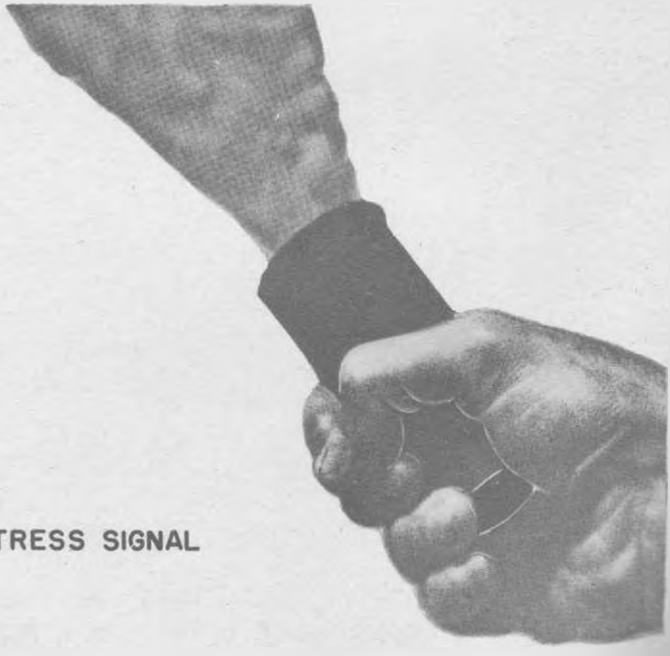
The signal is encased in a metal cylindrical body, one end of which is closed by a soldered cap and pull ring. The case can be held comfortably and safely in the bare hand during the burning period. The signal contains a pyrotechnic smoke mixture and is water tight.

OPERATION:

The sealing tape around the end of the cylinder is torn off and the paper cap is removed. The pull ring is brought down over the rim of the can and pressed down, using the ring as a lever to break the seal. The cylinder is pointed away from the face and a quick pull is exerted on the pull ring which comes out of the can thereby igniting the smoke mixture. The signal should be held at arm's length at an angle of about 30° so that drippings will not fall on the hand.

REMARKS:

This signal is to replace the White Smoke Grenade, HC, AN-M8, for emergency kits in life rafts and aircraft.



HAND SMOKE DISTRESS SIGNAL
MK I

RESTRICTED

Data:

LENGTH . . . . 12.0 in.
DIAMETER . . . . 1.25 in.
BURNING TIME OF BLUE LIGHT . . . 1 to 1.5 min.
BURNING TIME OF RED LIGHT . . . 2.5 to 3 min.

U. S. NAVY

NAVY RED LIGHT

Mk 1

NAVY BLUE LIGHT

Mk 1 Mod 1

(Hand Lights)

USE:

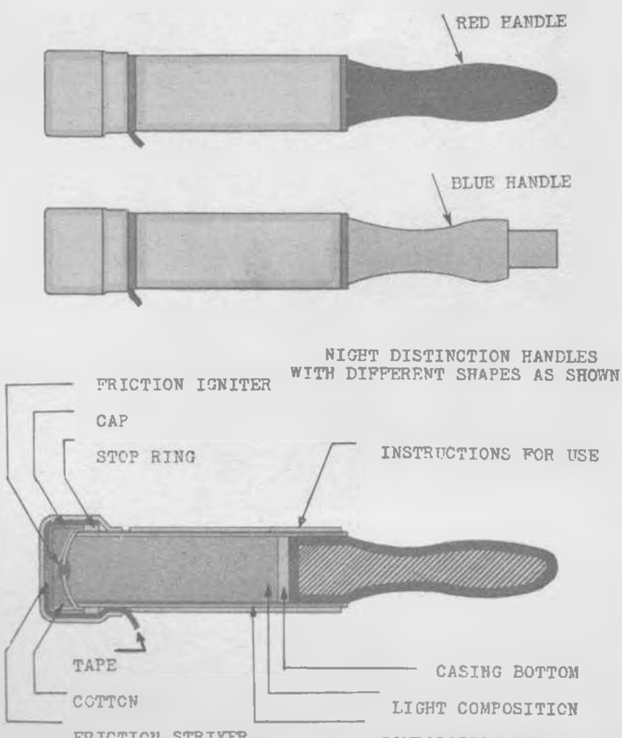
Flare suitable for hand use.

DESCRIPTION:

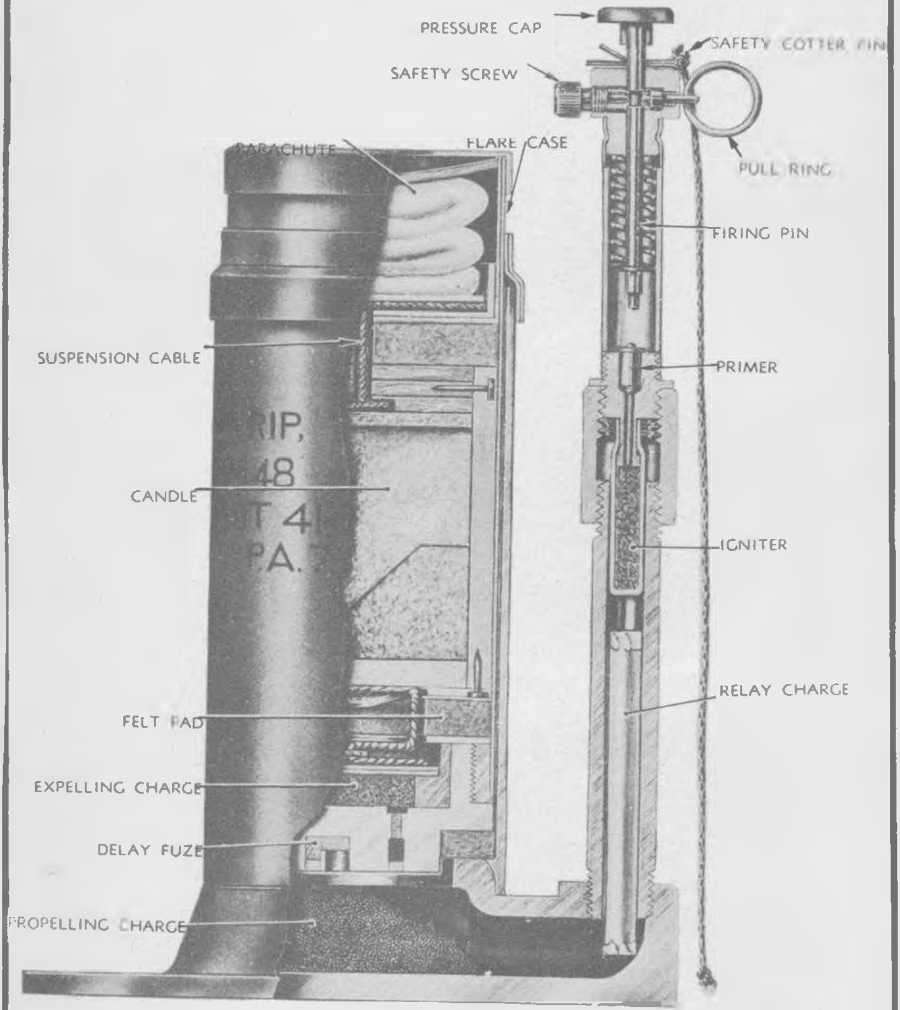
The flare consists of a paper tube filled with a pyrotechnic composition and attached to a wooden handle. The top of each flare contains a button of ignition material. A friction striker is provided with each signal.

OPERATION:

The flare is ignited by scraping the top of the inside cap against the forward end of the pyrotechnic mix. Hold the flare in an inclined position while burning to prevent drippings from burning the hand.



NAVY RED LIGHT, MK I & NAVY BLUE LIGHT, MK I, MOD I



FLARE, TRIP, PARACHUTE M 48

RESTRICTED

Data:

DIAMETER OF FLARE TUBE. .	2.5 in.
HEIGHT OF TRAJECTORY. . .	300 to 500 ft.
BURNING TIME.	20 seconds
INTENSITY OF LIGHT. . . .	100,000 candle power
COLOR OF LIGHT.	White to yellowish
EFFECTIVE ILLUMINATION. .	Circle of 300 yds. radius

U. S. ARMY FLARE

PARACHUTE TRIP FLARE

48

USE:

Primarily designed to give warning of enemy marauders or infiltrating hostile troops. Secondarily designed for illumination of enemy troops or signaling.

DESCRIPTION:

The flare consists of a one-fourth inch pipe and a steel tube approximately 2.5 inches inside diameter, which are attached to a base plate that contains a 75 grain propelling charge. The steel tube contains a delay fuse, an expelling charge, a candle, and a parachute assembly. The .25 inch pipe and the firing mechanism are joined by a coupling, and the pipe is threaded to the base plate. The firing train is composed of a primer, an igniter, and a relay charge. The firing mechanism contains the pressure cap, pull ring and pin, safety screw, safety cotter pin, and spring loaded firing pin.

OPERATION:

A 20 to 30 pound pressure on the pressure cap or a tension of 4 to 6 pounds on the pull pin releases the firing pin and fires the primer. The primer initiates the igniter which in turn starts the relay charge. The relay charge sets off the propelling charge which projects the illuminating shell through the large steel tube to a height of 300 to 500 feet. The propelling charge ignites a 3 second delay fuse in the shell. The delay fuze ignites an expelling charge which ignites and expels a parachute supported candle from the shell.

RESTRICTED

U. S. ARMY FLARE

ILLUMINATING HAND FLARE

T 14 T 14E1

Data:

LENGTH	4.375 in.
DIAMETER	2.375 in.
WEIGHT	1.3 lbs.
BURNING TIME OF T 14	55 sec. minimum
INTENSITY OF LIGHT OF T 14	40,000 candlepower
BURNING TIME OF T 14E1	90 sec. minimum
INTENSITY OF LIGHT OF T14E1	25,000 candlepower

USE:

For front line use in investigating suspicious noises at night.

DESCRIPTION:

This flare is an M49 trip flare modified in the following ways: (a) the bracket is omitted, (b) the top cap is replaced with a bottom cap, and (c) a two-second delay is attached in the grenade type igniting fuze.

OPERATION:

The flare may be thrown by hand, or may be launched by using a grenade launcher with the T2E1 adapter. Prior to release the safety pin is pulled. Functioning is the same as the standard hand thrown or launched grenades, except that the fuze ignites the flare composition after a two-second delay instead of causing an instantaneous, detonation. The T1 tree suspension device for smoke grenades may be used if entanglement in foliage is desired.

REMARKS:

This flare is not procured by the Navy.

RESTRICTED

U. S. ARMY FLARE

TRIP FLARE

M 49

Data:

LENGTH OF BODY	3.8 in.
DIAMETER OF BODY	2.5 in.
BURNING TIME	1 min.
INTENSITY OF LIGHT	40,000 candlepower
COLOR OF LIGHT	White to yellowish

USE:

For use see M 48 Parachute Trip Flare, page 335.

DESCRIPTION:

The flare has a grenade shaped cylindrical body, with a nose fuze that protrudes 0.875 inches from the head end. A mounting bracket and a spring loaded trigger mechanism are mounted on a metal base cap. The upper arm of the trigger is attached to a trip wire, and the lower arm of the trigger restrains the safety lever after the removal of the safety pin.

OPERATION:

A pull on the trip wire rotates the upper trigger arm away from the fuze lever. If the trip wire is cut, the upper trigger arm, which is restraining the fuze lever, rotates away from the fuze lever but in an opposite direction from above. A grenade type fuze is used but it has no delay element. The fuze ignites the flare instantaneously.

RESTRICTED

U.S. ARMY FLARE

TREE SUSPENDED FLARE

T 25

Data:

LENGTH.	24.0 in.
DIAMETER.	4.25 in.
WEIGHT.	18 lbs.
INTENSITY OF LIGHT.	800,000 candle power

USE:

Intended for front line use in investigating suspicious noises at night.

DESCRIPTION:

This flare contains the candle of the AN-M26 Aircraft Parachute Flare, modified for tree suspension and electrical or pull ignition. A pair of cables approximately 12 inches long replace the shock absorber of the AN-M26.

OPERATION:

The flare is suspended, by the cable provided, as high above the ground as practical. It may be fired by an electrical or pull device. The flare may be set up for both methods of firing.

REMARKS:

The flare is to be placed in advance of "front line" positions when such sites are accessible prior to or during lulls in enemy activities. The flare is not procured by the Navy at present.

RESTRICTED

U. S. NAVY FLARE

TRIP WIRE FLARE

Mk 1

Data:

LENGTH OF TUBE	5.5 in.
DIAMETER OF TUBE	2.5 in.
WEIGHT	3.5 lbs.
BURNING TIME	65 seconds
CANDLE POWER	100,000
EFFECTIVE ILLUMINATION	Area 500 ft. in dia.

USE:

Designed for use at night by ground troops for the purpose of revealing the approach of enemy ground troops.

DESCRIPTION:

The flare case is a steel tube approximately 5.5 inches long and 2.5 inches in diameter. Fixed to one end is a pull type, spring actuated firing mechanism to which the trip wire is attached. Enclosed in the tube are the primer, black powder charge, impregnated muslin disc, and pyrotechnic composition. Two 40 foot lengths of wire are available, making it possible to have two trip wires running in opposite directions. A web belt is available for securing the flare to a tree.

OPERATION:

A tug of three lbs. or more on the trip wire draws the plunger and firing pin away from the primer and compresses a spring which surrounds the firing pin. As the plunger is pulled away from the firing mechanism. its notched end disengages from that of the firing pin, which is then forced against the primer by the compressed firing pin spring. The primer ignites 0.3 grams of black powder. The black powder ignites the impregnated muslin disc, and in turn the pyrotechnic composition. The resultant gas pressure blows out the closure disc from the head and the flame from the burning candle illuminates the surrounding area. White smoke given off by the flare does not interfere with the effectiveness of illumination.

REMARKS:

To prevent self illumination, the flare should be mounted about 125 yds. forward of own positions. While mounting the flare, a steel helmet should be worn and the head should be kept below and away from the top of the flare.

RESTRICTED

U. S. ARMY FLARE

GROUND FLARE

M 81, M 82, M 83

Data:

LENGTH (without spike) . . .		7.75 in.	
DIAMETER.		1.75 in.	
WEIGHT		0.88 lbs.	
BURNING TIME.		2 min.	
COLOR AND INTENSITY OF LIGHT			
M 81(T9)	Red	20,000	candle power
M 82(T10)	Yellow	25,000	candle power
M 83(T12)	Green	35,000	candle power

USE:

To indicate to cooperating air elements a line of position or direction, and for troop recognition purposes.

DESCRIPTION:

Flare consists of a paper cylinder containing a pyrotechnic composition. It has a wooden base block with a 20 penny spike through it, and a match head covered by a removable plastic cup. A plastic film seals the plastic cup to the flare body. The outer head of the plastic cup has the scratching surface required to ignite the match composition.

OPERATION:

The flare is stuck in the ground using the spike as a support. The plastic cap is pulled off and scratched against the match composition which ignites the flare.

REMARKS:

Not procured by the Navy at present.

RESTRICTED

U. S. NAVY FLARE

TARGET ROCKET FLARE

Mk 1

Data:

WEIGHT	3 lbs.
WEIGHT OF BLACK POWDER STARTER	0.035 oz.

USE:

Used with the 3.25 inch rocket target Mks 10 and 11.

DESCRIPTION:

A pyrotechnic candle, secured into a wooden body, is housed in a steel tube. An electric squib is located over the starter composition of the candle. A steel cup shields the ignition end of the flare, and squib leads are coiled inside the nose cap.

OPERATION:

Tear off the adhesive strip and remove the cover. Place the flare over the nose of the rocket, and uncoil the squib leads. Fasten the alligator clips to the cotter pins of the leads and fire as normally.

RESTRICTED

U. S. NAVY GRENADE

ILLUMINATING HAND GRENADE

Mk 1

Data:

LENGTH	4.3 in.
DIAMETER	2.1 in.
WEIGHT	9.2 oz.
INTENSITY OF LIGHT	60,000 candlepower
DELAY	7 seconds
BURNING TIME	25 seconds

USE:

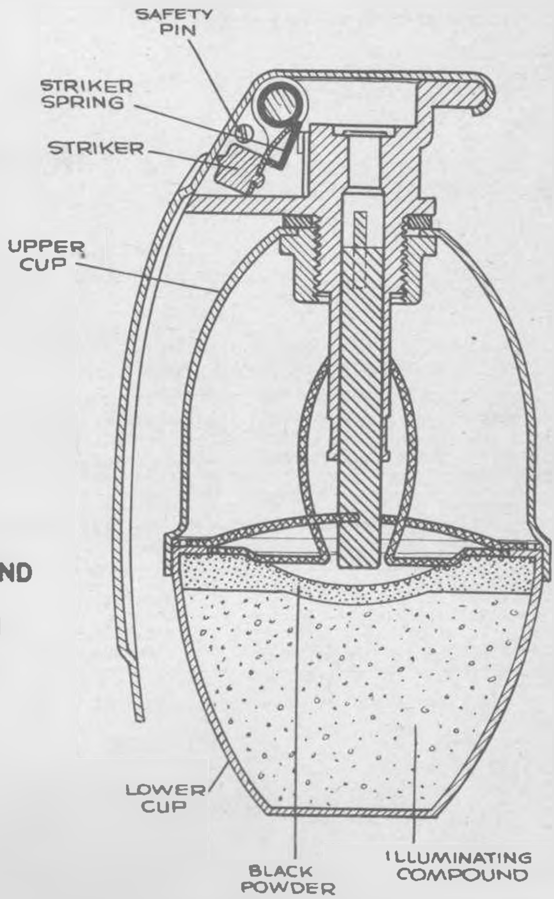
For illumination of enemy positions.

DESCRIPTION:

The grenade consists of two metal shells pressed together and sealed. The upper shell contains a Bouchon igniter and a delay fuze. The bottom shell contains the illuminant composition, first fire charge, ignition charge, quickmatch , and disc.

OPERATION:

Hold the grenade in the hand, making sure the lever is held tightly against the body of the grenade. Pull the release pin and throw the grenade. When the lever is released, the firing pin is freed to fire the primer. The primer ignites the delay which burns for 7 seconds and then ignites the ignition charge. The ignition charge sets off the first fire composition which in turn ignites the illuminant composition. The gaser from the ignition charge and first fire force the two shells apart thus leaving the illuminant composition of the bottom shell free for burning.



ILLUMINATING HAND GRENADE MK I

RESTRICTED

U. S. ARMY FLARE

AIRPORT FLARE M13

Data:

LENGTH OF CASE	23.1 in.
DIAMETER OF CASE	1.75 in.
BURNING TIME	3 minutes
INTENSITY OF LIGHT	40,000 candle power

USE:

To provide illumination for airplane landing at emergency fields, and to illuminate targets and objectives. To prevent infiltration or surprise by enemy troops.

DESCRIPTION:

The flare consists of a cylinder 23.1 inches long and 1.75 inches in diameter. The top cover is sealed with a strip of adhesive tape. A 7 inch hollow chipboard tube is mounted to one end of the cylinder.

OPERATION:

Remove the adhesive tape and slip the hollow tube over a rod stuck in the ground. Pull on the lanyard attached to the ignition wire to fire the flare.

REMARKS:

Not procured by the Navy.

RESTRICTED

U. S. ARMY FLARE

AIRPORT FLARE M76 (T15)

Data:

LENGTH	32.0 in.
DIAMETER	6 in.
BURNING TIME	6.5 minutes
INTENSITY OF LIGHT	800,000 candle power

USE:

To indicate the end of a runway in a fog.

DESCRIPTION:

This flare consists of a cylinder containing a candle similar to but larger than the flare candle of the AN-M26, and fitted with a socket base arrangement into which four channel shaped legs may be inserted to hold the flare upright on the runway.

MEANS OF IGNITION:

1. Pull release fork which holds a cocked firing pin.
2. Electric squib.

OPERATION:

May be initiated by the use of the electric squib or by pull on the release fork which allows the spring loaded firing pin to strike the primer. The primer acts directly to ignite the first fire composition. The remainder of the operation is similar to that of the aircraft flare AN-M26.

REMARKS:

This flare is not procured by the Navy at present.

RESTRICTED

HIGH ALTITUDE PARACHUTE FLARE AND FLARE MORTAR

Data:

LENGTH OF FLARE . . . 10.75 in.
DIAMETER OF FLARE . . 2.5 in.
WEIGHT OF FLARE . . . 5 lbs.
HEIGHT OF TRAJECTORY. 1000 ft. (approx.)
INTENSITY OF LIGHT. . 85,000 candle power
COLOR OF LIGHT . . . White
BURNING TIME . . . . 60 seconds
RATE OF FALL AFTER IGNITION . . 6 ft./sec.

USE:

Used to illuminate seaplane landing areas at night, and to illuminate an island base when low ceilings do not permit proper visibility from normal flying levels.

DESCRIPTION OF FLARE:

The flare consists of a cylindrical steel tube body with a copper cup welded to the closed end of the tube. The body contains an expelling charge, a pyrotechnic candle, and a silk parachute. The copper cup contains a fuze assembly, a propelling charge (25 grams of a combination of smokeless powder and black powder), and a standard shotgun primer.

DESCRIPTION OF FLARE MORTAR:

The mortar consists of a steel tube 36 inches long and 2.8 inches in diameter. The tube is screwed into a steel base plate 0.75 inches thick and 12 inches square. The base plate is provided with a central stud into which is pressed a hardened steel firing pin.

OPERATION:

Remove the closing cap from the end of the mortar. Attach a 30 foot lanyard to the brass release pin and insert the pin in the two holes drilled transversely about 6 inches from the end of the mortar. Insert the flare into the mortar so that it rests on the release pin with the copper end down. Fire the flare by pulling the lanyard, thus removing the release pin. The flare falls to the bottom of the mortar, firing the primer. The primer sets off the propelling charge and ignites the delay fuze. The expanding gases force the copper cup away from the flare and fill the bore of the mortar. The flare is propelled 1000 feet into the air, at which time the delay fuse ignites the expelling charge. The pyrotechnic candle and parachute are expelled, the expelling charge igniting the candle.

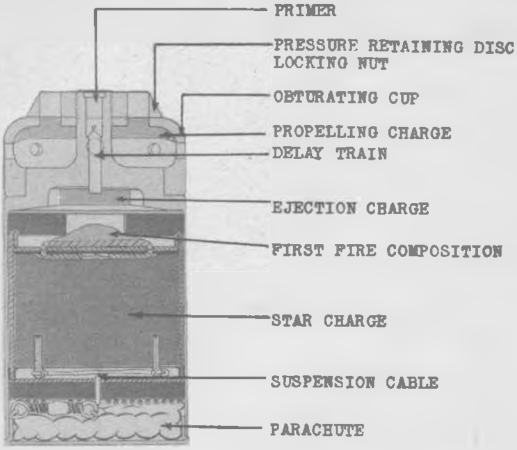
REMARKS:

A suitable barrier should be erected to shield personnel firing the flare. In case of a misfire, wait at least 3 minutes before disassembling the mortar. Clean mortar tube after firing.

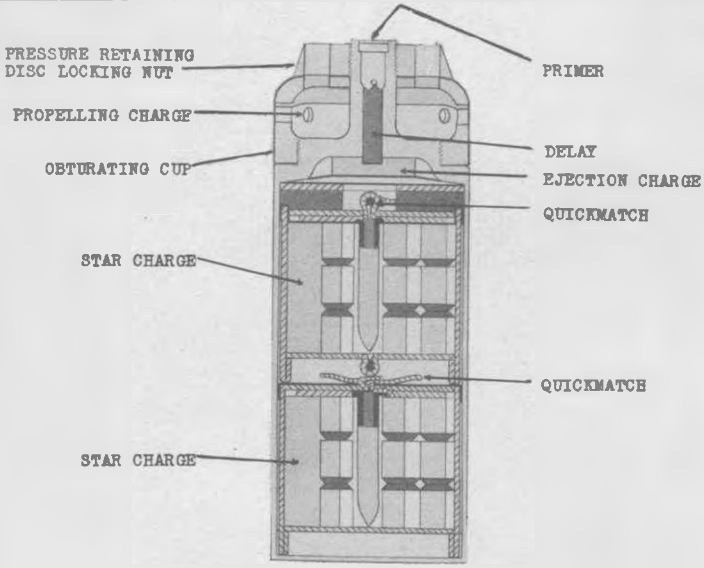
PART III

SHIP AND SUBMARINE PYROTECHNICS

CONFIDENTIAL



SHIP'S EMERGENCY IDENTIFICATION SIGNAL MK I



SHIP'S EMERGENCY IDENTIFICATION SIGNAL MK 2

SHIP'S EMERGENCY IDENTIFICATION SIGNAL

Mks 1, 2, 3, and 4

GENERAL DESCRIPTION:

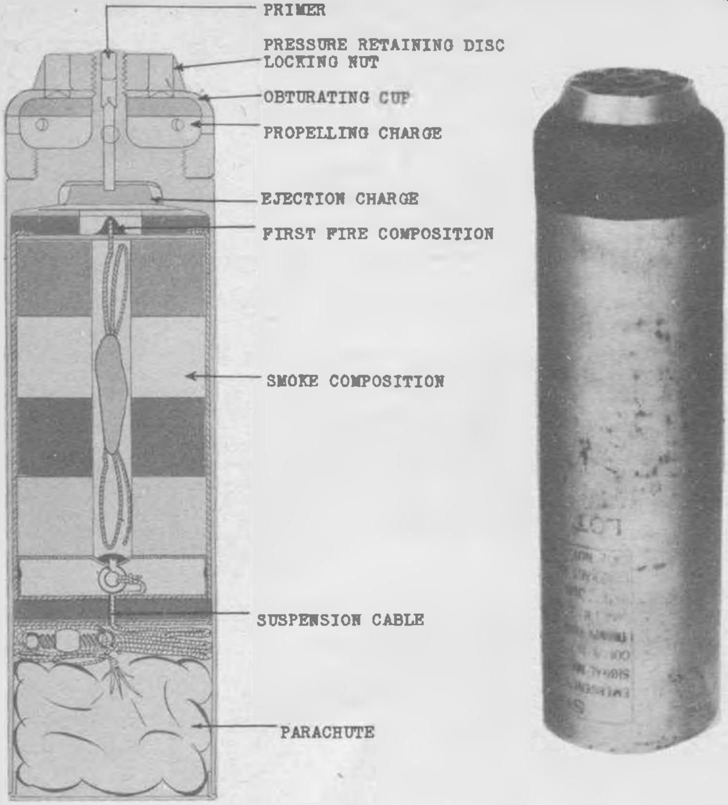
The body of each signal varies in length according to its design. Each signal consists of a pressure retaining disc and disc locking nut, primer, four grams smokeless powder propelling charge, copper obturating cup, delay train, ejection charge of approximately 1.1 grams of black powder, and a signal of pyrotechnic composition. All signal cups except the shower signals have a parachute for mid-air suspension.

OPERATION:

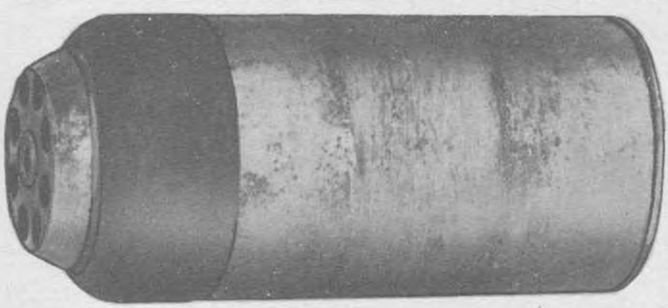
The signal is fired from Signal Projector Mk 1 or Mk 1 - 1. The signal is placed in the projector primer first where it rests against the retaining pin. A pull on the lanyard removes the firing pin and allows the signal to descend against the firing pin with sufficient force to close the valve and fire the primer. The primer ignites the delay train and propelling charge simultaneously. The gases from the propelling charge expand the obturating cup until it is secured tightly in the bore of the projector. Increased pressure ruptures the pressure retaining disc, and the gases then escape through the openings in the retaining disc locking nut into the projector bore. The gases propel the signal approximately 600 feet. The ignited delay train burns until the signal reaches approximately the zenith of its trajectory and then ignites the ejection charge. The ejection charge ejects and ignites the signal pyrotechnics through a quick match and first fire composition.

USE:

Primarily used as ships' emergency signal.



SHIP'S EMERGENCY IDENTIFICATION SIGNAL MK 3



SHIP'S EMERGENCY IDENTIFICATION SIGNAL MK 4

RESTRICTED

Data:

LENGTH. . . . . 5.124 in.
DIAMETER. . . . . 2.49 in.
COLOR . . . . Red, white, green or yellow
BURNING TIME . . . . 25 seconds ± 5 sec.

U. S. NAVY SIGNAL

SHIP'S EMERGENCY IDENTIFICATION SIGNAL

Mk 1
(Star)

DESCRIPTION:
The closing cup is embossed for night identification. The star is parachute suspended.

RESTRICTED

Data:

LENGTH. . . . . 6.374 in.
DIAMETER. . . . . 2.50 in.
COLOR . . . . Red, white, or green
BURNING TIME. . . . . 5 seconds

U. S. NAVY SIGNAL

SHIP'S EMERGENCY IDENTIFICATION SIGNAL

Mk 2
(Shower)

DESCRIPTION:
Designed to give two distinct bursts, one with a short delay and one with a long delay. The closing cup is embossed for night identification.

RESTRICTED

Data:

LENGTH. . . . . 9.124 in.
DIAMETER. . . . . 2.49 in.
COLOR . . . . Red, black, green or yellow
BURNING TIME . . . . 25 sec. ± 5 sec.

S. NAVY SIGNAL

SHIP'S EMERGENCY IDENTIFICATION SIGNAL

Mk 3
(Smoke)

DESCRIPTION:
The closing cap is painted the same color as produced by the signal. The signal is parachute suspended.

RESTRICTED

Data:

LENGTH. . . . . 5.124 in.
DIAMETER. . . . . 2.49 in.
COLOR COMBINATIONS
(a) Red - green - white
(b) White - red - green
(c) Green - white - red
BURNING TIME OF EACH COLOR. 9 seconds
DELAY OR INTERRUPTED DARKNESS BETWEEN EACH COLOR. . . . 1 second

U. S. NAVY SIGNAL

SHIP'S EMERGENCY IDENTIFICATION SIGNAL

Mk 4
(Chamelon)

DESCRIPTION:
The signal is parachute suspended and designed to change color while burning. Otherwise the signal is similar to the Mk 1.

PESTRICTED

Data:

LENGTH	18.0 in.
DIAMETER	3.0 in.
BURNING TIME	28 seconds
DELAY	27 seconds
COLOR OF STAR.	Red, yellow or green

U. S. NAVY SIGNAL

SUBMARINE EMERGENCY IDENTIFICATION SIGNAL

Mk 2 and Mk 3

USE:

Used as a submarine emergency identification signal whether the submarine is submerged or on the surface.

DESCRIPTION:

The signal consists of a cylindrical aluminum case containing a grenade type pyrotechnic candle. The bottom end contains two delay elements. A single star candle is attached to a parachute by an asbestos cord.

OPERATION:

The shell is projected from the standard submarine emergency identification signal ejector, using compressed air as the propellant. The shell is fired by a lug at its base which projects beyond the side of the shell and rides in a groove in the ejector tube. As the shell is forced through the tube, the extended lug reaches the end of the groove just before the base of the shell passes the muzzle door. The tripping lever is pulled back thereby cocking and releasing the firing pin lever and firing pin. The firing pin strikes the primer and the flash from the primer ignites a time fuze. The time fuze burns while the signal is rising to the surface. The delay ignites the grenade ejection charge which ejects the signal to a distance of approximately 350 feet. At the summit of the trajectory the delay train flashes into the signal ejection charge and causes the parachute suspended star to be ejected.

REMARKS:

The Mk 2 Mod 2 is obsolescent, being replaced by the Mk 3 Mod 1. The Mk 3 has slightly different construction from the Mk 2 Mod 2. The maximum launching depth is 160 feet.

The Mk 3 Mod 1 is similar to the Mk 2 Mod 1 except for the following: (a) a delay of 54 to 59 seconds, (b) a maximum launching depth of 285 feet, and (c) a sturdier construction to withstand pressures at a lower depth.

SUB EMERGENCY IDENTIFICATION SIGNAL MK 2, MOD. 2

RESTRICTED

U. S. NAVY SIGNAL

SUBMARINE FLOAT SIGNAL

Mk 1 Mod 1

Data:

LENGTH	18.75 in.
DIAMETER	3.0 in.
DELAY	27 seconds
BURNING TIME	15 seconds
COLOR	Black, yellow, green or red

USE:

Used to mark the position of a submerged submarine, and for signal purposes.

DESCRIPTION:

The firing mechanism consists of a firing pin, firing pin spring, firing pin lever, and tripping lever or lug. The ignition system consists of a primer, time fuse, quickmatch, and starter mixture. The aluminum signal contains a smoke pot, smoke mixture, smoke pot cover, and central tube. The signal has a nose cap and release valve.

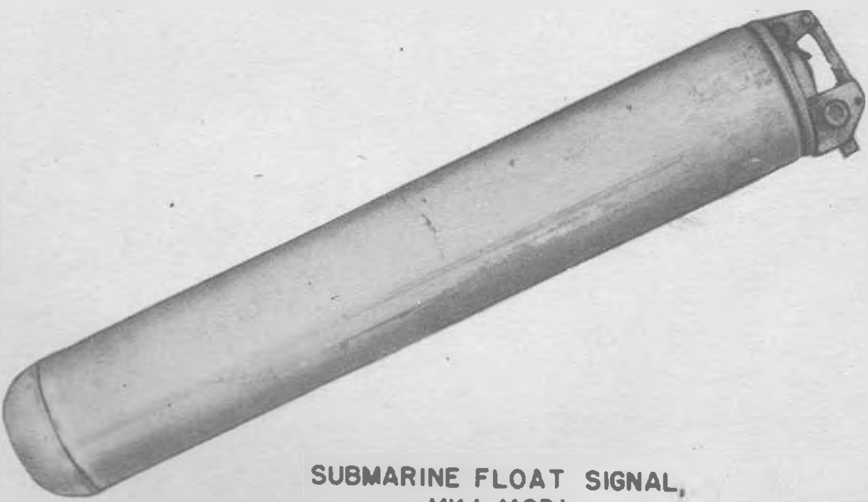
OPERATION:

The signal is fired from a submerged submarine, through a tube, using compressed air as a propellant. As the signal is leaving the ejector a tripping lever is raised by contact with a lug in the gun, cocking and releasing the firing pin lever which fires the primer. The primer ignites the time fuse which burns for 27 seconds. The signal is bouyant and rises to the surface within the 27 seconds fuse delay. The time fuse ignites a piece of quickmatch which in turn initiates the starter composition. The starter composition sets off the smoke mixture.

REMARKS:

The maximum launching depth is 162 feet.

The Mk 2 Mod 0 Submarine Float Signal is similar to the Mk 1 Mod 1 except for a fixed delay of 54 to 59 seconds. A maximum launching depth of 285 feet, and sturdier construction.



SUBMARINE FLOAT SIGNAL,
MK I MOD I

RESTRICTED

Data:

LENGTH	12.0 in.
DIAMETER	1.5 in.
WEIGHT	2 lbs.
BURNING TIME	5 seconds

U. S. NAVY SIGNAL

WHITE ROCKET (MARINE TYPE)

Mk 1

USE:

A merchant marine rocket issued by the Navy.

DESCRIPTION:

This signal consists of the rocket body, star pellets, propelling charge, clay headings, and closing cap.

OPERATION:

The rocket is fired by the AN-M8 Pyrotechnic Pistol and reaches a height of 250 feet. At the height of its trajectory the rocket bursts. The falling particles burn for 5 seconds.

REMARKS:

This signal will be replaced by the Rocket Pistol Signal Mk 3 Mod 0 (Shower).

PAC ROCKET (SNOWFLAKE) - This is British rocket adapted by the U.S. but now discarded. The rocket head is 3.25 inches in diameter and 12 inches long, with a fin assembly attached. The burning time is 45 to 60 seconds. It is not to be used.

RESTRICTED

U. S. NAVY SIGNAL

ROCKET
PISTOL SIGNAL

Mk 1 COMET
Mk 3 SHOWER
CHAMELON

Data:

LENGTH OF BODY	14.0 in.
DIAMETER OF BODY	1.5 in.
BURNING TIME	11 seconds
INTENSITY OF LIGHT	60,000 candlepower
COLOR OF SINGLE STAR	Red, green, or yellow

USE:

Used for emergency identification by surfaced submarines.

DESCRIPTION:

The upper section or signal chamber contains a pyrotechnic composition and powder ejector charge. The rocket motor, which is riveted to the signal chamber, contains one gram of black powder above a felt washer and 58 grams of black powder, which is the rocket element. Four spring loaded hinged vanes, 4 inches long and 1 inch wide, are attached to the rocket tube and fold and fit into the rocket chamber. The rocket chamber is an aluminum container with a Mk 5 primer in its base. This unit receives the rocket motor.

OPERATION:

The signal is fired from the Submarine Rocket Pistol or the Pyrotechnic Pistol AN-M8. Release of the trigger fires the primer which ignites the one gram auxiliary propelling charge. This black powder charge propels the signal chamber and attached rocket motor to about 30 feet from the pistol muzzle. At this point the 58 gram charge of black powder, which is the rocket element, takes effect and propels the signal to a height of approximately 650 feet. The rocket element ignites the expelling charge at the zenith of trajectory. The expelling charge ignites the star and simultaneously ejects it. The single star falls freely and burns out just before hitting the water.

REMARKS:

This signal replaces the chamelon type, Submarine Rocket Signal.

The Rocket Pistol Signal Mk 3 Mod 0 (Shower) is similar to this signal except that a burst shower is produced instead of a single star.

The Rocket Pistol Signal Chamelon is similar to this signal except that a variety of colors is obtained.

PISTOL, ROCKET SIGNAL
MK I (COMET)

RESTRICTED

U. S. NAVY FLARE

FLOAT FLARE

Mk 15

Data:

LENGTH OF FLARE.	37.2 in.
MAXIMUM DIAMETER	6.5 in.
WEIGHT	26 lbs.
BURNING TIME	5 minutes
INTENSITY OF LIGHT	100,000 candle power
DELAY BEFORE IGNITION . . .	5 minutes

USE:

Used by PT boats in silhouetting enemy ships and for illumination. For diversionary purposes.

DESCRIPTION:

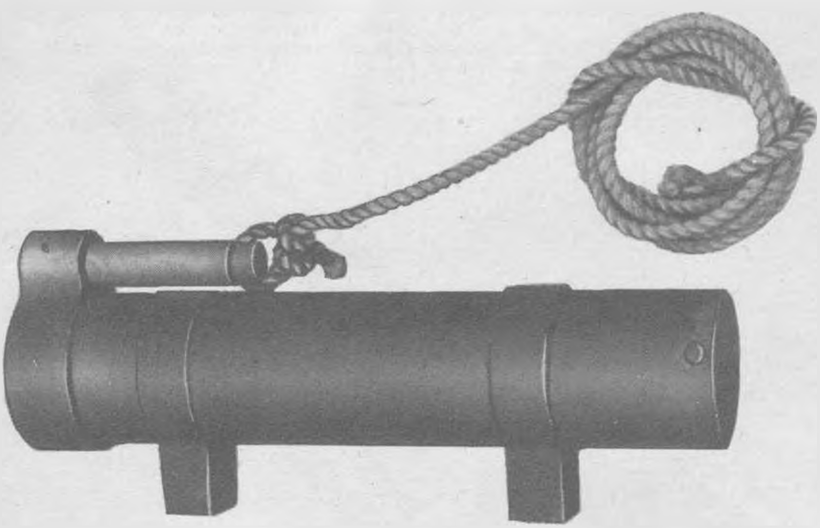
The flare consists of a wooden body housing a pyrotechnic column and having a metallic base to provide flotation stability. The top of the flare is closed by a cone shaped adapter which contains a bouchon grenade firing mechanism attached to a celluloid disc. Enclosed is 3.5 ft. of time fuse. The starter composition is attached to the flash end of the time fuse. The illuminant composition is next to the starter composition.

OPERATION:

The flare is held horizontally with the right hand firmly grasping the bouchon lever and the left hand supporting the nose cap. The safety key is pulled and the flare is tossed overboard. When the bouchon lever is released, the firing pin is forced by the firing pin spring to impinge upon the primer. The primer ignites the time fuse. The time fuse flashes into a booster bag of starter composition which in turn ignites the flare.

REMARKS:

It is recommended that one man hold the flare while a second man pulls the safety ring.



SUB EMERGENCY IDENTIFICATION FLARES
MK 10, MK 11, MK 12 & MODS.

RESTRICTED

U. S. NAVY FLARE

SUBMARINE EMERGENCY IDENTIFICATION FLARE

Mks 10, 11, 12 and Mods

Data:

LENGTH OF FLARE BODY.	9.75 in.
DIAMETER OF BODY	2.00 in.
BURNING TIME EACH INCREMENT . . . (Mk 11, Mk 12 and Mods)	10 seconds
BLACKOUT INCREMENTS. . . . . (Mk 11, Mk 12 and Mods)	5 seconds
WEIGHT	3.2 lbs.

USE:

Used by surfaced submarines to identify themselves.

DESCRIPTION:

The flare case consists of a seamless steel tube, one end of which is closed by a steel closure disc. The firing mechanism, which extends along the side of the flare body, is attached to the base casting, which carries the closure disc and primer. The firing mechanism is enclosed in a brass housing which contains the following: (a) a brass shaft held in place by a cotter pin, (b) a firing pin attached to the brass shaft by a sear joint, (c) a spring surrounding the firing pin, and (d) a lanyard attached to the brass shaft. The flare case contains the following: (a) a black powder charge, (b) a starter composition, (c) a pyrotechnic charge, and (d) a steel cup riveted to the case closing one end. Two clamps are welded to the flare body for mounting on the bracket fixed to the submarine bridge.

COLORS AVAILABLE:

Mk 11	Mk 11 Mod 1	Mk 11 Mod 2	Burning Time
Red	Green	Yellow	10 seconds
Blackout	Blackout	Blackout	5 seconds
Red	Green	Yellow	10 seconds
Blackout	Blackout	Blackout	5 seconds
Red	Green	Yellow	10 seconds
Blackout	Blackout	Blackout	5 seconds
Red	Green	Yellow	10 seconds

Mk 12	Mk 12 Mod 1	Mk 12 Mod 2	Burning Time
Red	Red	Green	10 seconds
Blackout	Blackout	Blackout	5 seconds
Green	Yellow	Yellow	10 seconds
Blackout	Blackout	Blackout	5 seconds
Red	Red	Green	10 seconds
Blackout	Blackout	Blackout	5 seconds
Green	Yellow	Yellow	10 seconds

OPERATION:

Mount the flare so that the firing mechanism points toward the deck. A vertical pull on the lanyard forces the brass shaft up, compressing the firing pin spring. The sear joint between the shaft and firing pin is broken when the shaft is pulled approximately 0.5 inches. The firing pin strikes the primer which ignites a small charge of black powder. The flash f om the black powder ignites the starter composition which in turn ignites the pyrotechnic candle. The flare burns in four increments of 10 seconds duration and intervening blackout increments of 5 seconds.

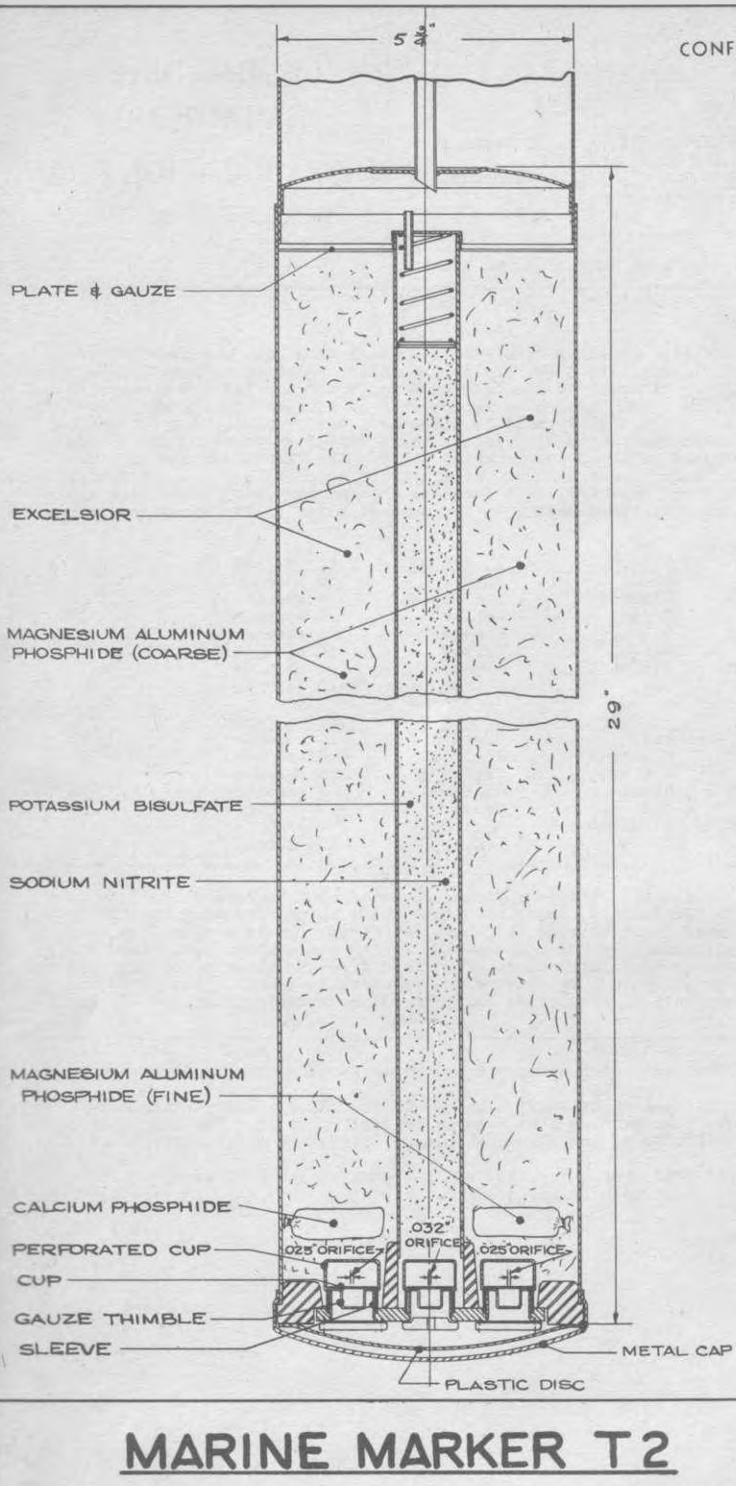
REMARKS:

Flares that have been submerged below periscope depth should be thrown overboard at the first opportunity.

The possibility of detonation in any of the flares, and particularly in those with green pyrotechnics should never be lost sight of. For this reason, personnel in the vicinity of the flares should be adequately shielded prior to firing.

Mk 10 and Mods are similar to the Mk 11, Mk 12 and Mods except that these burn with only one uninterrupted color.

CONFIDENTIAL



MARINE MARKER T2

RESTRICTED

U. S. NAVY MARKER

MARINE MARKER

T 2

Data:

LENGTH	29.0 in.
DIAMETER	5.75 in.
BURNING TIME	2.5 to 5 hours
LENGTH OF FLARE	10.0 in.
DIAMETER OF FLARE	3.0 in.

USE:

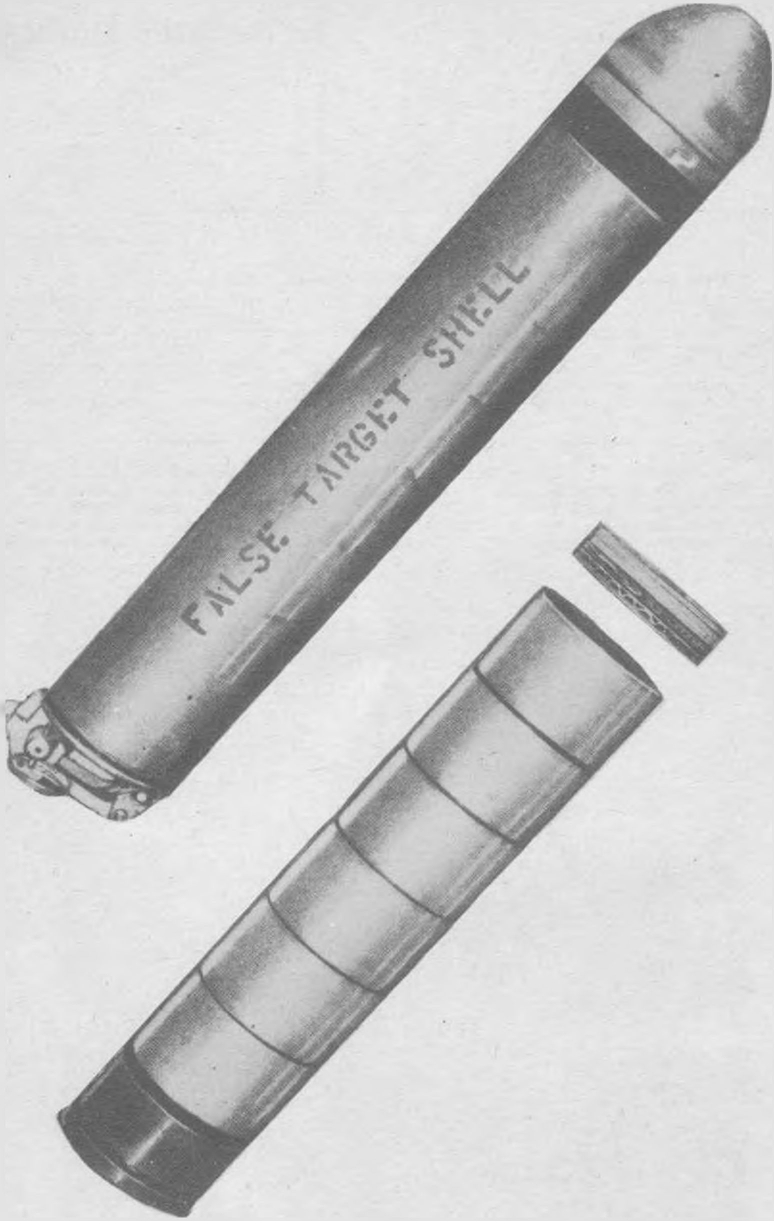
Used as a marker for ships and submarines.

DESCRIPTION:

The marker consists of a cylinder with an outer metal cap that encloses a plastic disc. Two orifices or water ports allow water to enter into the interior of the marker. A central tube contains potassium bisulfate and sodium nitrite. Coarse magnesium aluminum phosphide and excelsior surround the central tube. A bag of calcium phosphide and a bag of fine magnesium aluminum phosphide are placed near the water ports.

OPERATION:

The marker is launched, the plastic cover disc breaks and water enters the orifices. Water reacts with the calcium phosphide and magnesium aluminum phosphide to form PH_3 and P_2H_4. Water causes a chemical reaction between potassium bisulphate and sodium nitrite yielding oxides of nitrogen and oxygen. The gases from the above unite at the outlet pipe and PH_3 and P_2H_4 are consequently spontaneously ignited.



FALSE TARGET SHELL MK I

CONFIDENTIAL

U. S. NAVY TARGET SHELL

FALSE TARGET SHELL

Mk I

FALSE TARGET CAN

MK 2

Data

LENGTH OF CASE	18.0 in.
DIAMETER OF CASE	3.0 in.
DELAY	27 seconds
PERSISTENCE OF ECHO . . .	4 to 18 minutes.

USE:

To confuse and disrupt enemy underwater echo ranging.

DESCRIPTION:

The external appearance is similar to the Submarine Emergency Signal Mk 2 Mod 2. The shell holds six metal cups 2.75 in. in diameter and 1.875 in. in depth filled with a lithium hydride paraffin mixture. The base of the shell contains a primer, time fuse and 20 gram charge of smokeless powder. Attached to the base is a firing mechanism which is used with the standard emergency identification signal ejector.

OPERATION:

The shell is projected from the standard emergency identification signal ejector using 200 lbs. per square inch air pressure if possible. The shell is fired by a lug at its base which projects beyond the side of the shell and rides in a groove in the ejection tube. As the shell is forced thru the tube, the extended lug reaches the end of the groove just before the base of the shell passes the muzzle door. The tripping lever is pulled back thereby cocking and releasing the firing pin lever and firing pin. The firing pin strikes the primer and the flash from the primer ignites a length of time fuse coiled in the base of the shell. The time fuse burns for 27 seconds, and then ignites the 20 grams of smokeless powder which ejects the six cups of lithium hydride. When the lithium hydride contacts the water, a chemical reaction occurs which yields fine hydrogen bubbles. The hydrogen bubbles return an echo of the same order and magnitude as that returned by a submarine.

REMARKS:

False target shells should be segregated from pyrotechnics and other ammunition components, and should be kept in a dry atmosphere.

FALSE TARGET CAN MK 2 is similar to the false target shell in all respects except that it has nine metal cups instead of six.

U. S. GOVERNMENT PRINTING OFFICE O—1945