

TM 43-0001-30

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TECHNICAL MANUAL  
ARMY AMMUNITION DATA SHEETS  
FOR  
ROCKETS  
ROCKET SYSTEMS  
ROCKET FUZES  
ROCKET MOTORS  
(Federal Supply Class 1340)

This copy is a reprint which includes current  
pages from Changes 1 through 5.

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DECEMBER 1981

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WASHINGTON, DC, 17 August 2001

**Army Ammunition Data Sheets  
for  
Rockets, Rocket Systems, Rocket Fuzes, Rocket Motors  
(Federal Supply Class 1340)**

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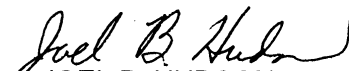
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(FSC 1340)**

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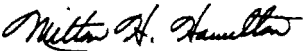
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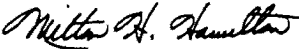
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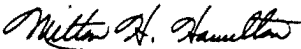
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ROCKET MOTORS (FSC 1340)**

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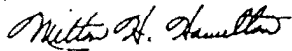
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**TECHNICAL MANUAL**

**No. 43-0001-30**

**HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, DC, 1 December 1981**

**Army Ammunition Data Sheets  
for  
Rockets, Rocket Systems, Rocket  
Fuzes, Rocket Motors  
(Federal Supply Class 1340)**

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You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to Commander, U.S. Army TACOM, Armament Research, Development and Engineering Center, ATTN: AMSTA-AR-WEL-S, Picatinny Arsenal, NJ 07806-5000. You may also send in your recommended changes via electronic mail or by fax. Our e-mail address is LSB@PICA.ARMY.MIL. Our fax number is DSN 880-4633, Commercial (973) 724-4633. A reply will be furnished to you.

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\*This manual supersedes TM 43-0001-30, 1 December 1981, including all changes.



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# CHAPTER 1 INTRODUCTION

## 1.1 PURPOSE.

1.1.1 This manual provides general and technical information concerning ground and aircraft rockets. It covers general characteristics, specific data, means of identification, precautions and general information on packing. General information pertaining to all types and kinds of conventional ammunition and explosives, and color coding for earlier manufactured munitions are contained in TM 9-1300-200. General information on care, handling, preservation, storing, shipping and destruction of ammunition and explosives is contained in AR 385-64 and DA PAM 385-64. Information on training of troops in tactical use of 3.5-in. rockets will be found on 66MM rockets in FM 23-25.

1.1.2 The rockets and components described in chapters 2 and 3 belong to Federal Supply Class 1340. Other items used in conjunction with the rockets are covered in other publications.

## 1.2 SCOPE.

1.2.1 For each item of materiel, there are illustrations and descriptions together with characteristics and related data. Included in the related data are type classification, logistics control code (LCC), dimensions, weight, performance data, packing data, and shipping and storage data.

1.2.2 Information concerning supply, operation, and maintenance of the items will be found in the publications referenced for those items. A complete listing of these publications is maintained in DA PAM 25-30.

1.2.3 Within this manual, items with the following type classifications are included:

1.2.3.1 Standard (LCC-A, LCC-B) OTCM/AMCTCM.

1.2.3.2 Contingency (CON).

1.2.3.3 Limited Procurement (LP).

1.2.3.4 Reclassified obsolete (OBS) for regular Army use, but used by National Guard or Reserve Units.

1.2.3.5 Reclassified OBS for all Army use, but used by Marine Corps, Air Force, or Navy.

1.2.3.6 Reclassified OBS, no users, but U.S. stocks remain.

1.2.4 Items with the following type classification are not included: Reclassified OBS for all U.S. use. No U.S. stocks remain. (Foreign use or stock may remain.)

1.2.5 Numerical values, such as weights, dimensions, candlepower, etc., are nominal values, except when specified as maximum or minimum. Actual items may vary slightly from these values. Allowable limits can be obtained from the drawings indicated in the data sheets.

## 1.3 QUANTITY-DISTANCE CLASSES AND STORAGE COMPATIBILITY GROUPS.

Quantity-Distance (QD) classes and Storage Compatibility Groups (SCG) listed in this manual are changed. For conversion to new system see table 1-1.

**Table 1-1. Quantity-Distance Classes and Storage Compatibility Groups.**

Quantity-Distance Hazard Class <sup>1/</sup>		Storage Compatibility Group <sup>1/3/</sup>
Old	New <sup>2/</sup>	Typical - New
8	6.1	
7	1.1	D
6	1.2(18)	E
5	1.2(12)	
4	1.2(08)	F
3	1.2(04)	G
2	1.3	C
1	1.4	S

Notes:

<sup>1/</sup>New QD and SCGs are compatible with classes used by NATO nations.

<sup>2/</sup>Numbers in parentheses are minimum distances x 100 feet to protect against specific fragment hazards and vary with items and types of ammunition. (Refer to AR 385-64 and DA PAM 385-64.)

<sup>3/</sup>There is no simple conversion from old SCGs to new system. The SCG groups listed in this column are typical for the majority of items in the corresponding listed QD class but do not apply to every individual item in the class. For SCG of individual items refer to AR 385-64 and DA PAM 385-64.

1.4 METRIC CONVERSION CHART.

For approximate conversions to metric measures see table 1-2.

**Table 1-2. Approximate Conversions to Metric Measures.**

Symbol	When You Know	Multiply By	To Find	Symbol	
LENGTH					
in.	inches	2.5	centimeters	cm	
ft	feet	30	centimeters	cm	
yd	yards	0.9	meters	m	
mi	miles	1.6	kilometers	km	
AREA					
in <sup>2</sup>	square inches	6.5	square centimeters	cm <sup>2</sup>	
ft <sup>2</sup>	square feet	0.09	square meters	m <sup>2</sup>	
yd <sup>2</sup>	square yards	0.8	square meters	m <sup>2</sup>	
mi <sup>2</sup>	square miles	2.6	square kilometers	km <sup>2</sup>	
	acres	0.4	hectares	ha	
WEIGHT					
oz	ounces	28	grams	g	
lb	pounds	0.45	kilograms	kg	
	short tons (2000 lb)	0.9	tonnes	t	
VOLUME					
tsp	teaspoons	5	milliliters	ml	
Tbsp	tablespoons	15	milliliters	ml	
fl oz	fluid ounces	30	milliliters	ml	
c	cups	0.24	liters	l	
pt	pints	0.47	liters	l	
qt	quarts	0.95	liters	l	
gal	gallons	3.8	liters	l	
ft <sup>3</sup>	cubic feet	0.03	cubic meters	m <sup>3</sup>	
yd <sup>3</sup>	cubic yards	0.76	cubic meters	m <sup>3</sup>	
TEMPERATURE					
Symbol	When You Know	Subtract	Multiply By	To Find	Symbol
°F	Fahrenheit	32	0.55	Celsius	°C

For approximate conversions from metric measures see table 1-3.

**Table 1-3. Approximate Conversions from Metric Measures.**

Symbol	When You Know	Multiply By	To Find	Symbol	
LENGTH					
mm	millimeters	0.04	inches	in.	
cm	centimeters	0.4	inches	in.	
m	meters	3.3	feet	ft	
m	meters	1.1	yards	yd	
km	kilometers	0.6	miles	mi	
AREA					
cm <sup>2</sup>	square centimeters	0.16	square inches	in <sup>2</sup>	
m <sup>2</sup>	square meters	1.2	square yards	yd <sup>2</sup>	
km <sup>2</sup>	square kilometers	0.4	square miles	mi <sup>2</sup>	
ha	hectares (10,000 m <sup>2</sup> )	2.5	acres		
WEIGHT					
g	grams	0.035	ounces	oz	
kg	kilograms	2.2	pounds	lb	
t	tonnes (1000 kg)	1.1	short tons		
VOLUME					
mL	milliliters	0.03	fluid ounces	fl oz	
L	liters	2.1	pints	pt	
L	liters	1.06	quarts	qt	
L	liters	0.26	gallons	gal	
m <sup>3</sup>	cubic meters	35	cubic feet	ft <sup>3</sup>	
m <sup>3</sup>	cubic meters	1.3	cubic yards	yd <sup>3</sup>	
TEMPERATURE					
Symbol	When You Know	Subtract	Multiply By	To Find	Symbol
°C	Celsius	1.8	32	Fahrenheit	°F

1.5 KEY TO ABBREVIATIONS AND SYMBOLS.

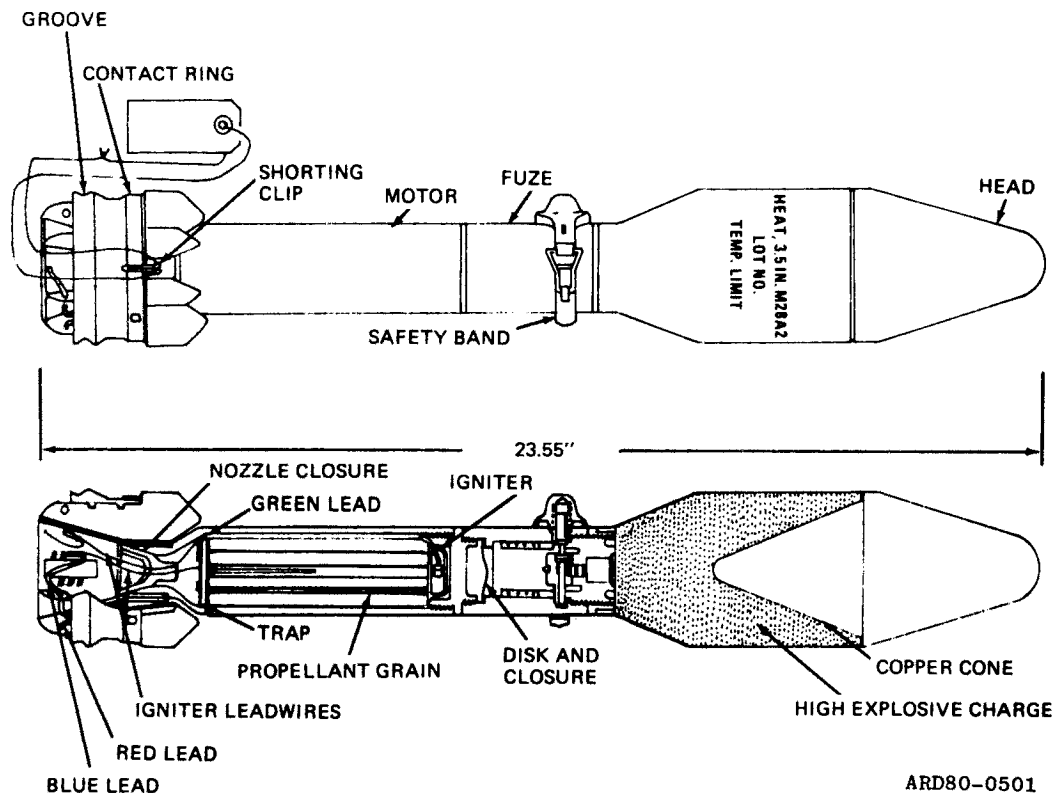
APERS .....	Antipersonnel	MPSM .....	Multipurpose submunitions
AR .....	Army Regulation	MS .....	Milliseconds
AT .....	Antitank	MT .....	Mechanical time
BD .....	Base detonating	MTSQ .....	Mechanical time and super-quick
BE .....	Base ejection	MV .....	Muzzle velocity
CP .....	Candle power	OBS .....	Obsolete
DA .....	Department of the Army	PD .....	Point detonating
DS .....	Discarding sabot	PDSQ .....	Point detonating super-quick
FM .....	Field manual	PI .....	Point initiating
FPS .....	Feet per second	PIBD .....	Point initiating, base detonating
FT .....	Feet	Prox .....	Proximity
G's .....	Force of Gravity	PWP .....	Plasticized white phosphorous
HE .....	High explosive	RAD .....	Ram air decelerator
HEAT-T-MP .....	High explosive antitank with tracer, multi- purpose	RAP .....	Rocket assisted projectile
HEDP .....	High explosive dual purpose	RC .....	Resistance capacitance
HEI .....	High explosive incendiary	RF .....	Radio frequency
HEP .....	High explosive plastic	RPS .....	Revolutions per second
HERA .....	High explosive, rocket assisted	S&A .....	Safety and arming device
HVAP .....	Hypervelocity, armor piercing	SC .....	Supply Catalog
HVTP .....	Hypervelocity, target practice	SD .....	Self destroying
Illum .....	Illuminating	Sec .....	Seconds
JATO .....	Jet assisted take off	SM .....	Supply Manual
LAW .....	Light antitank weapon	SQ .....	Super-quick
(LP)-T .....	Test (DODAC)	T .....	Time fuze or for training only
LSFFAR .....	Low-spin folding-fin aircraft rocket	-T .....	With tracer
Mod .....	Modified	TB .....	Technical Bulletin
mm .....	Millimeter	TM .....	Technical Manual
MPS .....	Meters per second	TP .....	Target practice
		TSQ .....	Time super-quick
		VX .....	Persistent toxic (casualty) nerve gas
		WP .....	White phosphorous

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CHAPTER 2  
GROUND ROCKETS

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ROCKET, HIGH-EXPLOSIVE, 3.5-INCH: AT, M28A2



Type Classification:

STD (LCC-B) OTCM 36841 Jul 58

Use:

The M28A2 HEAT rocket is used primarily against armored targets, tanks and secondary targets, such as gun emplacements, pillboxes and personnel. It is capable of penetrating heavy armor at angles of impact greater than 30°. In an antipersonnel role, it has a fragmentation area 10 yd wide and 20 yd deep.

Description:

a. The warhead is cylindrical and tapered. The forward end, called the ogive, is thin metal and hollow. The rear end, threaded internally to receive the fuze which is encircled by a safety band. The warhead contains a copper

cone whose apex faces aft and acts to shape the high explosive charge Composition B (Comp B).

b. The base detonating (BD) rocket fuze M404A2 consists of a body which contains the functioning parts; a safety band, a detonator and a booster pellet. The fuze body and safety band are olive drab. The fuze mechanism consists of an activating plunger, a setback spring, a setback sleeve, a firing pin assembly, a detent spring, an ejection pin and an ejection spring. The spring-loaded ejection pin passes through the fuze body.

c. The motor assembly consists of a tube which houses the propellant and igniter. The fin assembly is securely attached to this tube. The front end of the tube is assembled to the base of the fuze. The rear end forms a nozzle. The cylindrical motor cavity is divided into four



sections by two spacer plates which support the grains of propellant powder.

d. Each grain of propellant is 5-in. long and approximately 3/8-in. in diameter. Three grains are placed in each of the four sections formed by the spacer plates. Each lot of propellant is adjusted at the time of manufacture to give standard velocity. The igniter ignites the propellant.

e. The igniter consists of a short, cylindrical plastic case containing a small black powder charge and an electrical squib. It is assembled in the forward end of the motor on top of the propellant, spacer plates. The leads of the electrical squib, running parallel to the grains of propellant, pass from the igniter through the nozzle into the expansion cone. A green lead (ground) wire is connected to the aluminum support ring of the contact ring assembly. A red lead (positive) wire is attached to a pin which is insulated from the support ring, but is in contact with the copper contact band. These connections are positioned 180° apart. Blue lead is used for test purpose only.

f. The fin assembly consists of six aluminum alloy fins and a contact ring assembly. The contact ring assembly, which encircles the fins, consists of three rings. The aluminum support ring, which is innermost, is separated from the copper contact ring by a plastic insulating ring. The fins are spot welded to the expansion cone, and the expansion cone is press fitted to the rear of the motor tube. The M24 and the M66 off-route mines utilizing M28A2 HEAT rockets are described in TM 43-0001-36.

#### Differences between Models:

The BD rocket fuze M404A1 is similar to BD rocket fuze M404A2. The M404A1 differs principally in minor design changes of the functioning parts and the shape of the safety band.

#### Functioning:

a. When the safety band is removed, the ejection pin moves outward approximately 3/8 of an inch but still prevents all parts of the fuze mechanism from moving. When the rocket is in the firing chamber, the ejection pin is partially depressed by the chamber, thereby freeing the setback sleeve so it can move to the rear when the rocket is fired. The fuze is still safe, since the ejection pin prevents movement of the actuating sleeve and firing pin.

b. If it becomes necessary to remove the rocket from the launcher, the ejection pin will move outward and re-engage the setback sleeve. This returns the fuze to its original safe condition.

c. When the rocket is fired, the force of inertia causes the setback sleeve to move rearward. It is held in its rearward position by the lockpin. When the rocket leaves the muzzle of the launcher, the ejection pin is thrown clear of the fuze by the ejection pin spring. The fuze is then fully armed.

d. During flight, the firing pin lever and firing pin spring prevent the firing pin from striking the detonator. The creep spring retards the forward movement of the plunger and actuating sleeve. The action of the creep spring prevents the fuze from firing should the rocket strike light objects such as thin brush or undergrowth.

e. Upon impact with a more resistant object, the plunger and actuating sleeve move forward until the sleeve hits the firing pin lever. This causes the firing pin to strike and detonate the warhead.

Tabulated Data:

Rocket:

Model - - - - - M28A2  
 Type - - - - - Service  
 Diameter - - - - 3.5 in.  
 Length (max) - - 23.55 in.  
 Weight - - - - - 9.00 lb

Performance:

Operating temperature limits - - - - -  
 -20° to + 120°F  
 (-28. 6 to +48.4C)

Muzzle velocity (at 70°F) (approx) - - - - 325 ft/sec  
 (99 reps)

Warhead:

Type - - - - - HEAT  
 Body - - - - - Steel  
 Color - - - - - Olive drab w/yellow markings  
 Diameter - - - - 3, 5 in.  
 Length - - - - - 10.5 in.  
 Weight - - - - - 4.47 lb

High-explosive train:

Detonator - - - - M41  
 Booster (tetryl) - - - - 0.17 oz (4.81 g)  
 Filler (warhead) Type - - - - - Comp B  
 weight (approx) - - - - 1.88 lb (.854 kg)

Fuze:

Model - - - - - M404A1 or M404A2  
 Type - - - - - Base detonating  
 Diameter - - - - 2.0 in.

Length:

Overall - - - - 3.48 in.  
 To shoulder (max) - - - - - 2.94 in.  
 Weight - - - - - 1.16 lb  
 Arming distance - - - - - 10 ft (3.05 m)

Motor:

Diameter (at fins) - - - - - 3.5 in.  
 Length - - - - - 10.41  
 Weight - - - - - 3.30 lb  
 Thrust - - - - - 6,000-10,000 lb

Propelling initiating train:

Igniter:

Model - - - - - M20A1  
 Charge (black powder) - - - - 0.13±0.007  
 (3.5±.2 g)

Electric squab - - - - - M2

Propelling charge:

Propellant:

Model - - - - - M7  
 Type - - - - - Solvent  
 Configuration - Monoperforated, cylindrical, extruded grains (12)  
 Weight - - - - - 0.44 lb (198 g)  
 Burning time:  
 At -20°F - - - - 0.05 sec  
 At +120°F - - - - 0.02 sec

Launchers - - - - - M20, M20A1, M20A1B1, M20B1

Packing - - - - - 1 per metal/fiber container, 3 containers per wooden box

Box:

Weight (with contents) - - - - 53.0 lb

Dimensions:

W/metal

container - - - 29-9/16 in. x  
14-1/16 in. x  
16-19/32 in.

W/fiber

container - - - 29-3/16 in. x  
13-7/8 in. x  
16-19/32 in.

Cube:

W/metal

container - - - - 1.6ft<sup>3</sup>

W/fiber

container - - - - 1.5ft<sup>3</sup>

DODAC - - - - - 1340-H600

Shipping and storage data:

Storage class/

SCG - - - - - 1.1E

DOT shipping

class - - - - - A

DOT designation - ROCKET AMMUNI-  
TION WITH EXPLO-  
SIVE PROJECTILES

Field storage -- Group E

Drawings:

Complete assy - -9211744 (82-6-22)

Loading assy

(head) - - - - - 82-16-36

Loading assy

(motor) - - - - -9225502 (82-16-35)

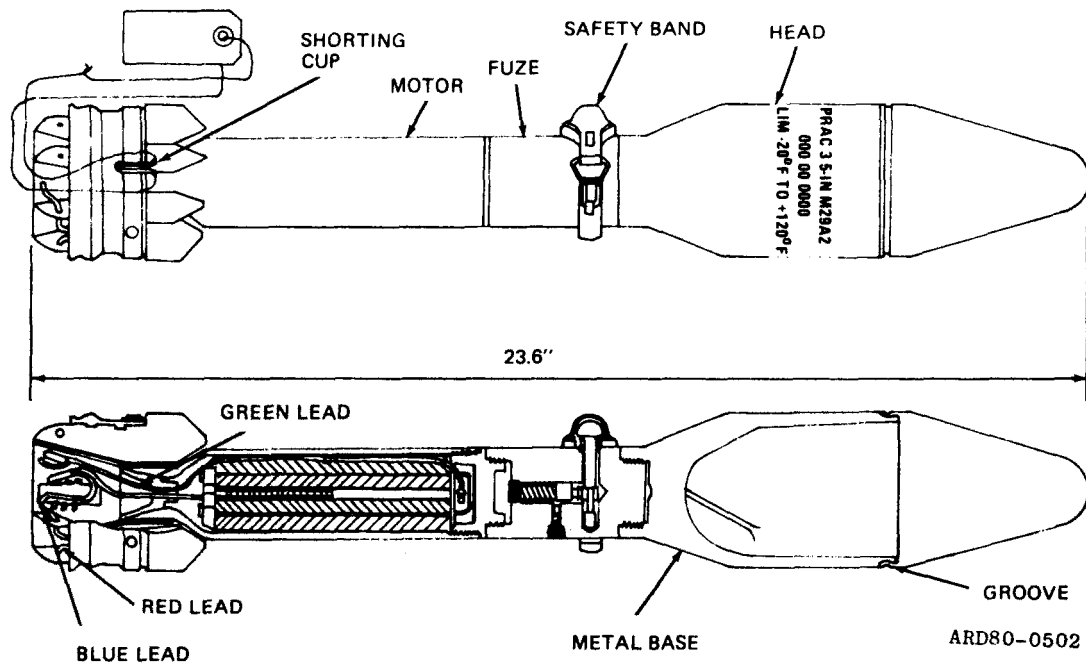
Packing (inner)- -7549038

Packing (outer)- -7549040

References:

TM 9-1340-222-34

ROCKET, PRACTICE, 3. 5-INCH M29A2



Type Classification:

STD (LLC-B) AMCTCM 36841 (M29A2)

Use:

For training personnel in use, care and handling of service rockets.

Description:

**a.** The warhead is completely inert. The practice rockets can be fired at buttoned-up, modified target tanks without danger to tank crews. The practice rockets have the same flight characteristics as the HEAT rocket.

**b.** The dummy fuze rocket M405 which series as a coupling for the warhead and motor, is cylindrical. It is threaded externally at the forward end to fit into the

warhead assembly, and internally at the rear end to receive the motor assembly. A safety band fits around the seals and fuze. This fuze incorporates a double-locking, bore-riding, round ejection pin assembly simulating that used in base detonating (BD) fuze M404A2. The body of the fuze and the safety band are painted blue.

**c.** The motor assembly consists of a tube which houses the propellant and igniter. The fin assembly is securely attached to this tube. The front end of the tube is assembled to the base of the fuze. The rear end forms a nozzle. The cylindrical motor cavity is divided into four sections by two spacer plates which support the grains of propellant powder.

**d.** Each grain of propellant is 5-in. long and approximately 3/8-in. in

diameter. Three grains are placed in each of the four sections formed by the spacer plates. Each lot of propellant is adjusted at the time of manufacture to give standard velocity. The igniter ignites the propellant.

**e.** The igniter consists of a short, cylindrical plastic case containing a small black powder charge and an electrical squib. It is assembled in the forward end of the motor on top of the propellant spacer plates. The leads of the electrical squib, running parallel to the grains of propellant, pass from the igniter through the nozzle into the expansion cone. A green lead (ground) wire is connected to the aluminum support ring of the contact ring assembly. A red lead (positive) wire is attached to a pin which is insulated from the support ring, but is in contact with the copper contact band. These connections are positioned 180° apart. Blue lead is used for test purpose only.

**f.** The fin assembly consists of six aluminum alloy fins and a contact ring assembly. The contact ring assembly, which encircles the fins, consists of three rings. An aluminum support ring, which is innermost, is separated from the copper contact ring by a plastic insulating ring. The fins are spot welded to the expansion cone; the expansion cone is press-fitted to the rear of the motor tube.

Differences between Models:

**a.** The M29A1 and M29A2 rockets are similar in appearance to the M28A2. The M29 series differ in that they have a crimping groove at the juncture of the warhead body and ogive. The rockets of an early manufacture are assembled with M28A2 rocket warhead metal parts inert loaded with plaster of paris.

**b.** The M29A1 warhead differs from the M29A2 warhead in the head and trap and

spacer assembly. The ogive is attached to the head body of four screws staked to the ogive. Some rockets may have the cast trap and square spacer blades.

The warhead being inert, no functions occur when the rocket is fired. The rocket is strictly for training purpose.

Tabulated Data:

Rocket:

Model	-----	M29A2
Type	-----	Practice
Diameter	----	3.5 in.
Length (max)	--	23.6 in.
Weight (approx)	-----	9.00 lb
Performance:		
Operating temperature limits-	-----	-20° to +120°F (-28.6 to +48.4°C)
Muzzle velocity (at 70°F, approx)	-----	334 fps (101.9 reps)
Range (max, approx)	-----	945 yd (863.7 m)

Warhead:

Type	-----	Inert
Body	-----	Cast iron
Color	-----	Blue w/white markings
Diameter	----	3.5 in.
Length	-----	10.5 in.
Weight	-----	4.47 lb

Fuze:

Model	-----	M405A2
Type	-----	Dummy
Diameter	----	2.0 in.

Length:

Overall	-----	3.42 in.
to shoulder (max)	-----	2.94 in.

Weight	-----	1.01 lb
--------	-------	---------

Motor:

Diameter (at  
fins) - - - - - 3.5 in.  
Length - - - - - 10.41 in.  
Weight - - - - - 3.30 lb  
Thrust - - - - - 6,000 to 10,000 lbs

Box:

Weight (with  
contents) - - - - 53.0 lb  
Dimensions:  
W/metal  
container - - - 29-9/16 in. x 14-1/16  
in. x 6-19/32 in.

Propellant initiating  
train:

Igniter:  
Model - - - - - M20A1  
Charge (black  
powder) - - - - 0.125 ± 0.007 oz  
3.54 ± 2 g)  
Electrical  
squib - - - - - M2

W/fiber

container - - - 29-3/16 in. x 13-7/8  
in. x 6-19/32 in.

Propelling charge:

Propellant:  
Model, - - - - - M7  
Type - - - - - Solvent  
Configuration- Monoperforated, cylin-  
drical extruded grains  
(12)  
Weight (new  
type) - - - - - 0.44 lb (200 g)  
Burning time:  
At -20°F - - - 0.05 sec  
At +120°F - - 0.02 sec

Cube:

W/metal  
container - - - - 1.6 ft<sup>3</sup>  
W/fiber  
container - - - - 1.5 ft<sup>3</sup>

Shipping and storage data:

Storage class/  
SCG - - - - - 1.2C (12)  
DOT shipping  
class - - - - - B  
DOT  
designation - - - ROCKET AMMUNI-  
TION WITH EMPTY  
PROJECTILES

Field storage- - Group C

DODAC - - - - - 1340-H601

Drawings:

Complete assy - 82-6-23  
Loading assy -- 82-6-23  
Fuze - - - - - Dummy 72-5-16  
Packing (inner)- 7549038  
Packing (outer)- 7549040

Launchers:

M29A2 - - - - - M20, M20A1,  
M20A1B1, M20B1  
M29A1 - - - - - M20, M20B1

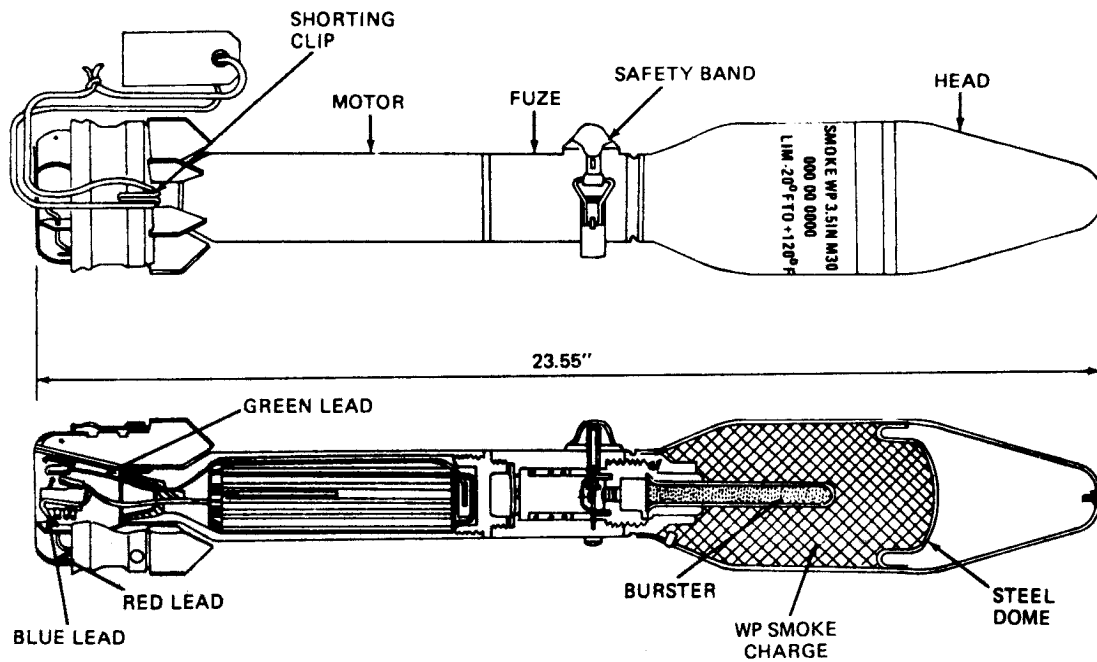
References:

TM 9-1340-222-20  
TM 9-1340-222-34

Packing - - - - - 1 per metal/fiber  
container; 3 con-  
tainers per wooden  
box

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ROCKET, GROUND: 3.5-INCH SMOKE (WP) M30



Type Classification:

(obsolete) was AMCTCM STD (LCC-B)  
36841 Jul 58

Use:

The 3.5-in. white phosphorous (WP), M30 smoke rocket is intended for smoke screening purposes.

Description:

**a.** Smoke rocket, 3.5-in. WP, M30 is fired in the same manner as rocket M28A2. On impact, the rocket bursts to produce a spray of phosphorous particles. These ignite on contact with air, generating dense white smoke. The smoke itself is harmless, but the burning particles produce painful burns. In external contour, the rocket is similar to the M28A2. Rocket M30 consists

of the WP smoke warhead, base detonating (BD) fuze M404A1 or M404A2, and the service motor assembly.

**b.** Rocket fuze BD M404A2 consists of a body which contains the functioning parts; a safety band, a detonator and a booster pellet. The fuze body and safety band are olive drab. The fuze mechanism consists of an activating plunger, a setback spring, a setback sleeve, a firing pin assembly, a detent spring, an ejection pin and an ejection spring. The spring-loaded ejection pin passes through the fuze body.

**c.** The motor assembly consists of a tube which houses the propellant and igniter. The fin assembly is securely attached to this tube. The front end of the tube is assembled to the base of the fuze, The rear end forms a nozzle. The cylindrical motor cavity is divided into four



sections by two spacer plates which support the grains of propellant powder.

d. Each grain of propellant is 5-in. long and approximately 3/8-in. in diameter. Three grains are placed in each of the four sections formed by the spacer plates. Each lot of propellant is adjusted at the time of manufacture to give standard velocity. The igniter ignites the propellant.

e. The igniter consists of a short, cylindrical plastic case containing a small black powder charge and an electrical squib. It is assembled in the forward end of the motor on top of the propellant spacer plates. The leads of the electrical squib, running parallel to the grains of propellant, pass from the igniter through the nozzle into the expansion cone. A green lead (ground) wire is connected to the aluminum support ring of the contact ring assembly. A red lead (positive) wire is attached to a pin which is insulated from the support ring, but is in contact with the copper contact band. These connections are positioned 180° apart. Blue lead is used for test purpose only.

f. The fin assembly consists of six aluminum alloy fins and a contact ring assembly. The contact ring assembly, which encircles the fins, consists of three rings. An aluminum support ring, which is innermost, is separated from the copper contact ring by a plastic insulating ring. The fins are spot welded to the expansion cone, and the expansion cone is press fitted to the rear of the motor tube.

#### Differences between Models:

a. This warhead is generally similar to that of rocket M28A2, except that it has a charge of white phosphorous (WP). At the rear, it has a union internally threaded to receive the fuze. The burster casing (M8)

is press-fitted into the union, and the steel body is fitted over it. The steel ogive and the internal steel dome, which closes the forward end of the filler cavity are attached to the body.

b. This fuze is similar to BD rocket fuze M404A2. The M404A1 differs principally in minor design changes of the functioning parts and the shape of the safety band.

#### Functioning:

a. When the safety band is removed, the injection pin moves outward approximately 3/8 of an inch but still prevents all parts of the fuze mechanism from moving. When the rocket is in the firing chamber, the ejection pin is partially depressed by the chamber, thereby freeing the setback sleeve so it can move to the rear when the rocket is fired.

b. The fuze is still safe, since the ejection pin prevents movement of the actuating sleeve and firing pin.

c. If it becomes necessary to remove the rocket from the launcher, the ejection pin will move outward and re-engage the setback sleeve. This returns the fuze to its original safe condition.

d. When the rocket is fired, the force of inertia causes the setback sleeve to move rearward. It is held in its rearward position by the lockpin. When the rocket leaves the muzzle of the launcher, the ejection pin is thrown clear of the fuze by the ejection pin spring. The fuze is then fully armed.

e. During flight, the firing pin lever and firing pin spring prevent the firing pin from striking the detonator. The creep

spring retards the forward movement of the plunger and actuating sleeve. The action of the creep spring prevents the fuze from firing should the rocket strike light objects such as thin brush or undergrowth.

f. Upon impact with a more resistant object, the plunger and actuating sleeve move forward until the sleeve hits the firing pin lever. This causes the firing pin to strike and detonate the burster.

Tabulated Data:

Rocket:

Model - - - - - M30  
 DODAC - - - - - 1340-H602  
 Assy drawing- - 82-6-26  
 Type - - - - - Smoke  
 Diameter - - - - 3.5 in.  
 Length (max) - - 23.55 in.  
 Weight (approx)- 9.00 lb  
 Performance:  
 Operating temperature limits - - - - -20° to +120°F (-28.6° to +48.4°C)  
 Muzzle velocity (at 70°F, approx) - - - - 317 fps (96.7 mps)  
 Range (max, approx) - - - - 945 yd (863.7 m)

Warhead:

Type - - - - - Chemical  
 Body - - - - - Steel  
 Color - - - - - Gray w/yellow markings  
 Diameter - - - - 3.45 in.  
 Length - - - - - 10.6 in.  
 Weight - - - - - 4.47 lb

High-explosive train:

Detonator - - - - M41  
 Booster (tetryl) - - - - 0.1702 (4.81 g)  
 Type - - - - - WP  
 Weight (approx)- 2.23 lb (1.01 kg)

Fuze:

Model - - - M404A1 or M404A2  
 Type - - - - BD

Motor:

Diameter (at fins) - - - 3.5 in.  
 Length - - - - 10.41 in.  
 Weight - - - - 3.30 lb  
 Thrust - - - - 6,000 to 10,000 lb

Propelling initiating train:

Igniter:

Model - - - M20A1  
 Charge (black powder) - - 0.125 ± 0.00702 (3.54 ± .2 g)

Electric squib - - - - M2

Propelling charge:

Propellant:

Model - - - M7  
 Type - - - - Solvent  
 Configuration - - - - Monoperforated, cylindrical, extruded grains (12)

Weight (new type) - - - - 0.44 lb (200 g)

Burning time:

At -20°F - 0.05 see  
 At +120°F - 0.02 sec

Launchers - - - - M20, M20A1, M20A1B1, M20B1

Packing - - - - 1 per metal/fiber container; 3 containers per wooden box

Box:

Weight (with contents) - - - 53.0 lb  
 Dimensions: W/metal container - 29-9/16 in. x 14-1/16 in. x 6-19/32 in.

W/fiber  
container - - - 29-3/16in. x 13-7/8  
in. x 6-19/32 in.

Field storage - - Group H  
DODAC - - - - - 1340-H602

Cube:

W/metal  
container - - - - 1.6 ft<sup>3</sup>

W/fiber  
container - - - - 1.5 ft<sup>3</sup>

Shipping and storage data:

Storage Class/  
SCG - - - - - 1.2H (12)

DOT shipping  
class - - - - - A

DOT ROCKET AMMUNITION  
designation - - - WITH SMOKE  
PROJECTILES

Drawings:

Complete  
assembly - - - - 82-6-26

Loading  
assembly - - - - 82-16-39

Fuze (M404A2,  
type BD) - - - - 9209515

Packing (inner) -7549038

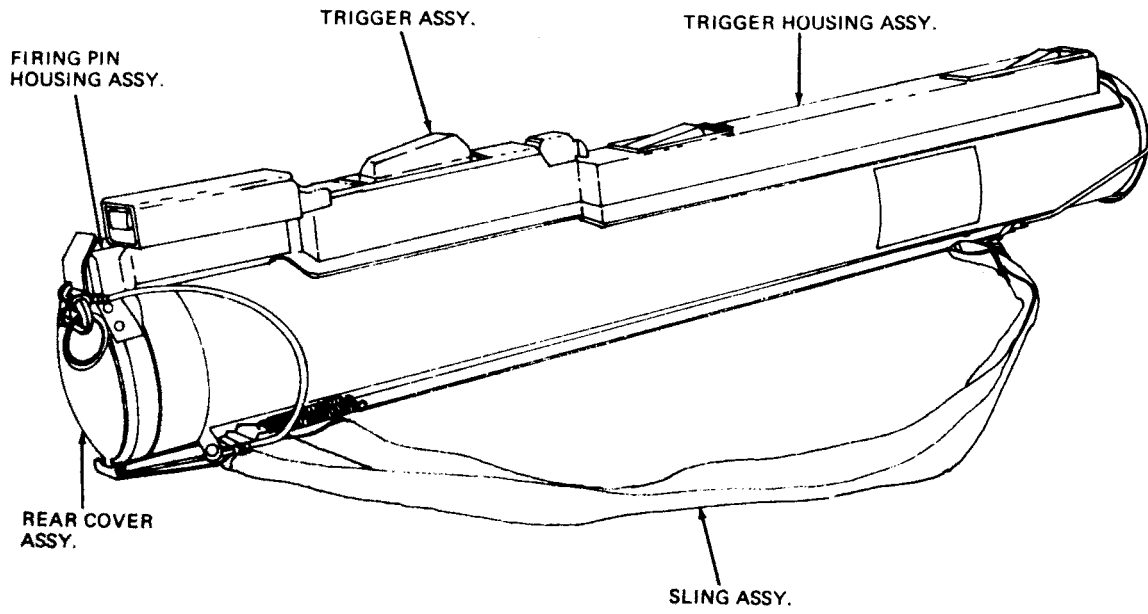
Packing (outer) -7549040

References:

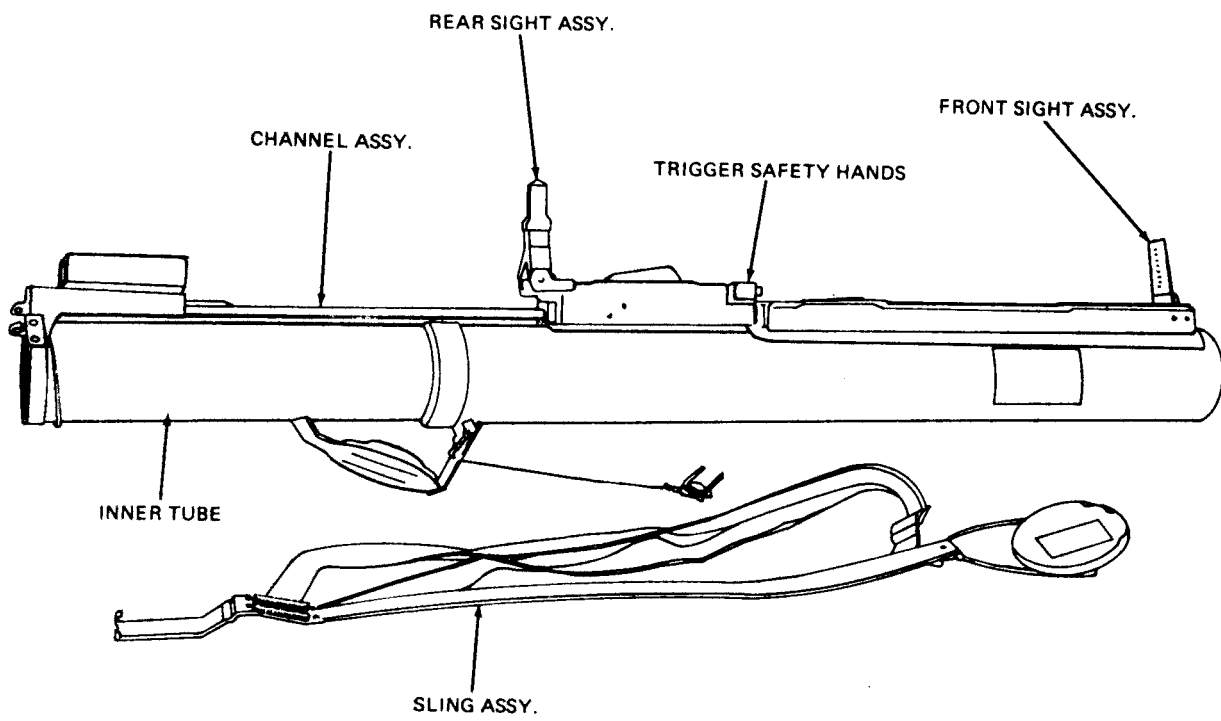
TM 9-1340-222-20

TM 9-1340-222-34

LIGHT ANTITANK WEAPON (LAW) SYSTEM M72 SERIES



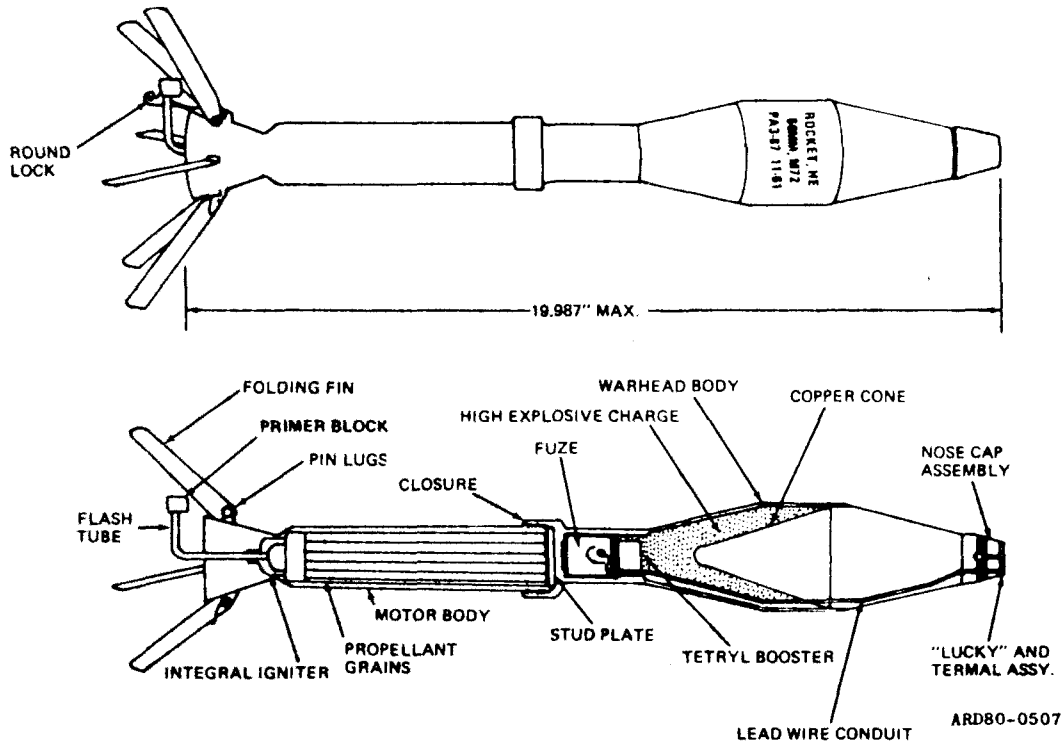
ARD80-0504A



ARD80-0504B

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ROCKET, HEAT, 66 MM, M72, M72A1, M72A2, AND M72A3



Type Classification:

- M72 & M72A1 OBS-MSR-05806019.
- M72A2 - STD LCC-B-MSR-09806022.
- M72A3-STD LCC-A-MSR-09806021.

Use:

Primarily for penetration of armored targets. It may be used effectively against bunkers and other light field of fortifications.

- a. Launcher.
- b. Rocket.

Description:

a. The packaged compact portable weapon issued as a single shot shoulder-fired launcher with a HEAT rocket and sling assembly. The rocket launcher is a tubular, telescoping, smooth-bore, open-breech

type weapon. The outer (front) tube is made of plastic, impregnated fiberglass; the inner (rear tube) is made of aluminum. The inner tube is oriented with respect to the outer tube by the channel assembly, which rides in an alignment slot in the trigger housing assembly. The tubes are locked in the open position when the detent assembly drops into the rectangular hole in the trigger housing assembly.

b. The fin stabilized rocket in this system contains a shaped charge warhead with a point initiating base detonating (PIBD) fuze. The fuze contains a 2-wire system from the piezo electric element on the warhead to the fuze detonator which provides electrical fuze initiation when the nose crystal is struck. In addition, the fuze has a mechanical inertial graze element as a secondary means of functioning.

Differences between Models:

The M72A2 rocket is similar to the M72A1 with the exception of the warhead which contains a precision shaped charge liner cone. This provides greater target penetration than the M72A1. There is also a minor change in the wiring between the piezo electric element and fuze, otherwise the two systems are identical. The M72A3 is similar to M72A2.

WARNING

WEAR EAR PLUGS WHEN FIRING THE WEAPON. THE 100 AND 150 METER MARKINGS ON THE FRONT SIGHT ARE COATED WITH RADIOACTIVE MATERIAL, THEN LAMINATED BETWEEN TWO SHEETS OF PLASTIC. IF SIGHT IS BROKEN, REMOVE AND PLACE IN A PLASTIC SEALED BAG. RETURN BAG TO AMMUNITION DISPOSAL PERSONNEL.

NOTE

The front sight on these launchers, up to and including the M72A2 series weapon, is designed for use under conditions of limited visibility and is coated with a radioactive material (Promethium 147) at the 100 and 150 meter marks. On the weapons with this limited light sight the 100 and 150 meter marks are white, the remaining markings are red. On weapons without this feature, all markings on the sight are in red. The M72A3 series weapons do not have this radioactive sight feature.

Functioning:

a. Extending the launcher into the extended or firing position automatically locks the weapon.

b. After the trigger safety handle is released, the trigger is depressed. This releases the channel assembly which drives the firing pin into the primer of the rocket motor igniter. This ignites the black powder in the flash tube, which in turn, ignites the integral igniter of the rocket motor. The igniter initiates the propellant. The burning propellant propels the rocket from the launcher.

c. Upon target impact, the fuze train detonates the charge which collapses the copper liner into a finger shaped jet. The jet is preceded by extremely hot, high velocity gases which melt a hole in the target. The copper jet then penetrates into the target. Almost simultaneously the body and ogive are blasted into small fragments by the detonated octol charge. These fragments travel adjacent to, and aft of the line of fire.

Tabulated Data:

LAW systems (packaged):

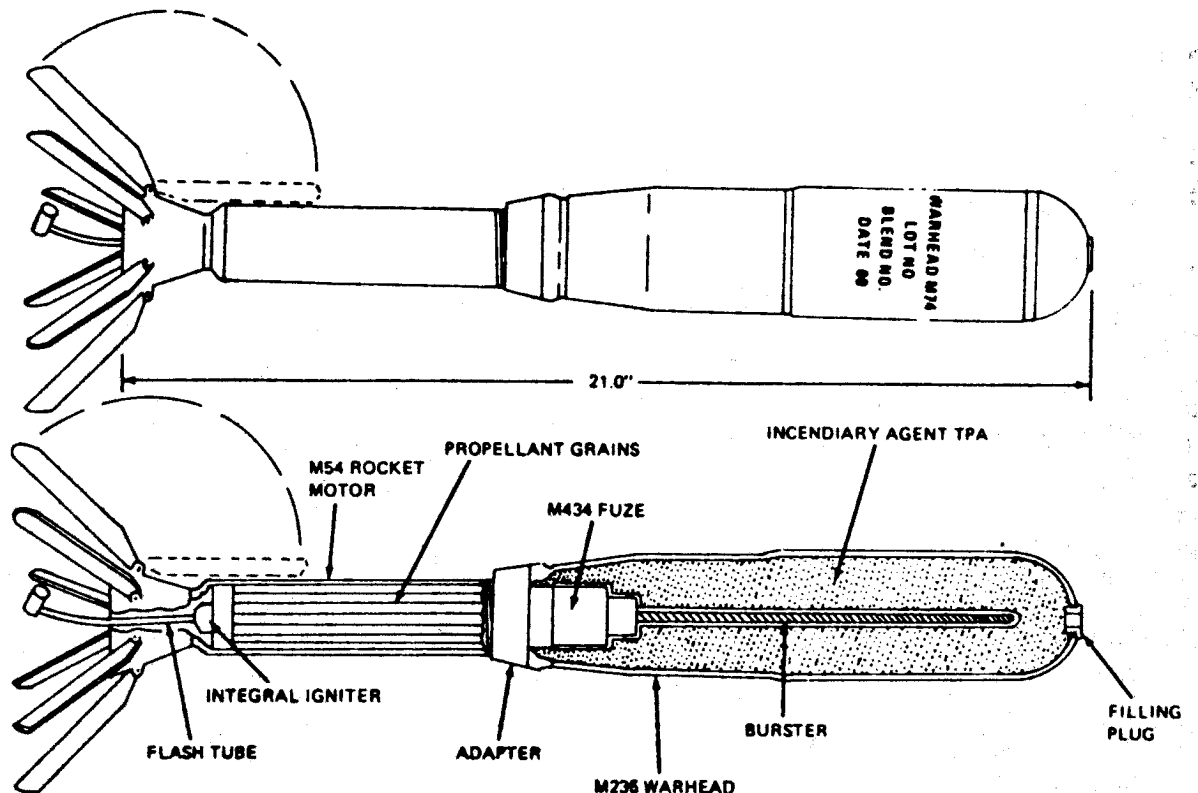
Models	-----	M72A2
Weight	-----	4.7 lb
Length:		
Closed		
position	-	25.77 in.
Extended		
position	-	35.16 in.
Launcher	---	M72
Weight	---	2.50 lb
Rocket	-----	M72
Warhead	--	M18A1
Fuze	-----	M412A1
Motor	----	M54

Warheads:		Packing box:	
Weight (loaded and fuzed) ---	2.3 lb	Weight	
Explosive charge:		w/contents ----	117.7 lb
Type -----	60/40 octol	Dimensions ----	33-1/2 in. x
Weight -----	0.67 lb (304 g)		31-1/8 in. x
Body material -	Steel w/aluminum		13-3/4 in.
	ogive	Cube ----	8.3 ft <sup>3</sup>
Color -----	Black w/yellow markings	Shipping and storage data:	
Fuzes (integral):		Storage class/	
Type -----	Point-initiating, base detonating	-----	1.1E
Weight -----	0.154 lb	DOT shipping class -----	A
Overall length (max) -----	1.89 in.	DOT designation ---	ROCKET AMMUNITION WITH EXPLOSIVE PROJECTILE
Diameter (max) -----	1.28 in.	Field storage -	Group E
Explosive booster:		*DODAC -----	1340-H553, 1340-H554, 1340-H555, 1340-H557, and 1340-H568
Type -----	Composition A5 (tetryl)	Drawings:	
Weight -----	0.200z (5.6g)	Complete assembly -----	10048503-M72 9210276-M72A1 9244054-M72A2
Arming distance -----	25 - 45 ft (7.6-13.7m)	Loading -----	9235663
Motor:		Packing (inner) -	9227925
weight -----	0.67 lb	Packing (outer) -	9227926
Propellant:		References:	
Model -----	M7	SC 1340/98-IL	TM9-1340-214-10
Type -----	Double base	TM 9-1340-222-20	FM 23-33
Weight -----	0.138 lb (62.7g)	TM 9-1340-222-34	
Configuration -----	Stick		
Number -----	19		
Velocity -----	475 fps (145 reps)		
Thrust at 70°F -----	4250 lb		
Burning time -	7 to 15 milliseconds		
Temperature limits -----	-40° to +140°F (-39.6° to 59.4°C)	*See appropriate supply catalog for individual NSN'S pertaining to this (these) DODAC(s).	
Packing of rocket in launcher -----	5 per carton; 1 carton per barrier bag; 3 barrier bags per wooden box		



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ROCKET, INCENDIARY, 66MM: TPA, M74



ARD80-0505

Type Classification:

STD (LCC-A) AMCTCM 9018 March 72

Use:

The M74 incendiary thickened triethyl aluminum (TPA) is used to defeat or neutralize hard, soft, or jungle targets.

Description:

The M74 consists of a rocket warhead containing approximately 1.3 pounds of TPA, a base detonating (BD) fuze and an adapter which adapts the rocket motor to the warhead. The rockets are issued in four round clips.

Functioning:

When the projectile is fired, acceleration acts upon the fuze sequential leaf arming mechanism. The fuze rotor assembly is then free to rotate to the armed position. When the rotor is in the armed position, the detonator is aligned with the remainder of the explosive train. Rocket deceleration, due to impact, causes the graze element of the fuze to shift, thereby allowing the firing pin of the fuze to be driven into the primer. The primer flashes through the flash channel and initiates the detonator, then the trademark in the warhead; disseminating the warhead agent.

Tabulated Data:

Rocket:

Model - - - - - M74  
 Type - - - - - Incendiary  
 Length - - - - - 21.0 in.  
 Weight (approx) - - 2.95 lb

Performance:

Operating temper -  
 ature limits - - - - -40' to +140°F  
 (-39. 6° to 59. 4°C)  
 Range (rmax) - - - - 825 yd (754 m)  
 Range (rein) - - - - 22 yd (20 m)  
 (hard targets)  
 Muzzle velocity  
 (approx) - - - - - 375 ft/sec

Burst radius  
 (approx) - - - - - 65. 5 ft (20 m)

Motor:

Model - - - - - M54  
 Length - - - - - 9.2 in.  
 Weight - - - - - 0.67 lb  
 Thrust - - - - - 4250 lb

Propellant initiating  
 train:

Igniter:

Model - - - - - M56  
 Type - - - - - Integral

Propelling charge:

Propellant - - - - - M7  
 Type - - - - - Solvent  
 Configuration - - - Monoperforated cyl-  
 indrical extruded  
 grains (19)  
 Weight - - - - - 0.138 lb  
 Burning time - - - 7 to 15 milliseconds

Launcher - - - - - M202A1

Packing - - - - - Four per clip

Warhead:

Model - - - - - M235  
 Type - - - - - Incendiary  
 Color - - - - - Red w/yellow band  
 and black markings

Length - - - - - 11.60 in.

Filler (warhead):

Type - - - - - Triethylaluminum  
 PyroPhoric (TPA)  
 Weight - - - - - 1.3 lb (0.59 kg)

Fuze:

Model - - - - - M434  
 Type - - - - - Base detonating

DODAC - - - - - 1340-H110

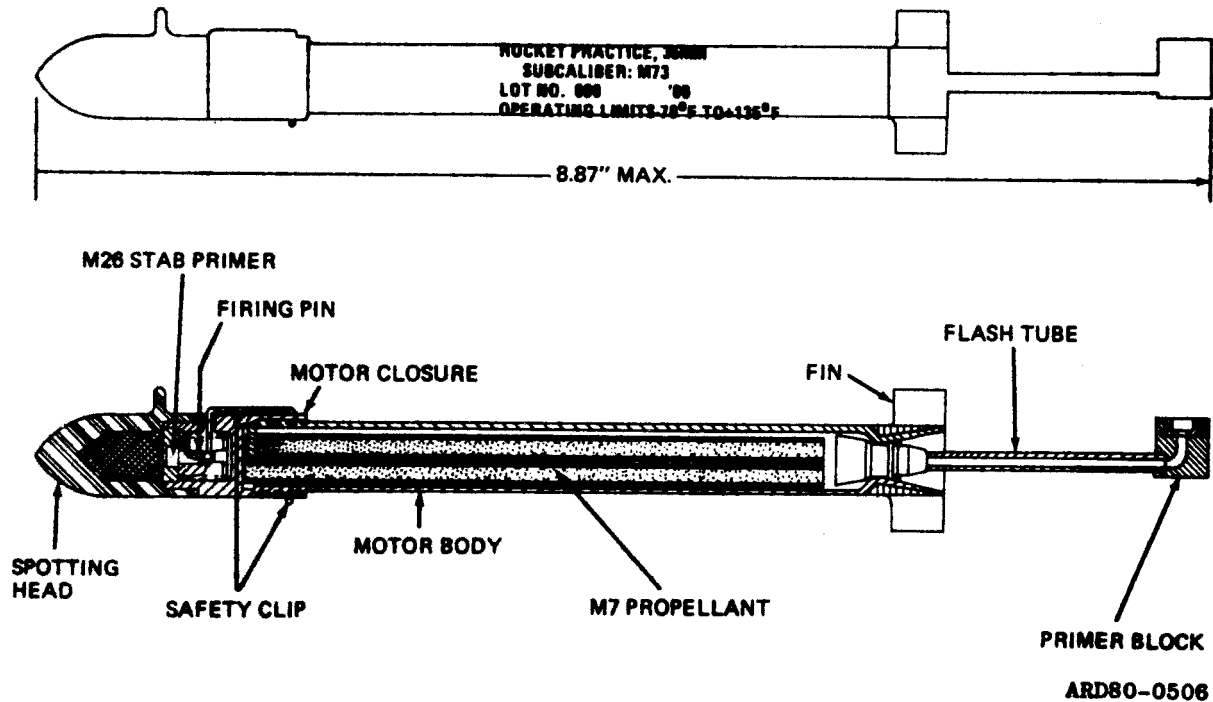
Shipping and storage  
 data:

Storage class/  
 SCG - - - - - 1.2L (12)  
 DOT shipping  
 class - - - - - A  
 DOT  
 designation - - - - - ROCKET  
 AMMUNITION  
 WITH INCENDIARY  
 PROJECTILE  
 Field storage - - - Group D

References:

TM 3-1055-218-12  
 TM 3-1055-456-12  
 Information on M196, four tube-CS  
 clips used in the M1202A1 launcher.

ROCKET, PRACTICE, 35 MM, SUBCALIBER, M73



Type Classification:

STD (LCC-A) AMCTCM 7617 April 70

Use:

To train personnel in the operation and use of the 66-mm antitank rocket, M72 series.

Description:

a. The M190 subcaliber launcher with M73 subcaliber rocket can be used against all solid stationary or moving targets.

Together they can be used in all training phases, from fixed firing live to simulated situations, such as a "trainfire" type operation.

b. The M190 subcaliber launcher is a tubular, telescoping, smooth-bore, open-breech weapon.

c. The M73 subcaliber rocket consists of a spotting head, a motor closure, a rocket motor and an igniter assembly. The spotting head contains the same flash composition used in the M80 explosive simulator (TM 9-1370-203-34&P) to assist in locating

the fired rocket. The forward end of the motor closure provides a cavity that contains a base detonating fuze and a primer. The motor case contains tubular grains or propellant. The rocket is stabilized by six molded, plastic fins.

Differences between Models:

The external appearance of the M190 subcaliber is almost identical to the M72A1. The M190 differs from the tactical launcher M72A1 by having a subcaliber rocket and a quick release primer housing door to simplify reloading. The used M72A1 launcher is modified by use of a conversion kit to produce the M190 subcaliber launcher.

Functioning:

Extending the launcher into the extended or firing position automatically locks the weapon. After the trigger safety handle is released, the trigger can be depressed. This releases the channel assembly which drives the firing pin into the primer of the rocket motor igniter. This ignites the black powder in the flash tube, which, in turn, ignites the integral igniter of the rocket motor. The igniter initiates the propellant. The burning propellant propels the rocket from the launcher. When the spotting head of the rocket strikes a target, an inertia-driven firing pin sets off the primer. The primer in turn sets off the spotting head which produces a flash, noise and white smoke.

Tabulated Data:

Rocket:

Model - - - - - M73  
 Type - - - - - Practice  
 Weight - - - - - 0.321b  
 Length - - - - - 8.87 in.

Diameter - - - - - 1.37 in.  
 Head:  
 Material - - - - - Plastic  
 Type - - - - - Spotting  
 Charge:  
 Flash  
 composition - - 0.05oz (1.41g)  
 Color - - - - - Black  
 Motor - - - - - Steel  
 Type of propellant:  
 Model - - - - - M7  
 Type - - - - - Double base  
 Weight - - - - - 0.02 lb (9 g)  
 Configuration - - - Stick  
 Number - - - - - 3  
 Fuze - - - - - Integral, base  
 detonating  
 Primer - - - - - Stab, M26  
 Velocity at 70°F- 497 fps  
 Burning time  
 (max) - - - - - 12 milliseconds  
 Range - - - - - (55-354 yd)  
 (50-325 m)  
 Temperature limits:  
 Firing - - - - - -10° to +135°F  
 (-23. 1° to +56. 65°C)  
 Storage - - - - - -40° to +140°F  
 (-39. 6° to +59. 4°C)  
 Launcher - - - - - M190  
 Packing - - - - - 30 per fiber container;  
 3 containers per wooden box  
 Packing box:  
 Weight w/contents- 58.8 lb (26, 460 g)  
 Dimensions - - - - 32-3/4 in. x 13-1/4  
 in. x 15-7/8 in.  
 Cube - - - - - 4.0 ft<sup>3</sup>

Shipping and storage data:

Storage class/  
 SCG - - - - - 1.2E (04)  
 Dot shipping  
 class - - - - - A

DOT designation ----- ROCKET AMMU-  
 NITION WITH  
 EXPLOSIVE  
 PROJECTILE

\*DODAC ----- 1340-H708

Drawings:

Complete assy ----- 10242725  
 Loading assy ----- 10242725  
 Packing (inner) ----- 10242743  
 Packing (outer) ----- 10242697

Information on SLUFAE mine neutral-  
 izing rockets, 115MM GB and VX  
 rockets and the VIPER HEAT Rocket,

References:

SC 1340/98-IL  
 TM 9-1340-203-20

\*See appropriate supply catalog for  
 individual NSN'S pertaining to this  
 (these) DODAC(S).

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**CHAPTER 3**  
**AIRCRAFT ROCKETS**  
**2.75-Inch**

**Complete Rounds:**

**a.** Complete rounds can be assembled in the combinations in table 3-1. They may be fired from the M157, M158, M159C, M3 or M200 2.75-Inch

**Aircraft Rocket Launchers.**

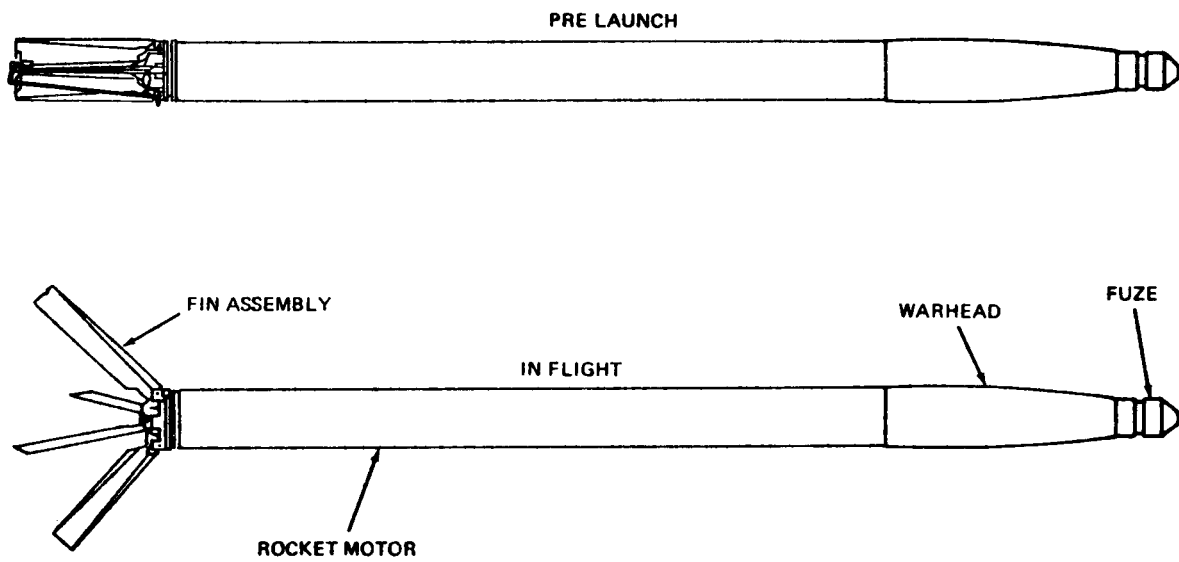
**b.** The rockets can be issued unassembled. This chapter contains information pertaining to the components of the unassembled rockets.

**Table 3-1. 2.75-Inch Complete Round Rocket Combinations**

<u>DODAC</u>	<u>Warhead</u>	<u>Motor</u>	<u>Fuze</u>
1340-H459	Flechette (ANTIPERSONNEL) WDU/4A/A High Explosive M151	Mk40, Mod 3	Integral
1340-H470		Mk4, Mods	M427
1340-H471		Mk40, Mod 3	M433
1340-H489		Mk40, Mod 3	M429
1340-H490		Mk40, Mod 3	M423
1340-H161		Mk40, Mod 3	M423
1340-H485	High Explosive M229	Mk4, Mod 10	M427
1340-H488		Mk40, Mod 3	M429
1340-H533		Mk40, Mod 3	M427
1340-H534		Mk40, Mod 3	M423
1340-H160		Mk40, Mod 3	M423
1340-H469	Smoke, WP, M156	Mk40, Mod 3	M433
1340-H519		Mk40, Mod 3	M423
1340-H486		Mk 4, Mod 10	M427
1340-H593		Mk40, Mod 13	M427
1340-H826	HE, DP	Mk40, Mod 3	M438 M247
1340-H828	Practice, WTU-1/B	Mk40, and Mods	None
1340-H180	Illuminating M257	Mk40	M442
1340-H116	Smoke, Screening WP, M259	Mk40, Mod 3	M446

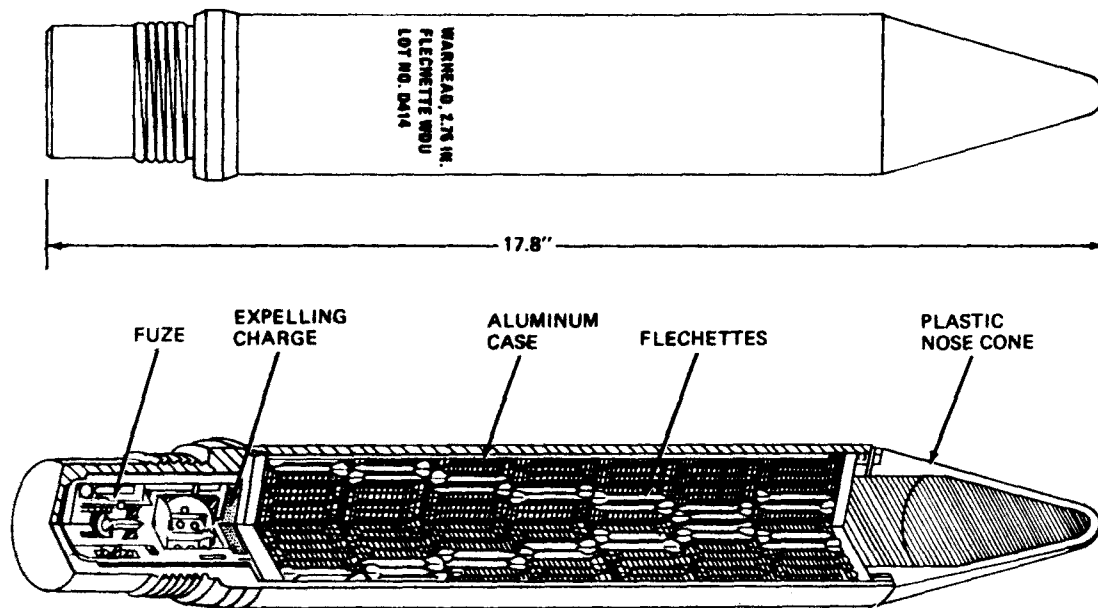


**TYPICAL 2. 75-INCH AIRCRAFT ROCKET (LSFFAR)**



ARD80-0508

ROCKET, FLECHETTE, 2.75-INCH, WDU-4A/A



ARD80-0509

Type Classification:

STD (LCC-A) AMCTCM 47560 Nov 69

Use:

The warhead contains flechettes and is used against personnel.

Description:

a. The complete round consists of a warhead with an integral fuze and rocket motor,

b. The warhead consists of 3 main parts: a nose section, a body, and an integral fuze. The nose section, a plastic cone bonded to a metal plate, is attached to the body by shear pins. The body is a

hollow cylinder loaded with 20 grain flechettes. The most recently manufactured WDU-4A/A warheads contain three tracers for the purpose of assisting the pilot/gunner in identifying the beaten zone of the flechette impact pattern. Two semicylindrical sleeves retain the flechettes in place. A metal pusher plate is located just aft of the flechettes. The threaded end of the body is machined internally to accommodate a base-detonating (BD) fuze.

c. The low-spin folding-fin aircraft rocket (LSFFAR) is an air-to-ground rocket primarily deployed from rotary-wing and other low-speed aircraft. However, it is also used on Air Force and Navy jet aircraft in ripple fire and in a restricted single fire mode.



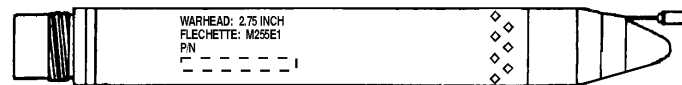
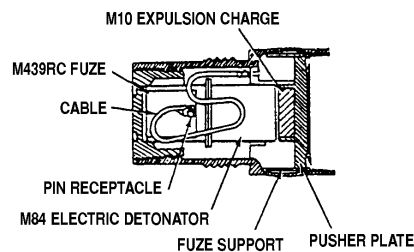
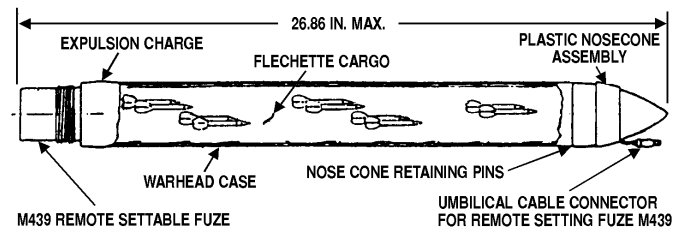
**Rocket Motor:**

Model - - - - - Mk 40, Mod3

Length (overall) - - 39.9 in.

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## ROCKET, FLECHETTE, 2.75-INCH W/M255A1 WARHEAD



U  
AR 6232

### TYPE CLASSIFICATION:

TBD

### USE:

The M255A1 warhead contains approximately 1179 60-grain flechettes for use against light material targets and personnel.

### DESCRIPTION:

The complete round consists of a warhead with an integral fuze and a rocket motor. The warhead consists of a nose cone assembly, a warhead case, and integral fuze, approximately 1179 60-grain flechettes, and an expulsion charge assembly. The nose cone assembly, a plastic cone bonded to a metal cup-shaped base, is attached to the body by shear pins. The body is a hollow cylinder loaded with approximately 1179 60-grain flechettes. A metal pusher plate is located just aft of the flechette cargo stack and is forward of the expulsion charge assembly. The threaded end of the body is machined internally to accommodate a base-detonating, remote settable, variable range fuze.

The primary warhead fuze, M439 RC, is a resistance-capacitance electronic variable time delay fuze. The time delay is remotely set for the desired functioning distance (time) by charging the circuit from the fire control center. The fuze begins timing at the first motion of the rocket and will function at the prescribed time if the Safety and Arming Device (S&A) is armed. The S&A is a mechanical acceleration integrator with an unbalanced rotor holding the M84 electric detonator and a runaway escapement. An acceleration greater than 27G is necessary to arm the fuze. The M439 RC fuze is a base mounted, forward firing fuze. The fuze connector cable extends from the fuze, through the warhead (in a lengthwise groove), and exits the ogive for connection to the launcher by an umbilical cable.

The flechette cargo contains approximately 1179 60-grain flechettes, which are deployed by initiation of a 5.5 gram expulsion charge.

The spin-stabilized wrap-around fin aircraft rocket is an air-to-ground rocket primarily deployed from rotary-wing and other low-speed aircraft. It can also be used on Air Force and Navy jet aircraft, as well as in the Mobile Ground Launcher System.

FUNCTIONING:

The rocket motor functions when current passes through the launcher firing contact to the igniter in the rocket motor. The current generates the heat necessary to detonate the igniter charge which ignites the propellant grain. Combustion gases from the burning propellant pressurize the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust.

Upon receipt of the fire signal from the pilot, the remote fuze setter processes the proper time constant (delay) to the M439 RC electronic time fuze immediately prior to firing the rocket. The intervalometer delivers a 160 millisecond pulse interval. The pulse is divided into a 45 millisecond fuze charging pulse, followed by a 45 millisecond rocket firing pulse. The remaining 70 milliseconds are used as dwell interval to maintain spacing between pairs of rockets fired.

After the rocket is fired and experiences sustained acceleration, the setback weight of the S&A device within the fuze moves rearward sufficiently to allow the roller attached to the unbalanced rotor to move out of the groove provided by the setback weight. Once the roller is free, the unbalanced rotor rotates in response to the acceleration forces. The rotation of the rotor is delayed by a runaway escapement which provides an arming delay (a function of the acceleration) until the rocket is a safe distance from the aircraft. When the setback weight experiences the necessary magnitude of acceleration, the rotor will lock up with the propellant charge and the fuze is armed. The detonator is now connected to the firing circuit, the connection between the electronic module and the umbilical cable is broken, and electronic timing is started.

From 1.2 to 25 or more seconds after firing, depending upon the range setting, the detonator is initiated electrically and ignites the expelling charge. Gases from the expelling charge force the pusher plate and cargo stack forward, shearing the nose cone (ogive) retaining pins and ejecting the flechettes into the airstream. The actual ejection range is some distance from the target as determined by the fire control computer along with the aircraft QE based on aircraft elevation, ground speed, and range to target.

TABULATED DATA:

Warhead:

Model .....	M255A1
Type .....	Flechette
Body .....	Aluminum
Color .....	Olive drab w/white markings
Diameter .....	2.75 in.
Length .....	26.86 in.
Weight .....	13.6 lb
DODAC .....	1340-H462 w/ MK66 Mod 2 motor; 1340-H411 w/MK66 Mod 4 motor

PERFORMANCE:

Motor:

Type .....	MK66, Mod 2
Diameter .....	2.75 in.
Length (max) .....	41.7 in.
Weight .....	24.4 lb (w/MK66, Mod 2 motor)
Igniter .....	2.2-3.5 ohms resistance
DODAC .....	1340-J147

Fuze:

Model .....	M439
Type .....	RC time fuze
Diameter .....	1.5 in. (max)
Length .....	2.77 in. overall
Weight .....	0.6 lb
Arming distance .....	96-126 m
Setback to arm .....	27g
Delay element .....	Electronic
Delay time .....	Variable
Detonator .....	M84 electrical
Maximum velocity .....	1950 fps (600 mps)

TEMPERATURE LIMITS:

Operating temperature limits .....	-50°F to +150°F (-46.56°C to +65.56°C)
------------------------------------	--

DRAWINGS:

Assembly drawing (w/MK66  
 Mod 2 motor)..... 13058370-13  
 Assembly drawing (w/MK66  
 Mod 4 motor)..... 13058370-25  
 Packing and marking drawings..... 9230116

PACKING DATA:

Packaging (Box):  
 Dimension..... 72-13/16 in. x 8-11/  
 16 in. x 9-1/2 in. w/  
 MK66, Mod 2  
 motor  
 Cubic contents ..... 3.5 cu ft  
 Total explosive weight..... 7.13 lb (3.24 kg)  
 Total weight (w/contents 4 warheads  
 w/motors assembled in fiber  
 containers)..... 138 lb (62.6 kg) w/  
 MK66, Mod 2 or 4  
 motor

Packing..... 1 rocket consists of  
 warhead M255E1  
 and Rocket motor  
 MK66 Mod 2 or 4  
 per fiber container;  
 4 fiber containers  
 per wooden box

SHIPPING AND STORAGE DATA:

Complete (Round):  
 DOD hazard class..... (03) 2.3 C)  
 DOT hazard class ..... 1.2 C  
 DOT shipping class ..... A  
 DOT designation ..... Rocket, UN: 0436  
 NSN: 1340-01-  
 309-5799  
 DOT label..... Explosive 1.2 C

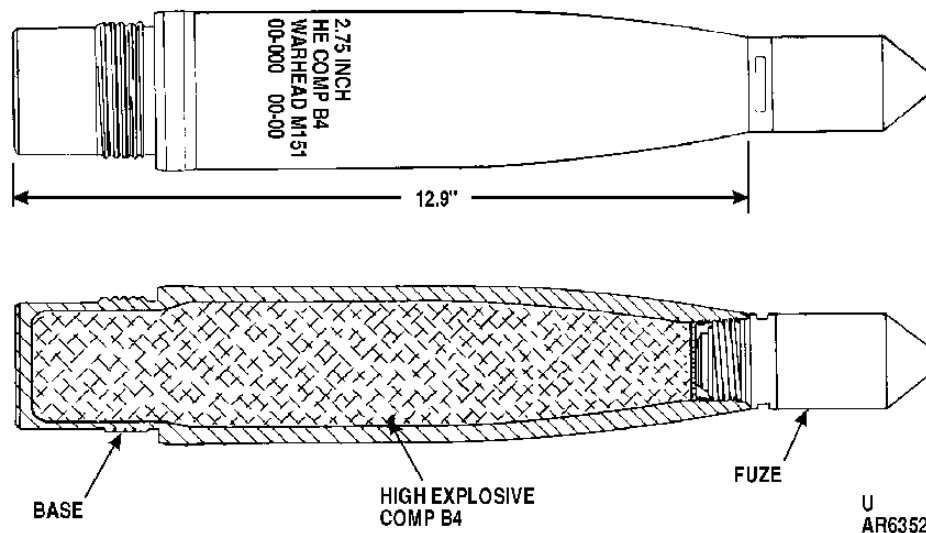
NOTE

Rocket, 2.75-Inch, Flechette: w/Warhead  
 M255A1 and Motor MK66 Mod 2 (DODIC  
 H462) or Motor MK66 Mod 4 (DODIC H411)  
 is airworthiness certified for the A/MH6 and U/  
 MH60 aircraft only, and will not be issued to  
 units that do not use these aircraft.



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## ROCKET, HIGH-EXPLOSIVE, 2.75-INCH W/M151 WARHEAD



### TYPE CLASSIFICATION:

STD (LCC) AMCTCM 3990, 3233, and 5178 Oct 65.

### USE:

This is a general purpose high-explosive rocket that can be presently assembled in five different combinations of motors and fuzes.

### DESCRIPTION:

This low-spin folding-fin aircraft rocket (LSFFAR) is an air-to-ground rocket primarily deployed from rotary-wing and other low-speed aircraft. It is also used on Air Force and Navy jet aircraft in ripple fire and in a restricted single fire mode.

The warhead consists of two main parts, a nose and a base, brazed together. The nose section is threaded to receive a fuze. The base is made of steel and is threaded for attachment to rocket motor.

Fuzes assembled with 2.75-inch rockets are classified as point detonating (PD), or proximity, according to the manner in which they are initiated. Except for the Proximity Fuze M429, these fuzes are nondelay and super-quick. The point detonating fuzes and proximity fuzes are threaded into the forward end of the high explosive warhead.

The M151 warhead is available with fuzes M423, M427, M429, and M433. These fuzes differ from each other functionally and have the following characteristics:

M423 and M427 - Oblique impact sensitive, point-detonating, super-quick type fuze.

M429 - Transistorized doppler type proximity fuze with a super-quick impact switch as a backup.

M433 - A resistance-capacitance multi-option time delay fuze with selectable functioning modes for jungle canopy penetration, bunker penetration and super-quick for open terrain.

The rocket motors are described in Chapter 5.

### FUNCTIONING:

#### Fuze Functioning:

A typical PD fuze (M423 and M427) arms under minimum, sustained acceleration. On impact with the target, the nose of the fuze is crushed and the firing pin strikes the primer. Primer detonation sets off, in sequence: the detonator, the booster lead-in, the booster, and the explosive in the warhead.

The M429 proximity fuze is a completely transistorized, continuous wave, doppler device to provide airburst characteristics. It was designed primarily for use with high-explosive (HE) warheads for improved antipersonnel lethalties.

The M429 proximity fuze is equipped with a super-quick impact switch which serves as a backup in the event of failure of the airburst electronics. The arming mechanism is similar to that contained in the M427 fuze except that it has been modified to include an electric detonator as well as a

battery starter assembly to initiate an electric battery. An electric detonator is assembled in the rotor. A plastic (lexan) sleeve houses the thermal battery which is located directly above the safing and arming (S&A) mechanism.

The M433 fuze is an electronic multi-option delay time delay fuze with selectable functioning modes for forest canopy penetration, bunker structure penetration, and super-quick (SQ) for open terrain. The fuze body is steel. A forest canopy switch extends from the nose of the fuze to signal to the fuze electronic circuit when first contact is made with the tree tops. An umbilical assembly is positioned at the nose of the fuze for electrical connection to the M132 fuze safety and timing device located in the helicopter. Internally, the fuze consists of a Resistance Capacitance (RC) electronic time circuit, a safing and arming mechanism with an electrical M84 detonator and a booster assembly.

The M433 fuze has a selectable time delay range that depends on the height of the forest canopy (40 to 130 ft). After first contact with the tree tops, a delay timer is activated which results in warhead functioning beneath the canopy but above ground level. The bunker structure penetration mode is incorporated into the fuze to defeat the medium hardness targets constructed of logs, earth, bricks, etc. The fuze can be set from the cockpit for penetrating up to 10 feet of protection and destroying the target from within. The hard target penetration RC timer is activated by inertial switch sensing, setback in excess of 1000 G's. Also, an SQ point detonating feature is included to provide operational flexibility in open terrain. This mode is achieved by

setting delay to zero. First contact with any surface detonates the round.

The M433 has no internal battery. Required voltage is supplied by the aircraft via the M132 safety and timing device 160 milliseconds prior to the rocket being fired. During this 160 millisecond period, fuze is charged to give time delay selected by pilots.

The M433 fuze is to be used with M151 warheads.

Testing the M433 fuze against 3 ft thick wood barriers indicates warhead detonations may occur 6 in. prior to exit from the barrier to as much as 4.5 ft into the bunker void.

The M433 fuze nose cap is designed to provide fuze sensitivity on oblique/graze impacts. With the cap removed and the fuze set in the delay mode, oblique/graze impact sensitivity is obtained through the inertial action of the firing pin.

Because of the void sensing characteristics of the M433 fuze, complete destruction may be anticipated when a target hit is achieved. It is recommended that rockets be fired in pairs at minimum ranges and steep dive angles to enhance target hits.

DIFFERENCES BETWEEN MODELS:

The table below identifies the differences between the high-explosive M151 warhead incorporated within the approved configurations of motor and fuze.

DODAC	Warhead	Motor	Fuze
1340-H470	High-Explosive M151	MK 40, Mods 1, 3	M427
1340-H471		MK 40, Mod 3	M433
1340-H489		MK 40, Mods 1, 3	M429
1340-H490		MK 40, Mods 0, 1, 3	M423
1340-H161		MK 40, Mod 3	M423
1340-H485		MK 4, Mod 10	M427
1340-H163		MK 66, Mod 1 or 2	M423
1340-H164		MK 66, Mod 1 or 2	M433
1340-H582		MK 66, Mod 3	M433
1340-H583		MK 66, Mod 3	M423
1340-HA12		MK 66, Mod 4	M423

Rocket Functioning:

When the rocket is launched with a PD fuze, it becomes armed from inertial forces resulting from sustained acceleration. This frees the unbalanced rotor to turn and lock the explosive train in the armed position. Upon impact with a target, the detonator functions and initiates the explosive train.

Upon detonation, the warhead shatters into thousands of small, high-velocity fragments.

TABULATED DATA:

Warhead model.....	M151
Type.....	High explosive
Weight (fuzed).....	8.7 lb
Length (w/o fuze).....	12.9 in.
Filler:	
Type.....	Comp B4
Weight.....	2.3 lb (1.04 kg)
Body material.....	Pearlitic or ferritic malleable iron
Color.....	Olive drab, yellow markings

TEMPERATURE LIMITS:

Firing.....	-65° to +150°F (-53.35° to +64.9°C)
Storage.....	-65° to +150°F (-53.35° to +64.9°C)

DRAWINGS:

Drawing numbers.....	8882186, 9220807, 9204528, 9209570, 9235961, 8796521, 9230114, 8796522
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PACKING DATA:

Packing for complete round.....	1 rocket consisting of Warhead, HE, M151 with Rocket Fuze, M423 or M427 with MK 4, MK 40, or MK 66 motor; 1 or 3 per fiber container; 3, 4 or 25 containers per wooden box or 4 per metal container
---------------------------------	---

Packing box:

Weight w/contents:

Wood.....	127 lb
Metal.....	147 lb

Dimensions:

Wood.....	62-13/16 in. x 8-11/16 in. x 9-1/2 in.
Metal.....	70.7 in. x 9.24 in. x 9.24 in.
Cube.....	3.5 ft

SHIPPING AND STORAGE DATA:

Storage class/SCG.....	1.1E
DOT shipping class.....	A
DOT designation.....	ROCKET AMMUNITION WITH EXPLOSIVE PROJECTILES
Field storage.....	Group F
*DODAC.....	1340-H470, 1340-H471, 1340-H489, 1340-H490, 1340-H161, 1340-H485, 1340-H163, 1340-H164, 1340-H582, 1340-H583, 1340-HA12

REFERENCES:

- TM 9-1340-222-20
- TM 9-1340-222-34
- SC 1340/98-IL

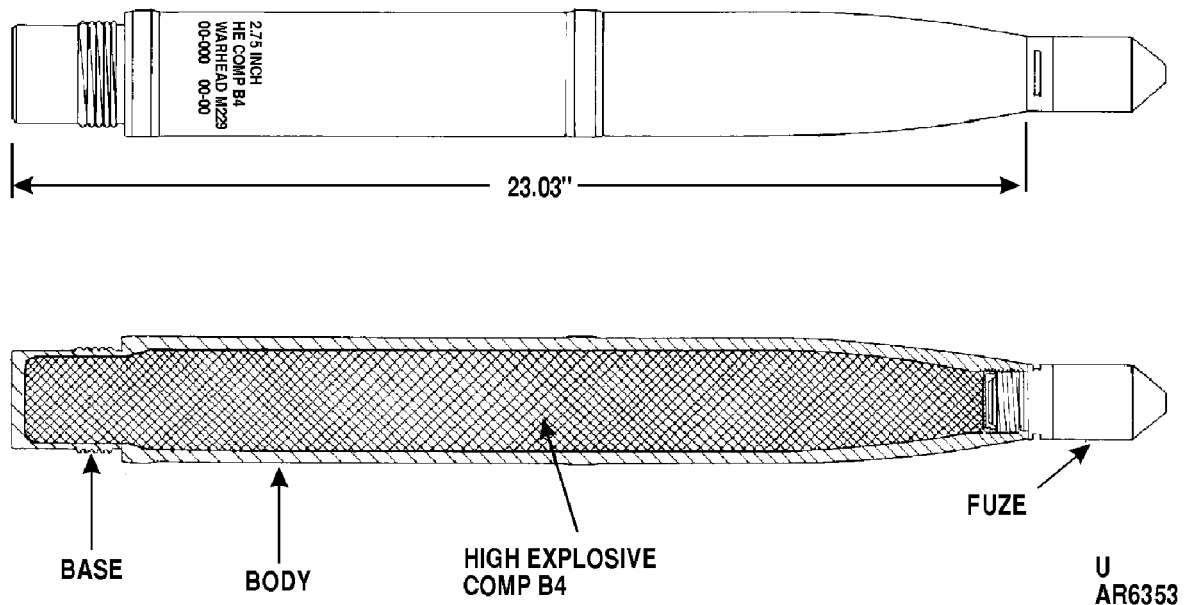
\*See appropriate supply catalog for individual NSN's pertaining to this (these) DODAC(s).



Do not fire M151 warheads with M433 fuze and MK66 motor from closer than 51 meters from other helicopters. There is a remote possibility of airburst due to premature fuze function. Affected lots are: LOP94D825-001 through LOP94D825-006.

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## ROCKET, HIGH-EXPLOSIVE, 2.75-INCH W/M229 WARHEAD



### TYPE CLASSIFICATION:

STD AMCTCM or OTCM 8685

### USE:

To provide improved aerial artillery capability for the 2.75-inch rocket.

### DESCRIPTION:

This rocket is an air-to-ground rocket primarily deployed from rotary-wing and other low-speed aircraft. It is also used on Air Force and Navy jet aircraft in ripple fire mode.

This rocket is used to enhance the lethality and destructiveness of the 2.75-inch rocket in its aerial artillery role. It uses the M229 warhead which is an elongated version of the M151 warhead and is commonly referred to as the 17-pound warhead.

It consists of three main parts consisting of the nose, body, and base. The three main parts are welded together. There is

an alternate two-piece design consisting of a one-piece nose body plus a base.

Fuzes assembled with 2.75-inch rockets are classified as point detonating (PD) or proximity, according to the manner in which they are initiated. Except for the Proximity Fuze M429, these fuzes are nondelay and super-quick (SQ). The PD fuzes and proximity fuze are threaded into the forward end of the high explosive warhead.

The M229 warhead is available with fuzes M423, M427, and M429. These fuzes differ from each other functionally and have the following characteristics:

M423 and M427 - Oblique impact sensitive, point-detonating, super-quick type fuze.

M429 - Transistorized doppler type proximity fuze with a super-quick impact switch as a backup.

The rocket motors are described in Chapter 5.

DIFFERENCES BETWEEN MODELS:

The nose and base of the M229 warhead are essentially identical to the M151 parts which are separated by the 10-inch long cylindrical body.

The table below identifies the differences between the high-explosive M229 warhead incorporated within the approved configurations of motor and fuze.

FUNCTIONING:

Ignition: Functioning of the 2.75-inch rocket with an M229 warhead begins when the firing circuit switch is closed. Current passes through the launcher firing contact to the igniter in the rocket motor. This current generates the heat necessary to initiate the igniter charge, which ignites the propellant grain. Combustion gases from the burning propellant pressurize the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust.

DODAC	Warhead	Motor	Fuze
1340-H469	High-Explosive M229	MK 40, Mod 3	M433
1340-H488		MK 40, Mod 1, 3	M429
1340-H533		MK 40, Mod 1, 3	M427
1340-H534		MK 40, Mod 1, 3	M423
1340-H160		MK 40, Mod 3	M423
1340-H642		MK 66, Mod 2	M423
1340-HA09		MK 66, Mod 4	M423

Fuze Functioning: The M429 proximity fuze is a completely transistorized, continuous wave with doppler device to provide airburst characteristics. It is designed primarily for use with HE warheads for improved antipersonnel lethalties.

A super-quick impact switch on the M429 serves as a backup in the event of failure of the airburst electronics. The arming mechanism is similar to that contained in the M427 fuze except that it has been modified to include an electric detonator as well as a battery starter assembly to initiate an electric battery. An electric detonator is assembled in the rotor. A plastic (lexan) sleeve houses the thermal battery which is located directly above the S&A mechanism.

When the rocket is launched, the fuze becomes armed from inertial forces resulting from sustained acceleration. This frees the unbalanced rotor to turn and lock the explosive train in the armed position. Upon sensing a target, the detonator is fired and initiates the explosive train.

Upon detonation, the warhead shatters into thousands of small high-velocity fragments.

TABULATED DATA:

Warhead model .....	M229
Type .....	High explosive
Weight (fazed).....	18.1 lb
Length (w/o fuze).....	2303 in.
Filler:	
Type.....	Comp B4
Weight .....	4.8 lb (2.18 kg)
Color.....	Olive drab w/yel-low markings

TEMPERATURE LIMITS:

Firing.....	-65° to +150°F (-53.35° to +64.9°C)
Storage .....	-65° to +150°F (-53.35° to +64.9°C)

**DRAWINGS:**

9220806.....	W/Motor, MK40, Mod 3
13058371.....	W/Motor, MK66, Mod 2
9218698.....	Warhead, M229
9230116.....	Packing and mark- ing

DOT labels.....	EXPLOSIVE 1.1E
Field storage.....	Group F
*DODAC.....	1340-H469, 1340- H488, 1340-H533, 1340-H534, 1340- H160, 1340-H162, 1340-HA09

**PACKING DATA:**

Packing.....	1 per fiber con- tainer, 4 containers per wooden box
Packaging for complete round.....	1 rocket consisting of warhead, HE, M229 w/rocket fuze and rocket motor per fiber container; 3, 4 or 25 containers per wooden box
Packing box:	
Weight (w/contents).....	162 lb
Dimensions.....	72-13/16 in. x 8-11/ 16 in. x 9-1/2 in.
Cube.....	3.5 cu ft



When firing rockets with the M229 warhead and MK66 Motor from the A/MH6 and U/MH60 Aircraft, limit engagement of targets and ensure line of fire is clear of obstructions at a minimum distance of 450 feet if forward airspeed exceeds 10 knots or 350 feet if forward airspeed is less than 10 knots.

**NOTE**

Rocket, HE, 2.75-Inch with warhead M229 and Motor MK66 is airworthiness certified for the A/MH6 and U/MH60 Aircraft only, and will not be issued to units that do not use these aircraft.

**SHIPPING AND STORAGE DATA:**

Storage class SAG.....	1.1E
DOT shipping class.....	A
DOT designation.....	ROCKET AMMU- NITION WITH EXPLOSIVE PRO- JECTILES UN 0181

**REFERENCES:**

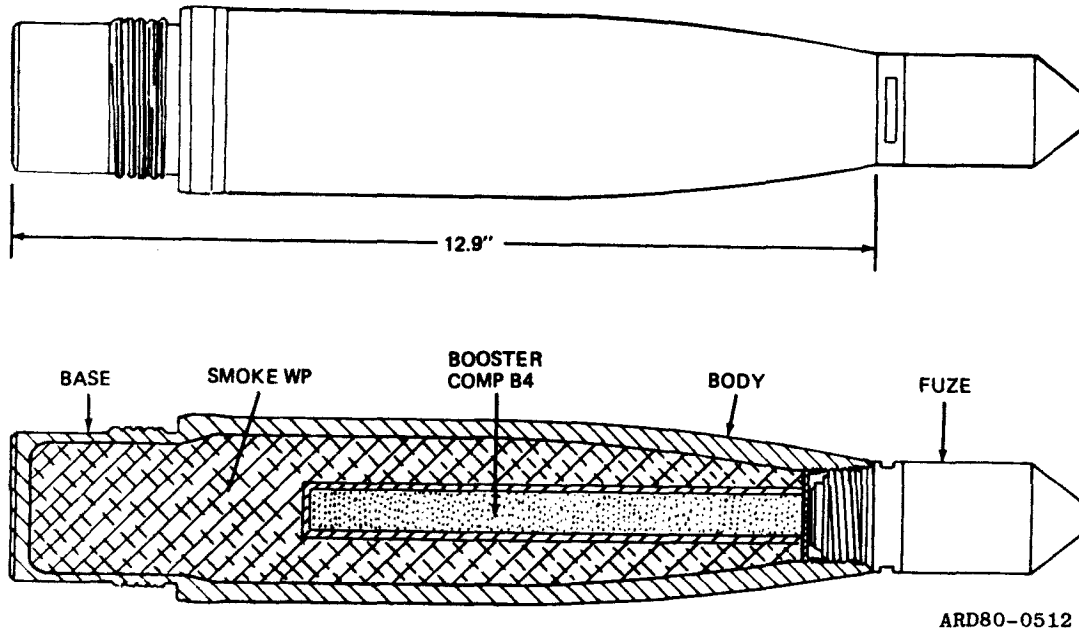
- TM 9-1340-222-20
- TM 9-1340-222-34
- SC 1340/98-IL

\*See appropriate supply catalog for individual NSN's pertaining to this (these) DODAC(s).



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**ROCKET, SMOKE, WP, 2.75 -INCH WM156 WARHEAD**



**Type Classification:**

STD AMCTCM 10756032

**Use:**

Primarily to provide smoke for target marking and incendiary purposes.

**Description:**

a. This warhead is a ballistic match for high explosive (HE ) Warhead M151. The M156 consists of a steel body, a base, and an adapter, brazed together. The body is shaped at the forward end to form the ogive. The base is an extruded steel cup threaded for attachment to the rocket motor. The steel adapter, at the forward end of the warhead, is threaded to receive the fuze. It also serves to retain the burster charge tube.

b. The fuzes assembled in this 2.75-in. rocket are classified as point detonating (PD), or proximity, according to the manner in which they are initiated. Except for the Proximity Fuze M429, these fuzes are nondelay and super-quick. The point detonating fuzes and proximity fuze are threaded into the forward end of the warhead.

c. The WP M156 warhead is available with fuzes M423, M427, and M429. These fuzes differ from each other functionally and have the following characteristics:

- |       |  |
|-------|--|
| M423) | Oblique impact sensitive,  |
| M427) | point-detonating, super-quick type fuze.   |
| M429  | Transistorized Doppler type proximity fuze with a super-quick impact switch as a backup. |

d. The LSFFAR 2.75-in. rocket motors are fin stabilized and have scarfed nozzles. The scarfed nozzles give low spin to the rocket and provide the additional stability required for deployment from low speed aircraft.

e. The rocket motor is described in Chapter 5.

Differences between Models:

The table below describes the differences between the WP smoke M156 warhead incorporated within the approved configurations of motor and fuze.

Functioning:

a. Ignition. Functioning of the 2.75-in. rocket with an M156 warhead begins when the firing circuit switch is closed. Current passes through the launcher firing contact to the igniter in the rocket motor. This current generates the heat necessary to initiate the igniter charge, which ignites the propellant grain. Combustion gases from the burning propellant pressurize the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust.

b. Fin Operation. The thrust of the nozzle exhaust blows off the fin retainer and releases the fins. Upon clearing the launcher, the fins are opened by the force

of the fin actuating piston pushing on the heels of the fins.

c. Fuze Functioning.

(1) A typical point detonating (PD) fuze (M423 and M427) arms under minimum, sustained acceleration. On impact with the target, the nose of the fuze is crushed and the firing pin strikes the primer, initiating the explosive train.

(2) The M429 proximity fuze is a completely transistorized, continuous wave, doppler device to provide airburst characteristics. It is designed primarily for use with HE warheads for improved anti-personnel lethalties. A super-quick impact switch serves as a backup in the event of failure of the airburst electronics. The arming mechanism is similar to that contained in the M427 fuze except that it has been modified to include an electric detonator as well as a battery starter assembly to initiate an electric battery. An electric detonator is assembled in the rotor. A plastic (lexan) sleeve houses the thermal battery which is located directly above the safety and arming device (S&A) mechanism.

Tabulated Data:

Warhead model -- M156  
 Type ----- Smoke, WP  
 Weight (fuzed) --- 9.7 lb  
 Length (w/o fuze) - 12.9 in.

<u>DODAC</u>	<u>Warhead</u>	<u>Motor</u>	<u>Fuze</u>
	<u>Smoke WP M156</u>		
1340-H472		Mk40, Mod 3	M429
1340-H519		Mk40, Mod 0, 3	M423
1340-H486		Mk4, Mod 10	M427
1340-H593		Mk40, Mod 0, 3	M427

Filler:

Type ----- White phosphorous  
 Weight ----- 2.2 lb (999 g)  
 Burster charge:  
 Type ----- Comp B  
 Weight ----- 0.12 lb (54.5 g)  
 Body material --- Steel tubing  
 Color ----- Light green; red  
 marking, yellow  
 band

Temperature limits:

Firing ----- -40° to +165°F  
 (-39.6° to +73.15°C)  
 Storage ----- -40° to +140°F  
 (-39. 6° to +59.4°C)

Packing ----- 1 per fiber container;  
 4 or 25 containers  
 per wooden box

Drawing number --- D90-1-44

Packing for complete  
 round -----

1 rocket consisting  
 of Warhead, Smoke,  
 WP, M156 with  
 rocket fuze and  
 motor per fiber con-  
 tainer; 4 containers  
 per wooden box

Packing box:

Weight ----- 162 lb  
 Dimensions ----- 72-13/16 in. x  
 8-11/16 in. x 9-1/2  
 in

Cube ----- 3.5 ft<sup>3</sup>

Shipping and storage data:

Storage class/  
 S C G ----- 1. 2H (12)  
 DOT Shipping  
 class ----- A  
 DOT designation -- ROCKET AMMUNI-  
 TION WITH SMOKE  
 PROJECTILES

Field storage ---- Group D  
 \* D O D A C ----- 1340-H472, 1340-  
 H519, 1340-H486,  
 1340-H593

Drawing number ---- 9252330, 9242567

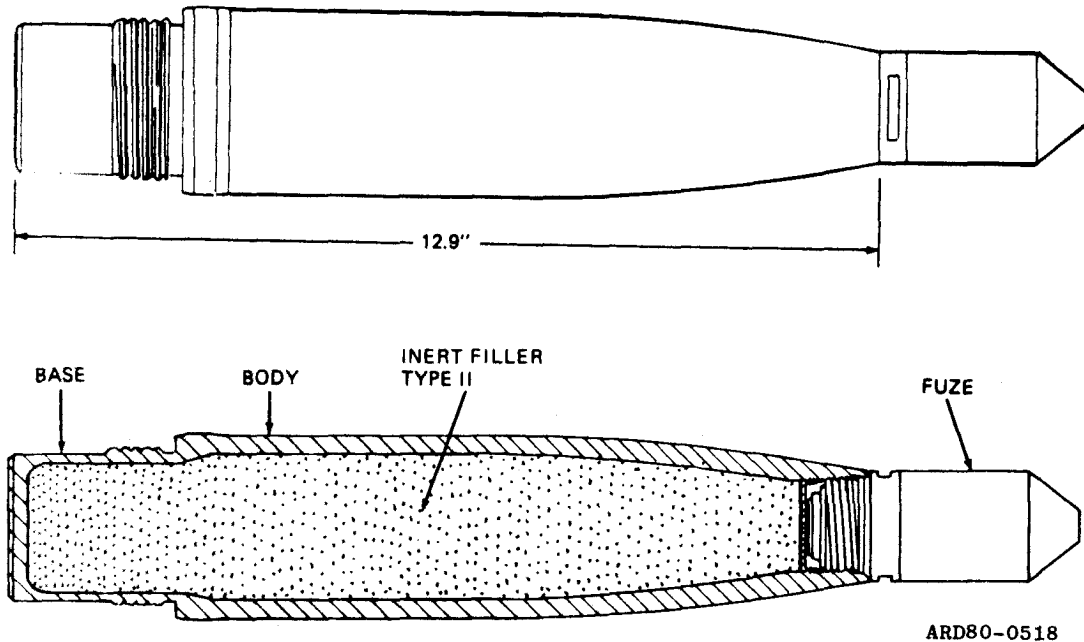
References:

TM 9-1340-222-20&P  
 TM 9-1340-222-34&P  
 SC 1340/98-IL

\*See appropriate supply catalog for indi-  
 vidual NSN's pertaining to this (these)  
 DODAC(s).

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**ROCKET, PRACTICE, 2.75-INCH W/M230 WARHEAD**



Type Classification:

STD AMCTCM or OTCM 9153

Use:

This warhead is used for training and testing purposes.

Description:

a. This low-spin folding fin aircraft rocket is an air-to-ground rocket primarily deployed from rotary-wing and other low-speed aircraft. It is also used on Air Force and Navy jet aircraft in ripple fire and in a restricted single fire model. The nozzles are scarfed to produce the low rate of spin required for deployment at low speeds.

b. The warhead consists of two main parts, a nose and a base, brazed together. The nose section is threaded to receive a fuze. The base is made of steel, or cast iron and is threaded for attachment to rocket motor.

c. Fuze M435 is an inert fuze. It simulates point detonation fuzes M423 and M427 generally in length, weight and configuration. It is made entirely of aluminum.

d. The LSFFAR 2.75-in, rocket motors are fin stabilized and have scarfed nozzles. The scarfed nozzles impart low spin to the rocket and provide the additional stability required for deployment from low speed aircraft.

e. The motors are composed of the following subassemblies and components.

(1) Motor tube and head closure assembly. Integral and non-integral bulkhead tubes are used with the rocket motors. The forward end of the motor tube is internally threaded to accommodate the warhead. The integral bulkhead motor tube has the motor tube and head closure formed in one piece by impact intrusion. It has no blowout disk. The non-integral bulkhead motor tube is made of aluminum alloy. The motor head is closed at the aft end by a thin scored disk. The disk functions as a blowout diaphragm.

(2) Propellant grain and associated fittings. The propellant grain is internally burning grain. It is inhibited on both ends and spirally wrapped with inhibiting tape along the external surface.

(3) Igniter. The igniter Mk 125 contains one electrical squib. Current passing through the squib bridgewire generates the heat necessary to ignite the squib mix which in turn ignites the powder in the igniter.

(4) Nozzle and fin assembly. The nozzle and fin assembly consists of a nozzle assembly (one nozzle plate, four inserts, and seals or a burst diaphragm), a fin-actuating mechanism, four fins and a fin retainer. It is attached to the aft end of the motor tube by a lockwire. Older motors have stepped-end lockwires; on new production items, the stepped-end has been eliminated.

#### Differences between Models:

The Mk 40 Mods 1 and 3 have integral bulkhead motor tubes whereas the Mk 40 Mod 0 has a non-integral bulkhead tube.

The igniter of the Mod 3 motor differs from that of the Mods 0 and 1 motors in that the igniter has been modified to incorporate a carried, frangible case in lieu of the blowout plug and the squib is located on the periphery of the case instead of the center of the case. The M230 has the same configuration, weight and center of gravity as the M151 warhead. Standard M151 metal parts are filled with an inert filler material having the same density as Composition B4 to manufacture this warhead.

#### Functioning:

a. Ignition. Functioning of the 2.75-in. rocket with an M230 warhead begins when the firing circuit switch is closed. Current passes through the launcher firing contact to the igniter in the rocket motor. This current generates the heat necessary to initiate the igniter charge, which ignites the propellant grain. Combustion gases from the burning propellant pressurizes the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust,

b. Fin Operation. The thrust of the nozzle exhaust blows off the fin retainer and releases the fins. Upon clearing the launcher, the fins are opened by the force of the fin actuating piston pushing on the heels of the fins. The fins are held by the crosshead of the piston at an angle of 45° with the axis of the motor tube.

c. Fuze Functioning. The rocket fuze M435 is entirely inert.

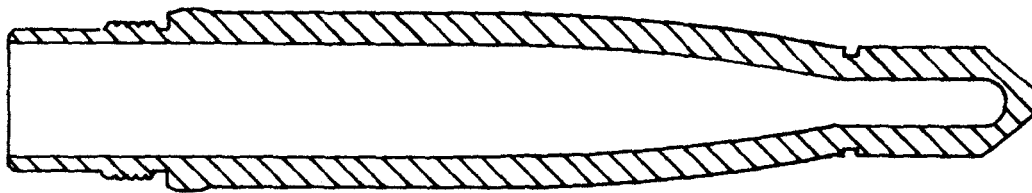
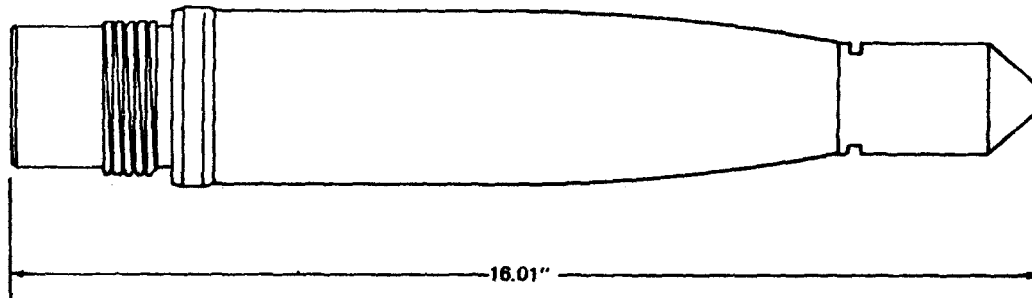
d. Rocket Functioning. The warhead is entirely inert and is used for practice only.





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**ROCKET, PRACTICE, 2.75-INCH W/INERT WARHEAD WTU-1/B**



ARD80-0513

Type Classification:

Std AMCTCM or OTCM 36841 and 9153.

Use.

This warhead is used for training and support testing of other rocket components.

Description:

a. The WTU-1/B warhead is an inert slug warhead having the same shape, weight and center of gravity as the standard M151 warhead. The warhead does not contain a fuze.

b. This warhead simulates flight and trajectory characteristics of the M151 warhead.

Differences between Models: N/A

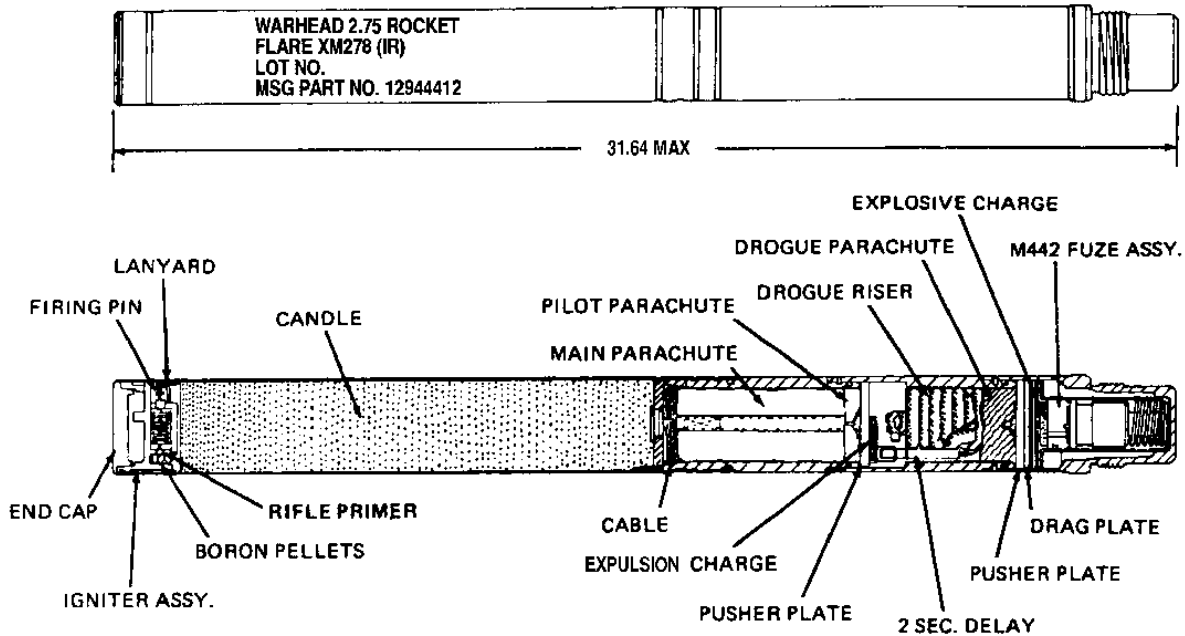
Functioning:

a. Functioning of the 2.75-in. rocket begins when the firing circuit switch is closed. Current passes through the launcher firing contact to the igniter in the rocket motor. This current generates the heat necessary to initiate the igniter charge, which ignites the propelling grain. Combustion gases from the burning propellant pressurize the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust.

b. The thrust of the nozzle exhaust blows off the fin retainer and releases the fins. Upon clearing the launcher, the fins are opened by the force of the fin actuating piston pushing on the heels of the fins. The fins are held by the crosshead of the piston at an angle of 45° with the axis of the motor tube.



## ROCKET, FLARE, 2.75-INCH W/M257 ILLUMINATING WARHEAD



U  
AR 6191

### TYPE CLASSIFICATION:

STD, LCC-A, TT, HQDA, Jan 76

### USE:

To provide helicopters with target illuminating capability from a safe standoff distance in a hostile environment.

### DESCRIPTION:

This flare rocket is an air-to-ground rocket primarily deployed from rotary-wing and other low-speed aircraft. It is employed with the low-spin folding-fin MK40 motor and with the spin stabilized wrap around fin MK66 motor Mods 1, 2, 3, and 4.

The M257 illuminating warhead consists of an ignition system, flare, main parachute, drogue parachute assembly, and an integral fuze and delay assembly. The warhead is enclosed in an aluminum case.

The setback-actuated fixed time integral fuze provides a standoff distance of approximately 3,000 meters. The arm-

ing fuze and delay assembly is actuated by motor acceleration.

The rocket motor is described in Chapter 5.

### FUNCTIONING:

The rocket with warhead, flare, M257, is fired from helicopter with standard 2.75-inch motor MK40 or MK66 to attain elevation between 2000 and 4000 ft at 3000 m downrange. Upon rocket launch, the M442 fuze arms upon acceleration (17 G's approximately required). After 1.5 seconds (at motor burnout), the fuze functions initiating delay train. After 9 seconds, delay ignites first expulsion charge in fuze assembly. Gas pressure forces pusher plate forward, shears pin, separates motor and adapter section from remainder of warhead. Rocket velocity is now 800 fps approximately.

The deflector plate, attached by cable to motor adapter, is extended into airstream and deflects path of motor and adapter. Pusher plate attached to drogue chute deploys drogue. Rocket warhead velocity then decreases to approximately 200 fps during the next 2 seconds.

**TM 43-0001-30**

Upon deployment of drogue chute, the gas generator is activated by pull on lanyard attached to drogue. After two seconds, the gas generator functions the second expulsion charge located in retainer block of drogue housing. Gas pressure forces pusher plate forward, shearing pins and separating drogue housing from main chute insert and candle assembly.

The pusher plate is attached by a threadline to the pilot chute. The pilot chute is deployed, and in turn pulls bag off main chute. The main chute now deploys the steel cable which is attached to the main chute shroud lines on one end and in turn pulls a lanyard attached to candle igniter assembly.

The pull on the lanyard rotates a bellcrank, releasing the firing pin. The firing pin fires a rifle primer, which fires boron pellets. The boron pellets ignite a propellant wafer. Propellant ignites the candle. Ignition gases pressurize nose cap, blowing it free.

The candle, suspended from the main chute, is now burning. During the first 15 seconds, the igniter housing is burned away. The candle descends at 15 fps and burns for 100 seconds with a minimum light output of one million candle power (CP).

**DIFFERENCES BETWEEN MODELS:** N/A

**TABULATED DATA:**

**Rocket:**

Type .....	MK40, Mod 3 MK66 Mod 1, 2, 3, and 4
Diameter .....	2.75-in. nominal
Length (max) .....	68.22 in. (w/MK40 Mod 3 motor) 70.975 in. (w/ MK66 series motor)
Maximum velocity .....	1600 fps (488 mps)

**Warhead:**

Model .....	M257
Type .....	Flare
Body .....	Aluminum
Color .....	Olive drab w/white markings
Diameter .....	2.75 in.
Length .....	31.5 in.
Weight .....	10.8 lb

**Candle characteristics:**

Burn time .....	120 sec nominal
Light output .....	1 mil cp min
Parachute descent rate .....	15 fps approx

Composition .....	Magnesium Sodium Nitrate
Weight .....	5.44 lb (2.47 kg)
<b>Fuze:</b>	
Model .....	M442
Type .....	Setback actuated, fixed time
Diameter .....	1-5-in.
Length overall .....	3.1 in.
Weight .....	0.6 lb
Arming time .....	1.1 sec

**TEMPERATURE LIMITS:**

Operating temperature limits .....	-25° to +140°F (-31.35° to +59.40°C)
Maximum velocity .....	1600 fps (488 mps)

**DRAWINGS:**

M257 WHD .....	9332220
w/MK40 - 3 motor .....	10399105
w/MK66 - 1 motor .....	13058370-5
w/MK66 - 2 motor .....	13058370-6
w/MK66 - 3 motor .....	13058370-7
w/MK66 - 4 motor .....	13058370-31

**Packing:**

w/MK40 - 3 motor .....	9294492
w/MK66 series motor .....	9357963

**PACKING DATA:**

Packing .....	1 warhead per fiber container; 1 motor per fiber container, unassembled
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**Box:**

Weight w/contents (6 fiber containers w/3 warheads and 3 motors, unassembled) .....	131 lb (58950 g) w/ MK40 Mod 3 motor; 132.5 lb (60101 g) w/MK66 Series
Dimensions .....	46-3/16 in. x 11-7/8 in. x 9-9/32 in. w/ MK40 Mod 3 motor; 48-1/16 in. x 12-1/4 in. x 9-3/8 in. w/MK66 series motor

Cubic contents (with fiber container) .....	3 cu ft
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SHIPPING AND STORAGE DATA:

Storage class/SCG ..... 1.2G (08)  
DOT shipping class ..... A  
DOT designation ..... ROCKET AMMU-  
NITION WITH  
ILLUMINATING  
PROJECTILE  
Field storage ..... Group D

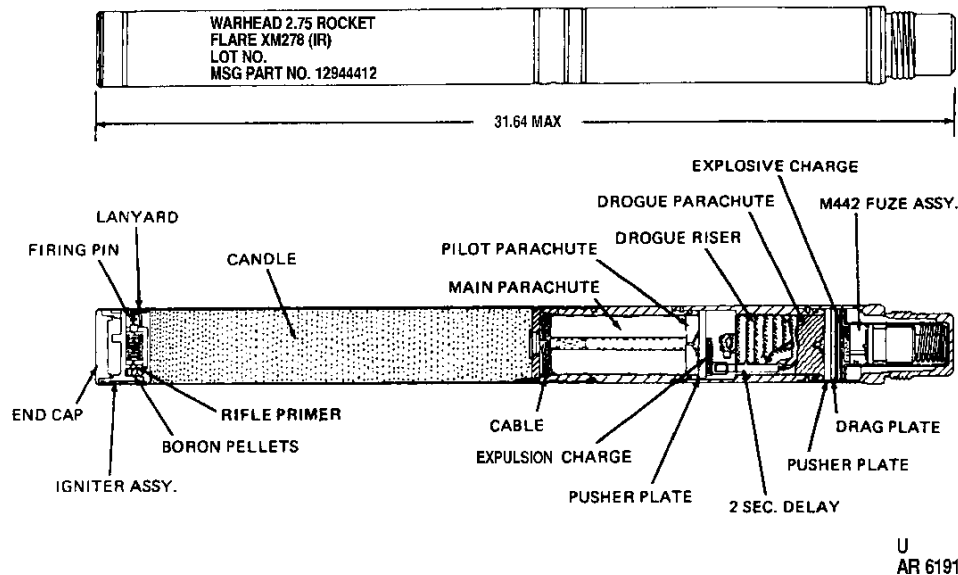
DODAC ..... 1340-H180 w/  
MK40 Mod 3 motor  
1340-H181 w/  
MK66 Mod 1 motor  
1340-H182 w/  
MK66 Mod 2 motor  
1340-H183 w/  
MK66 Mod 3 motor  
1340-HA18 w/  
MK66 Mod 4 motor

REFERENCES:

TM 9-1340-222-20  
TM 9-1340-222-34

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## ROCKET, FLARE, 2.75-INCH W/M278; IR ILLUMINATING WARHEAD



U  
AR 6191

### TYPE CLASSIFICATION:

TBD

### USE:

To provide helicopters with target illuminating capability from a safe standoff distance in a hostile environment.

### DESCRIPTION:

The M278 illuminating warhead consists of an ignition system, flare, main parachute, drogue parachute assembly, and an integral fuze and delay assembly. The warhead is enclosed in an aluminum case.

The setback-actuated fixed time integral fuze provides a standoff distance of approximately 3,500 meters. The fuze and candle igniter arming are actuated by rocket motor acceleration.

### FUNCTIONING:

The rocket with warhead, flare, M278 is fired from helicopter with standard 2.75-inch motor MK66 to attain elevation between 2000 and 4000 ft at 3000 m down-range. Upon rocket launch, the M442 fuze arms upon acceleration (17 G's

approximately required). After 1.0 seconds (at motor burn-out) the fuze functions, initiating delay train. After nine seconds, delay ignites first expulsion charge in fuze assembly. Gas pressure forces pusher plate forward, shears pin, separates motor and adapter section from remainder of warhead. Rocket velocity is now approximately 800 fps.

The deflector plate, attached by cable to motor adapter, is extended into airstream, deflects path of motor and adapter. Pusher plate, attached to drogue chute, deploys drogue. Rocket warhead velocity then decreases to approximately 200 fps during next two seconds.

Upon deployment of drogue chute, the gas generator is activated by pull on lanyard attached to drogue. After two seconds, the gas generator functions the second expulsion charge located in retainer block of drogue housing. Gas pressure forces pusher plate forward, shearing pins and separating drogue housing from main chute insert and candle assembly.

The pusher plate is attached by a thread-line to the pilot chute. The pilot chute is deployed, and, in turn, pulls bag off main chute. The main chute now deploys the steel cable which is attached to the main chute shroud lines on one end, and in turn, pulls a lanyard attached to candle igniter assembly.



The pull on the lanyard rotates a bellcrank, releasing the firing pin. The firing pin fires a rifle primer, which fires boron pellets. The boron pellets ignite a propellant wafer. Propellant ignites the candle. Ignition gases pressurize nose cap, blowing it free.

The candle, suspended from the main chute is now burning. During the first 15 seconds, the igniter housing is burned away. The candle descends at 13 fps, burns for 180 seconds with a light output of 222 watts per steradian in the near infrared spectrum, and a maximum of 1000 candlepower in the visible spectrum.

**TABULATED DATA:**

**Rocket:**

Type .....	MK66, Mod 2 or 4
Diameter .....	2.75 in. nominal
Length (max) .....	71.12 (w/warhead)
Weight.....	24.4 lb (w/MK66 motor)
DODAC .....	1340-H154 w/ MK66 Mod 2 motor; 1340-HA10 w/MK66 Mod 4 motor

**Motor:**

Type .....	MK66, Mod 2 or 4
------------	------------------

**Warhead:**

Model.....	M278
Type .....	Flare
Body.....	Aluminum
Color .....	Olive drab w/white markings
Diameter .....	2.75 in.
Length .....	31.64 in.
Weight.....	10.8 lb

**Fuze:**

Model.....	M442
Type .....	Setback actuated, fixed time
Diameter .....	1.5 in.
Length .....	3.1 in. overall
Weight.....	0.6 lb
Arming time.....	1.1 sec

**PERFORMANCE:**

Maximum velocity .....	1600 fps (488 mps)
Candle characteristic:	
Burn time .....	180 sec nominals
Light output .....	1000 cp max

Parachute descent rate .....	13 fps approx
Composition .....	Potassium, Cesium Nitrate, Hexamine, Binder
Weight .....	5 lb (2.27 kg)
Infrared output.....	222 Watts/Steradian

**TEMPERATURE LIMITS:**

Operating temperature limits .....	-25°F to +140°F (-31.35°C to +59.40°F)
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**DRAWINGS:**

Packing and marking drawing .....	12624792
Assembly drawing .....	12944412 w/MK66 Mod 2 motor; 13058370-24 w/MK66 Mod 4 motor

**PACKING DATA:**

**Packaging (Box):**

Dimensions.....	48-1/16 in. x 12-1/4 in. x 9-3/8 in. w/ MK66 motor
Cubic contents .....	3 cu ft
Total explosive weight .....	12.17 lb (5.52 kg)
Total weight (w/contents 6 fiber containers w/3 warheads and 3 motors, unassembled) .....	132.6 lb (60.1 kg) w/MK66 motor
Packing .....	1 warhead per fiber container, 1 motor per fiber container, unassembled, 6 fiber containers (3 warheads and 3 motors) in a box

**SHIPPING AND STORAGE DATA:**

DOD hazard class .....	(04) 1.3 G
DOT hazard class.....	1.3 G
DOT shipping class.....	A
DOT designation.....	AMMUNITION ILLUMINATING UN 0254
Field storage.....	Group D

**STORAGE AND SURVEILLANCE:**

Quantity Distance Class and Storage Data:

Warhead, Hydra 70, Illumination M278:

QD class .....	.1.3
Storage class .....	G
Total explosive weight .....	5 lb
Filler .....	Pyrotechnic flare

Rocket, Hydra 70, w/Warhead, Illumination, M278  
w/Fuze M442 and Rocket Motor MK66 Mod 2 or 4:

QD class .....	1.3
Storage class .....	G

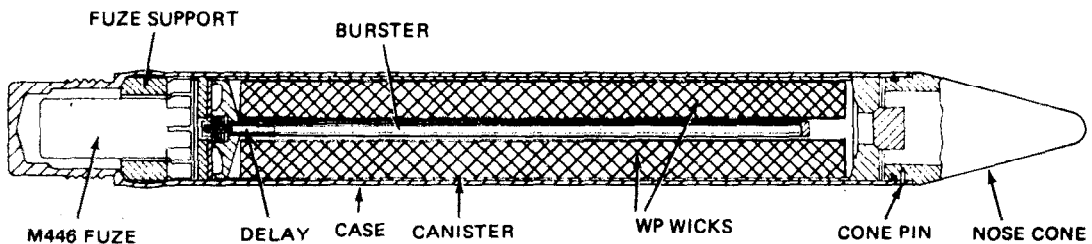
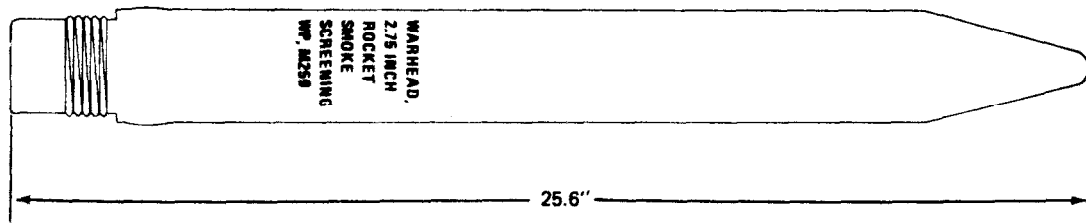
Total explosive weight .....	12.2 lb
Filler .....	Pyrotechnic flare and motor propel- lant

**NOTE**

Rocket, 2.75-Inch, Flare: w/Warhead M278 and Motor MK66 Mod 2 (DODIC H154) or Motor MK66 Mod 4 (DODIC HA10) is airworthiness certified for the A/MH6 and U/MH60 aircraft only, and will not be issued to units that do not use these aircraft.

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**ROCKET, 2.75-INCH, SMOKE SCREENING WP, M259**



ARD80-0525

Type Classification:

STD AMCTCM or OTCM 08786008

Use:

This rocket is used to provide a protective smoke screen. A group of rockets will provide a smoke screen for approximately five minutes. It is usually deployed from low speed rotary-wing aircraft.

Description:

The rocket warhead M259 consists of an aluminum casing, an internal canister assembly and a mechanical fuze with delay charge. The canister assembly consists of

ten white phosphorous (WP) filled submunitions, a central burster, and a pyrotechnic delay detonator system. The canister is 2-1/2-in. in diameter and 16-in. long with a rear end plate containing a central burster tube and a forward end plate containing a WP filling port and a closure plug. The submunitions are perforated steel sheet formed into two sets of five pie shaped containers packed with fiberglass. The fiberglass serves as a matrix for physically holding the WP and it restricts the flow of WP during functioning to produce a greater than five min smoke source. The central burster is primacord. The pyrotechnic delay detonator system initiates the burster. The M446 fuze is a mechanical escapement

type with a 4-1/2 second pyrotechnic delay, arming on acceleration and functioning at deceleration. The warhead base is externally threaded for attachment to a standard Mk 40 Mod 3 motor.

Functioning:

When the rocket motor is actuated the fuze is armed. Six seconds after launch the fuze actuates the expulsion charge to eject the canister assembly out the nose of the warhead, approximately 2500 m down range. This charge also ignites the central burster in the canister assembly, which after a 0.25 second delay, initiates the burster charge. When the burster charge functions, it ruptures the canister and disperses the submunitions.

Tabulated Data:

Rocket:

Model - - - - - M259  
 Type - - - - - White phosphorous  
 Weight - - - - - 19.6 lb (motor + whd)  
 Length - - - - - 62.9 in. (motor + whd)  
 Diameter - - - - - 2.75 in.

Components:

Fuze - - - - - M446  
 Weight - - - - - 0.6 lb (272 g)  
 Type - - - - - Mechanical-setback actuated fixed time

Warhead:

Weight - - - - - 8.75 lb  
 Diameter - - - - - 2.75 in.  
 Length - - - - - 25.6 in.

Filler:

Type - - - - - White phosphorous  
 Weight - - - - - 3.51b (1.59 kg)

Temperature limits:

Firing - - - - - -40° to +150°F  
 (-39.6° to +64.9°C)

Packing - - - - - 4 rockets consisting of Warhead, Smoke, WP, M259 with rocket motor per fiber container; 4 containers per wooden box

Packing box:

Weight - - - - - 135.0 lb  
 Dimensions - - - - - 72-4/5 in. x 8-3/4 in. x 9-1/2 in.

Cube - - - - - 3.5 ft<sup>3</sup>

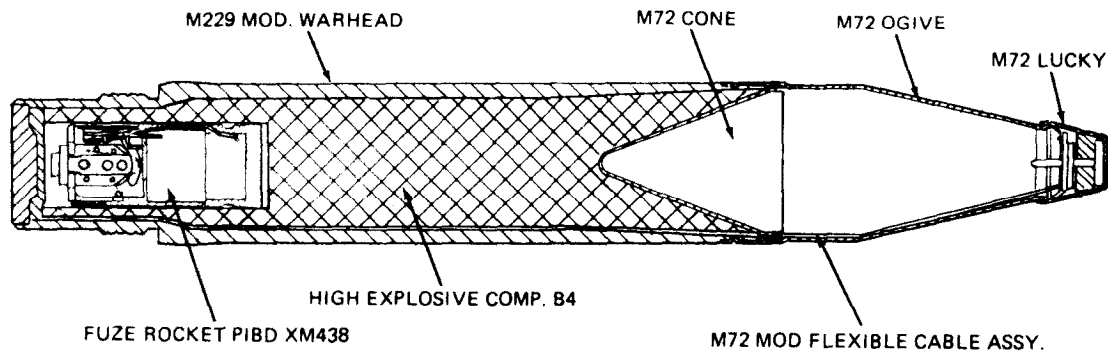
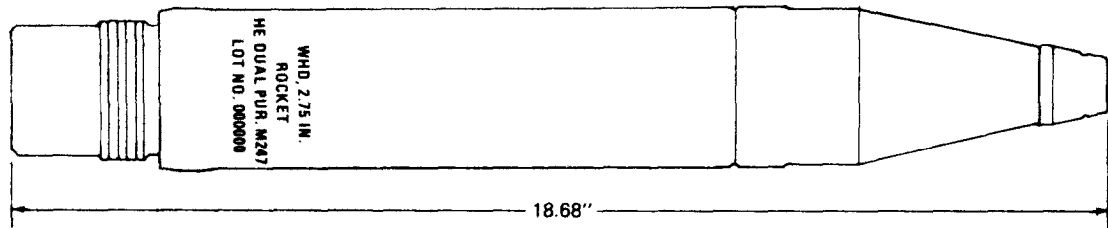
Shipping and Storage Data:

Storage class/  
 SCG - - - - - 1.2H (12)  
 DOT shipping class - - - - - A  
 DOT designation - - ROCKET AMMUNITION W/SMOKE PROJECTILES EXPLOSIVE A AND FLAMMABLE LABELS REQUIRED  
 Field storage - - - - - Group C  
 DODAC - - - - - 1340-H116  
 Drawing number - - - - - D90-1-332

References:

TM 9-1055-460-14  
 TM 9-1090-202-12  
 TM 9-1090-203-12  
 TM 9-1300-206  
 TM 9-1340-222-20  
 TM 9-1340-222-34  
 TM 750-244-5-1

**ROCKET, DUAL PURPOSE, 2.75-INCH HE W/WARHEAD, M247**



ARD80-0526

Type Classification:

LP 9354, LP-U 04736108

Use:

To meet the needs of simultaneously defeating enemy armor and personnel.

Description:

A low-spin folding-fin aircraft rocket (LSFFAR), air-to-ground primarily deployed from rotary-wing and other low-speed aircraft.

The warhead section configuration matches the weight and flight characteristics of the M151 HE warhead. The fragmentating body is a take-off from the M229 HE warhead. The shaped charge section is the copper liner core which was developed for a light antitank weapon (LAW).

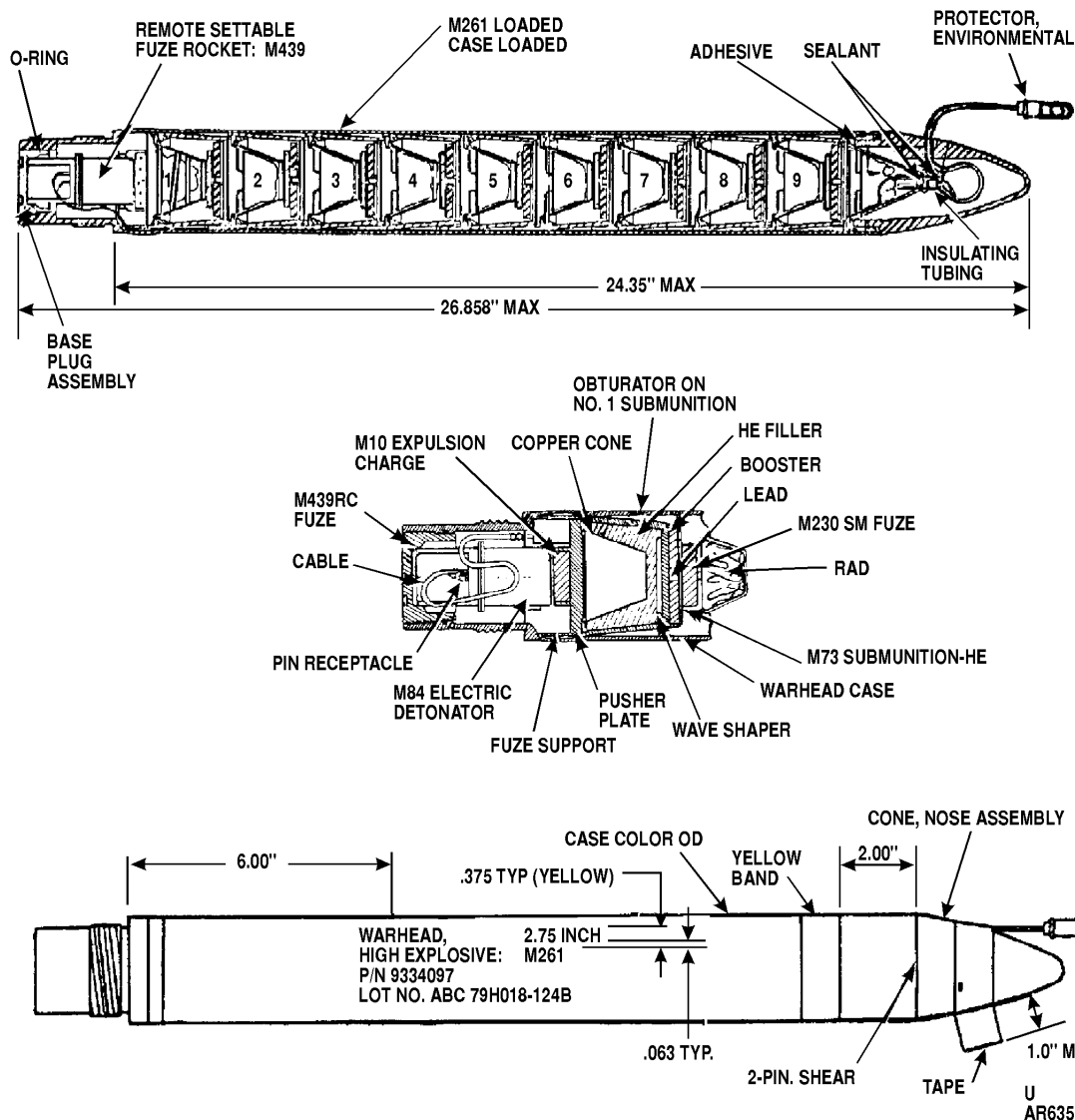
The warhead employs the M438 fuze. The armor penetration of this warhead is approximately the same as the M72 LAW with antipersonnel performance approximately 70 percent of that of the M151 HE warhead.

Functioning:

a. Fuze Functioning. The M438 is an integral point initiating, base detonating fuze for the M247 dual purpose warhead. The quick-response nature of the M247 warhead program dictated that standard, proven components be used for the design of its fuze. Therefore, the M438 fuze system consists of the initiating crystal from the M72 LAW, and the safety and arming device, thermal battery, and impact switch from the M429 proximity fuze. A component board assembly (CBA) is incorporated to provide fuze intelligence and safety,



## ROCKET, HIGH-EXPLOSIVE, 2.75-INCH, MULTIPURPOSE SUBMUNITION (MPSM) W/M261 WARHEAD



**TYPE CLASSIFICATION:**

STD (LCC-A)

**USE:**

The warhead contains nine each multipurpose submunitions for use against personnel, materiel, and light armor.

**DESCRIPTION:**

The complete round consists of a warhead with an integral fuze and a rocket motor.

The warhead consists of: a nose cone assembly, a warhead case, an integral fuze, nine submunitions, and an expulsion charge assembly. The nose cone assembly is a plastic cone bonded to a metal cup-shaped base and is attached to the body by shear pins. The body is a hollow cylinder loaded with nine full caliber multipurpose submunitions (MPSM). Each submunition has a folded Ram Air Decelerator (RAD) which nests into the shaped charge cone of the submunition ahead. The ninth (forward) submunition nests into the forward cup which makes up the base of the nose cone. A metal pusher plate is located just aft of the submunition cargo stack and is forward of the expulsion charge assembly. The threaded end of the body is machined internally to accommodate a base detonating, remote settable, variable range fuze.



The primary warhead fuze, M439 RC, is a resistance-capacitance electronic variable time delay fuze. The time delay is remotely set for the desired functioning distance (time) by charging the circuit from the fire control center. The fuze begins timing at the first motion of the rocket and will function at the prescribed time if the safety and arming device (S&A) is armed. The S&A is a mechanical acceleration integrator with an unbalanced rotor holding the M84 electric detonator and a runaway escapement. An acceleration greater than 27G's is necessary to arm the fuze. The M439 RC fuze is a base mounted, forward firing fuze. The fuze connector cable extends from the fuze through the warhead (in a lengthwise channel) and exits the ogive for connection to the launcher by an umbilical cable.

The HE, MPSM M73 consists of a steel body with a fragmenting wall filled with Composition B explosive incorporating a shaped charge liner, LX14 booster, explosive lead charge, M230 omni-directional fuze with M55 detonator, wave shaper, and fabric drag device (RAD). The fragmenting body produces 10 grain fragments with a maximum velocity of approximately 5,000 fps.

The spin stabilized wraparound fin rocket is an air-to-ground rocket primarily deployed from rotary-wing and other low-speed aircraft. It can also be used on Air Force and Navy jet aircraft as well as in the Mobile Ground Launcher System.

**FUNCTIONING:**

The rocket motor functions when current passes through the launcher firing contact to the igniter in the rocket motor. The current generates the heat necessary to detonate the igniter charge which ignites the propellant grain. Combustion gases from the burning propellant pressurize the chamber and exhaust through the nozzle providing the unequal forces required for rocket thrust.

Upon receipt of the fire signal from the pilot, the remote fuze setter processes the proper time constant (delay) to the M439 RC electronic time fuze immediately prior to firing the rocket. The intervalometer delivers a 160 millisecond pulse interval. The pulse is divided into a 45 millisecond fuze charging pulse followed by a 45 millisecond rocket firing pulse. The remaining 70 milliseconds are used as dwell interval to maintain spacing between pairs of rockets fired.

After the rocket is fired and experiences sustained acceleration, the setback weight of the S&A device within the fuze moves rearward sufficiently to allow the roller attached to the unbalanced rotor to move out of the groove provided by the setback weight. Once the roller is free, the unbalanced rotor rotates in response to the acceleration forces. The rotation of the rotor is delayed by a runaway escapement which

provides an arming delay (a function of the acceleration) until the rocket is a safe distance from the aircraft. When the setback weight experiences the necessary magnitude of acceleration, the rotor will lock into place with the M84 detonator lined up with the propellant charge and the fuze is armed. The detonator is now connected to the firing circuit, the connection between the electronic module and the umbilical cable is broken, and electronic timing is started.

Depending upon the range setting, the detonator is initiated electrically and ignites the expelling charge 1.2 to 25 or more seconds after firing. Gases from the expelling charge force the pusher plate and cargo stack forward, shearing the nose cone (ogive) retaining pins and ejecting the submunitions into the airstream. The actual ejection range is some distance from the target as determined by the fire control computer along with the aircraft quadrant elevation (QE) based on aircraft elevation, ground speed, and range to target.

The M73 MPSM operation is as follows: Upon release of the submunitions into the airstream, the RAD high drag device inflates by Ram air forced through holes in air scoops. The arming stem in the M230 fuze breaks the safety shear wire and retracts, freeing the slider which is then moved across the runaway escapement delay to bring the detonator into line with the firing pin. The fuze is now fully armed. If the submunition should be subjected to an impact force applied in any direction, the sensing mass will move and release the locking ball holding the firing pin. The firing pin drives forward and initiates the detonator. The shaped charge liner penetrates armor or other material in line with its axis and the submunition body shatters into small, high velocity fragments to defeat soft targets.

**TABULATED DATA:**

Warhead:	
Type .....	2.75 in. Rocket, HE, Multipurpose Submunition (MPSM)
Weight (fuzed) .....	13.6 lb
Length (overall) .....	26.84 in. (max)
Body material .....	Extruded aluminum
Fuze (integral): .....	
Type (electronic) .....	M439 RC
Length .....	2.77 in.
Diameter .....	1.48 in. (max)
Delay element .....	Electronic
Delay time .....	Variable
Detonator .....	M84 electrical
Setback to arm .....	27 g
Arming distance .....	96 - 126 m

Expulsion charge .....	M10 (80%), black powder (20%)
Propellant weight .....	5.5 g
Filler (payload):	
Type .....	M73 HE Multipurpose Submunition (MPSM)
Quantity .....	9 ea
Weight:	
Each .....	1.2 lb
Total .....	10.8 lb
HE Charge (Comp B):	
Net HE quantity:	
Each .....	0.2 lb
Total .....	1.8 lb
Booster LX14:	
Each .....	0.631 lb
Total .....	0.279 lb
Detonator M55:	
Charge .....	Lead azide NOL#130, 55 mg
Lead, PBX-N5 .....	120 mg
Color .....	Olive drab w/yellow markings and a yellow band

SHIPPING AND STORAGE DATA (WARHEAD W/O MOTOR):

Quantity-distance class .....	1.1
Storage compatibility group .....	D
DOT shipping class .....	A
DOT designation .....	EXPLOSIVE PROJECTILES - DANGEROUS
Field storage .....	Group F

SHIPPING AND STORAGE DATA (WARHEAD W/O MOTOR):

Quantity-distance class .....	1.1
Storage compatibility group .....	E
DOT shipping class .....	A
DOT label .....	Explosive A
DOT designation .....	ROCKET AMMUNITION W/EXPLOSIVE PROJECTILES

Field storage .....	Group F
DODAC for complete round .....	1340-H464 (MK66 Mods 1 and 2); 1340-H165 (MK66 Mod 3); 1340-HA14 (MK66 Mod 4)

TEMPERATURE LIMITS:

Firing .....	-50°F to +150°F
Storage .....	-50°F to +160°F

DRAWINGS:

Warhead, 2.75-Inch, High Explosive, M261 .....	9334097
M261, Loaded Case Assembly .....	9334122
Grenade, General Purpose, High Explosive, M73 .....	9334143
MK66, Mod 1 Motor, Loaded Assembly (Navy) .....	233AS400

PACKING DATA:

Packaging for complete round .....	1 rocket consists of warhead M261 and rocket motor MK66 Mod 1, 2, 3, or 4 per fiber container; 4 containers per wooden box or metal container
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Packing box, wooden:

Weight with contents (4 warheads in containers):	
With inert motors .....	138 lb
With MK66 motors .....	162 lb
Weight unloaded .....	32 lb
Dimensions .....	72-13/16 in. x 8-11/16 in. x 9-1/2 in.
Cube .....	3.5 cu ft

Container, Metal, Ammunition (PA150):

Weight w/contents .....	161.86 lb
Dimensions .....	78.45 in. x 9.24 in. x 9.24 in.
Cube .....	3.9 cu ft

REFERENCES:

- TM 9-1300-200, Chapter 5
- TM 9-1055-460-13&P
- TM 9-1340-222-20
- TM 9-1340-222-34
- SB 742-1340-92-010
- MIL-STD-1168A (28 Feb 75)
- AR 385-64
- DA PAM 385-64



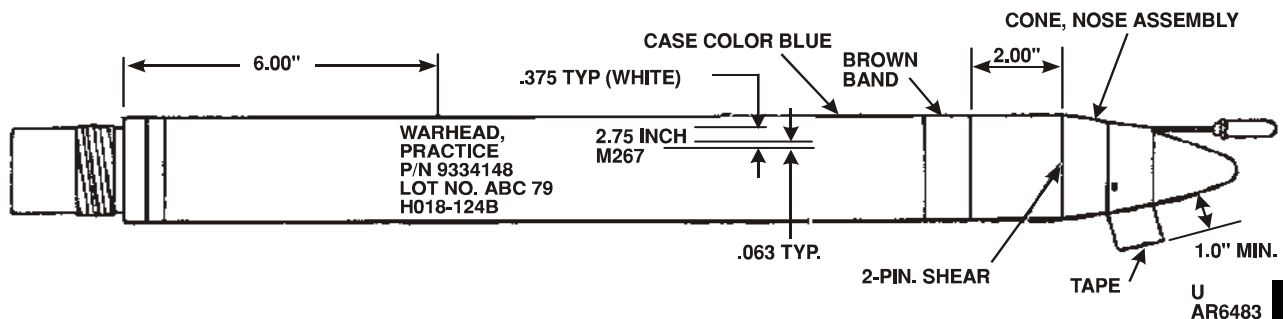
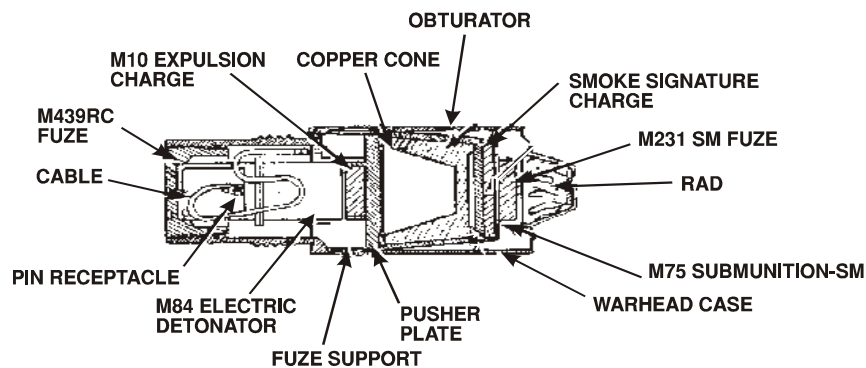
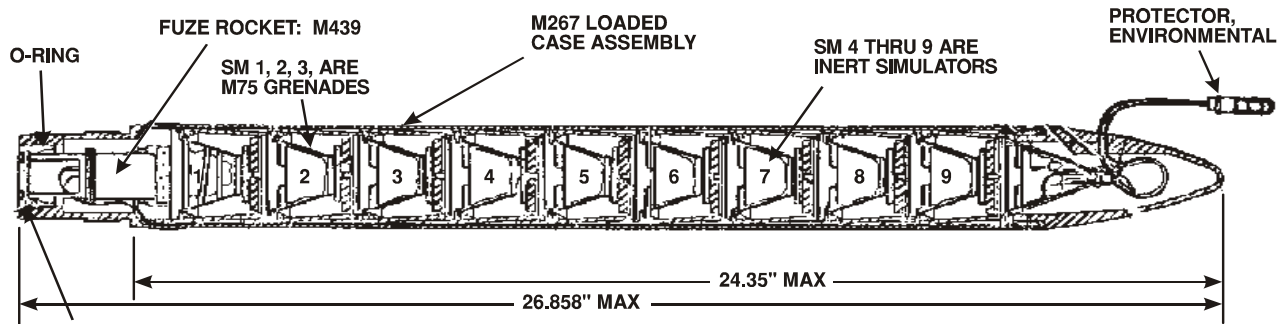
Premature expulsion of submunitions from the M261 warhead and its effect on fast moving aircraft are: normal deployment of submunition warheads will be from a helicopter hover position. However, if the aircraft is required to fire while moving forward at high speed (90 knots and higher), the aircraft can fly into/under the submunitions in the event of premature functioning of the warhead. This is due to the firing quadrant (QE) at long range target engagement (about 6 km) and assumes the aircraft will continue to fly forward in a straight line (same azimuth and elevation) for about 8

seconds after firing. Probability of premature expulsion is high (1 in 1000) and the resulting hazard risk of flying into/under the submunition cluster is also high. Depending upon the number of rounds fired in any given mission, the risk changes from 2 in 1000 to 7.6 in 100.

Correct use of the M261 submunition warheads at ranges less than 1000 meters is as follows: although the M261 warhead is designed for minimum engagement range of 1000 meters, the current rocket management system does allow a lower minimum range setting of 500 meters. At 500 meters, the hazard risk is estimated to be from 1.57 in 10,000,000 to 5.97 in 1,000,000, depending upon the number of rounds fired due to the decrease in separation distance between the aircraft and the submunitions. The acceptable level of risk is 1 in 1,000,000 for ammunition.

Motor blows and premature expulsion of submunitions from the M261 warhead can cause catastrophic hazard if fired over friendly troops and equipment. Firing over the heads of friendly troops and equipment is prohibited.

## ROCKET, 2.75-INCH, PRACTICE W/M267 WARHEAD



**TYPE CLASSIFICATION:**

STD (LCC-A)

**USE:**

The warhead contains three smoke signature multipurpose submunitions and six simulators for use in training and for practice firing.

**DESCRIPTION:**

The complete round consists of a warhead with an integral fuze and an MK66 Mod 1, 2, 3 or 4 spin-stabilized, wrap-around fin rocket motor.

The warhead consists of a nose cone assembly, a warhead case, an integral fuze, nine submunitions, and an expulsion charge assembly. The nose cone assembly is a plastic cone bonded to a metal cup-shaped base and is attached to the body by shear pins. The body is a hollow cylinder loaded with three full caliber practice submunitions and six simulators. Each submunition has a folded Ram Air Decelerator (RAD) which nests into the shaped charge cone of the submunition ahead. The ninth forward simulator assembles into the base of the nose cone. A metal pusher plate is located just aft of the submunition cargo stack and is forward of the expulsion charge assembly. The threaded end of the body is machined internally to accommodate a base detonating, remote settable, variable range fuze.

The primary warhead fuze, M439 RC, is a resistance-capacitance electronic variable time delay fuze. The time delay is remotely set for the desired functioning distance (time) by charging the circuit from the fire control center. The fuze begins timing at the first motion of the rocket and will function at the prescribed time if the safety and arming device (S&A) is armed. The S&A is a mechanical acceleration integrator with an unbalanced rotor holding the M84 electric detonator and a runaway escapement. An acceleration greater than 27G's is necessary to arm the fuze. The M439 RC fuze is a base mounted, forward firing fuze. The fuze connector cable extends from the fuze, through the warhead (in a lengthwise channel), and exits the ogive for connection to the launcher by an umbilical cable.

The M75 submunition consists of a steel body with a smoke signature flash charge and the identical outside configuration as the M73 HE grenade. It has the same weight and center of gravity as the loaded HE grenade. The M231 omni-directional fuze is used in this practice grenade.

The spin stabilized wrap-around fin aircraft rocket is an air-to-ground rocket primarily deployed from rotary-wing and other low-speed aircraft. It can also be used on Air Force and Navy jet aircraft as well as in the Mobile Ground Launcher System.

**FUNCTIONING:**

The rocket motor functions when current passes through the launcher firing contact to the igniter in the rocket motor. The current generates the heat necessary to detonate the igniter charge which ignites the propellant grain. Combustion gases from the burning propellant pressurize the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust.

Upon receipt of the fire signal from the pilot, the remote fuze setter processes the proper time constant (delay) to the M439 RC electronic time fuze immediately prior to firing the rocket. The intervalometer delivers a 160 millisecond pulse interval. The pulse is divided into a 45 millisecond fuze charging pulse followed by a 45 millisecond rocket firing pulse. The remaining 70 milliseconds are used as a dwell interval to maintain spacing between pairs of rockets fired.

After the rocket is fired and experiences sustained acceleration, the setback weight of the S&A device within the fuze moves rearward sufficiently to allow the roller attached to the unbalanced rotor to move out of the groove provided by the setback weight. Once the roller is free, the unbalanced rotor rotates in response to the acceleration forces. The rotation of the rotor is delayed by a runaway escapement which provides an arming delay (a function of the acceleration)

until the rocket is a safe distance from the aircraft. When the setback weight experiences the necessary magnitude of acceleration, the rotor will lock into place with the M84 detonator lined up with the propellant charge and the fuze is armed. The detonator is now connected to the firing circuit, the connection between the electronic module and the umbilical cable is broken, and electronic timing is started.

Depending upon the range setting, the detonator is initiated electrically and ignites the expelling charge 1.2 to 25 or more seconds after firing. Gases from the expelling charge force the pusher plate and cargo stack forward shearing the nose cone (ogive) retaining pins and ejecting the submunitions into the airstream. The actual ejection range is some distance from the target as determined by the fire control computer along with the aircraft quadrant elevation (QE) based on aircraft elevation, ground speed, and range to target.

The M75 submunition operation is as follows: Upon release of the submunitions into the airstream, the RAD high drag device inflates by Ram air forced through holes in air scoops. The arming stem in the M231 fuze breaks the safety shear wire and retracts freeing the slider which is then moved across the runaway escapement delay to bring the detonator into line with the firing pin. The fuze is now fully armed. If the submunition should be subjected to an impact force applied in any direction, the sensing mass will move and release the locking ball holding the firing pin. The firing pin drives forward and initiates the detonator. The detonator ignites the smoke pyrotechnic charge resulting in a brilliant flash and a puff of white smoke.

**TABULATED DATA:**

<b>Warhead:</b>	
Type .....	2.75-Inch Rocket, Practice, M267
Weight (fuzed) .....	13.6 lb
Length (overall) .....	26.86 in. (max)
Body material .....	Extruded aluminum (one piece)
<b>Fuze (Integral):</b>	
Type (electronic) .....	M439 RC
Length .....	2.77 in.
Diameter .....	1.48 in. (max)
Delay element .....	Electronic
Delay time .....	Variable
Detonator .....	M84 electrical
Setback to arm .....	27 g
Arming distance .....	96-126 m
Expulsion charge .....	M10 (80%), black powder (20%)
Propellant weight .....	5.5 g

Filler (payload):  
 Type ..... M75 SM  
 Quantity ..... 3 ea M75 and 6 ea inert simulators

Weight:  
 Each ..... 1.2 lb  
 Total ..... 10.8 lb

Smoke charge:  
 Aluminum powder ..... 67%  
 Potassium Perchlorate ..... 33%

Net quantity:  
 Each ..... 0.04 lb (17 g)  
 Total ..... 0.12 lb (51 g)

Detonator M55:  
 Charge ..... Lead azide - NOL #130 55 mg  
 Color ..... Blue w/white markings and brown band

**TEMPERATURE LIMITS:**

Firing ..... 50° to +150°F  
 Storage ..... 50° to +160°F

**DRAWINGS:**

M267 warhead ..... 9334148  
 M267 Loaded Case Assembly ..... 9334123  
 Grenade, General Purpose, Practice, M75 ..... 9334151  
 M267 warhead w/MK66  
   Mod 1 motor ..... 13058370-2  
 M267 warhead w/MK66  
   Mod 2 motor ..... 13058370-4  
 M267 warhead w/MK66  
   Mod 3 motor ..... 13058370-8  
 M267 warhead w/MK66  
   Mod 4 motor ..... 13058370-28

**PACKING DATA:**

Packing for complete round ..... 1 rocket consists of warhead M267 and rocket motor MK66 Mods 1, 2, 3, or 4 per fiber container; 4 containers per wooden box or metal container

Packing box, wooden:  
 Weight with contents (4 warheads in containers):  
   With inert motors ..... 138 lb  
   With MK66 motors ..... 162 lb  
 Weight unloaded ..... 32 lb  
 Dimensions ..... 72-13/16 in. x 8-11/16 in. x 9-1/2 in.  
 Cube ..... 3.5 cu ft

Container, Metal, Ammunition (PA150):  
 Weight w/contents ..... 162 lb  
 Dimensions ..... 78.45 in. x 9.24 in. x 9.24 in.  
 Cube ..... 3.9 cu ft

**SHIPPING AND STORAGE DATA (COMPLETE ROUND):**

Hazard class/division and storage compatibility ..... (04) 1.2 G  
 DOT shipping class ..... A  
 DOT designation ..... ROCKET AMMUNITION WITH SMOKE PROJECTILE  
 DODAC ..... 1340-H873 (M267 warhead); 1340-H463 w/MK66 Mod 1 motor; 1340-H463 w/MK66 Mod 2 motor; 1340-H974 w/MK66 Mod 3 motor; 1340-HA17 w/MK66 Mod 4 motor

**REFERENCES:**

MIL-STD-1168A (28 Feb 75)  
 SB 742-1340-92-010  
 TM 9-1055-460-13&P  
 TM 9-1300-200, Chapter 5  
 TM 9-1340-222-20  
 TM 9-1340-222-34  
 AR 385-64  
 DA PAM 385-64

**WARNING**

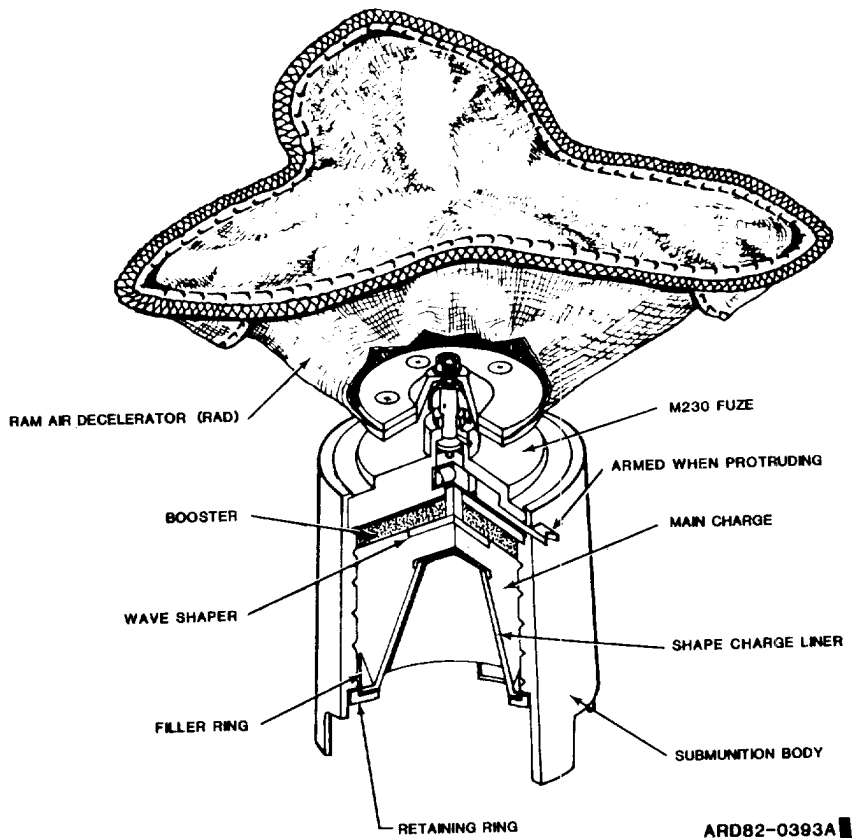
Premature expulsion of submunitions from the M267 warhead and its effect on fast moving aircraft are: normal deployment of submunition warheads will be from a helicopter hover position. However, if the aircraft is required to fire while moving forward at high speed (90 knots and higher), the aircraft can fly into/under the submunitions in the event of premature functioning of the warhead. This is due to the firing quadrant elevation (QE) at long range target engagement (about 6 km) and assumes the aircraft will continue to fly forward in a straight line (same azimuth and elevation) for about 8 seconds after firing. Probability of premature expulsion is high (1 in 1000) and the resulting hazard risk of flying into/under the submunition cluster is also high. Depending upon the number of rounds fired in any given mission, the risk changes from 2 in 1000 to 7.6 in 100.

Correct use of the M267 submunition warheads at ranges less than 1000 meters is as follows: although the M267 warhead is designed for minimum engagement range of 1000 meters, the current rocket management system does allow a lower minimum range setting of 500 meters. at 500 meters, the hazard risk is estimated to be from 1.57 in 10,000,000 to 5.97 in 1,000,000, depending upon the number of rounds fired due to the decrease in separation distance between the aircraft and the submunitions. the acceptable level of risk is 1 in 1,000,000 for ammunition.

Motor blows and premature expulsion of submunitions from the M267 warhead can cause catastrophic hazard if fired over friendly troops and equipment. Firing over the heads of friendly troops and equipment is prohibited.

GRENADE, GENERAL PURPOSE, HE: M73  
 MULTIPURPOSE SUBMUNITION (MPSM), HIGH EXPLOSIVE

M73 SUBMUNITION (ARMED)



Type Classification:

STD (LCC-A)

Use:

The M261 warhead contains 9 each MPSM'S M73 for use against personnel, materiel, and light armor.

Description:

The submunition grenade consists of a full caliber, cylindrical tapered steel casing, prescored internally for controlled fragmentation, a Ram Air Decelerator (RAD) device for orientation and stabilization, a truncated shaped charge liner.

wave shaper and the M230 omni-directional fuze with explosive train. The kill mechanism is a truncated subcaliber, 44° included angle, shaped charge copper liner 33.02mm (1.3 in.) high. The submunition detonation is initiated by the M230 fuze which is armed by the action of the Ram Air Decelerator on ejection from the warhead.

Functioning:

When the warhead fuze functions, the expulsion charge is initiated and, by means of a pusher plate, presses the submunitions forward until the nose cone retaining pins are sheared and the submunitions are expelled into the airstream. The RAD high drag device inflates and turns the submunition forward and toward the ground.



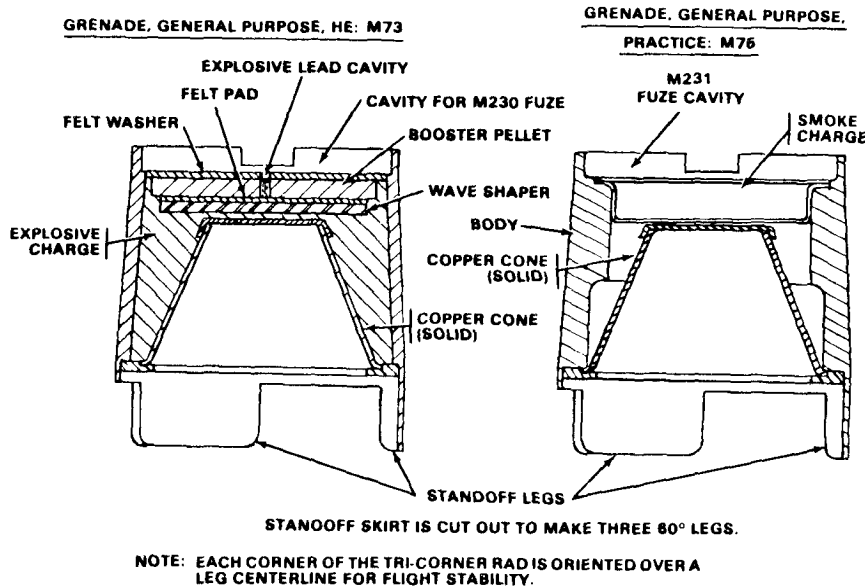
The shock of inflation by Ram air forced through holes in the air-scoops in the RAD exerts a strong drag on the arming stem in the M230 fuze, in excess of 20 pounds, which breaks the safety shear wire. The fuze arming stem retracts approximately 0.110 inch and the arming pin at the base of the stem is withdrawn from the slider. The slider is then driven across the runaway escapement delay mechanism by its spring to bring the detonator into line with the firing pin. The fuze is now fully armed. If the submunition should be subjected to an impact force applied in any direction (as striking the ground or a vehicle), the sensing mass will move and release the locking ball holding back the spring loaded firing pin. The firing pin is driven forward and initiates the M55 stab detonator. The detonator sets off, in sequence, the explosive lead, the booster charge, and the high explosive main charge. The shaped charge lines penetrates light armor or other material in line with its axis and the submunition body shatters into small, high velocity fragments to defeat soft targets.

Tabulated Data:

Nomenclature: Grenade, General Purpose: M73

Length, fuzed with folded RAD (approx) -----	4 in
Diameter (max) -----	2.55 in
Material, steel, thickness -----	0.125 in
Weight, loaded -----	1.2 lb
Explosive charge, Comp B, net -----	0.2 lb (90 g)
Detonator, M55, and PBX-N5 lead, charge -----	1.75 mg
Rooster LX14 -----	0.031 lb (14 g)
Cone, material -----	Copper
D i a m e t e r -----	50.8mm (2 in.)
Height (truncated) -----	33.02mm (1.3 in.)
Angle, included -----	4 4°
Standoff -----	19.3mm (0.76 in.)
Wave shaper material -----	Lead
Fragments:	
Weight -----	10 gr
Shape, platelet -----	2.54x6.15x6.15mm
Total number (approx) --	195
Fuze:-----	M230
Weight (approx) -----	0.25 lb
Drawing No. -----	9333825
Grenade Drawing No. -----	9334143

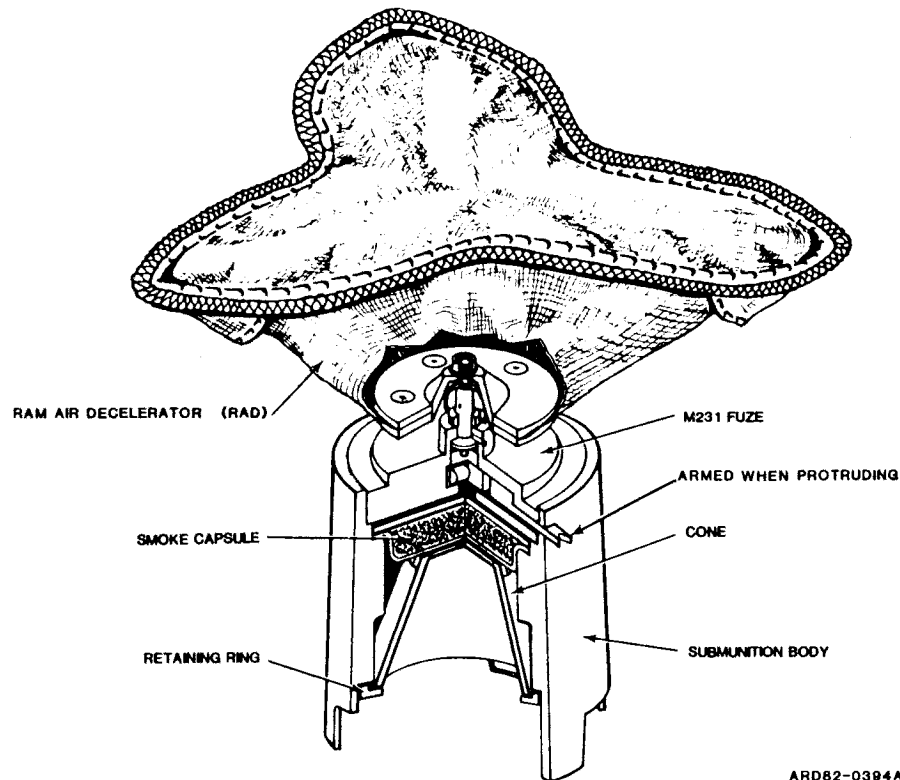
Comparison of HE and Practice Grenades



ARD 80-0177B

GRENADE, GENERAL PURPOSE, PRACTICE: M75

M75 SUBMUNITION (ARMED)



Type Classification:

STD (LCC-A)

Use:

The M267 warhead contains 3 each M75 practice submunitions and 6 inert simulators for use in training.

Description:

The M75 submunition consists of a steel body with a smoke signature flash charge. The body has the identical outside configuration as

the M73 HE grenade. However, the wall is thicker and is machined out so that the finished grenade with the smoke capsule has the same weight and center of gravity as the loaded HE grenade. The smoke/flash charge consists of 17 grams of a mixture of potassium perchlorate (33%) and aluminum powder (67%). The charge is ignited by the M55 detonator in the M23 omni-directional fuze. The M231 fuze is identical to the M230 fuze (used with the HE grenade) except that there is no explosive lead and no booster pellet. There is no wave shaper; the smoke capsule is directly below the fire hole of the fuze.

Functioning:

The functioning of the M75 grenade is similar to that of the M73 HE grenade and the submunition fuze M231 functions the same as the M230 fuze. When the grenade is armed (the slider now projects approximately 0.25 inch out of the grenade body), and if it is subjected to an impact force applied in any direction (by striking the ground or a hard object), the sensing mass moves on its pivot and releases the locking ball holding back the firing pin. The firing pin, driven by its spring, strikes the M55 stab detonator which, in turn, ignites the smoke pyrotechnic charge, resulting in a brilliant flash and a puff of white smoke.

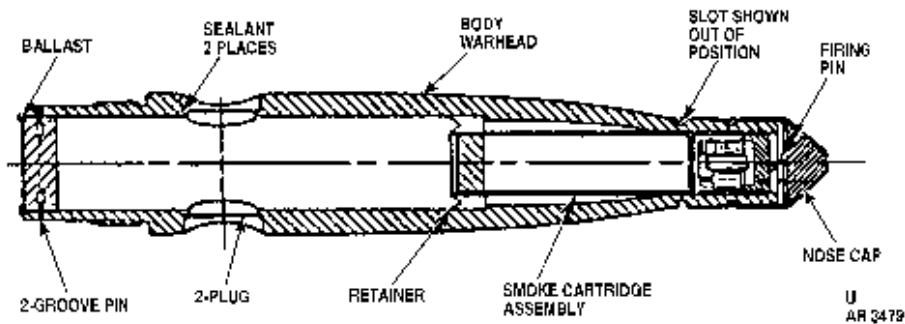
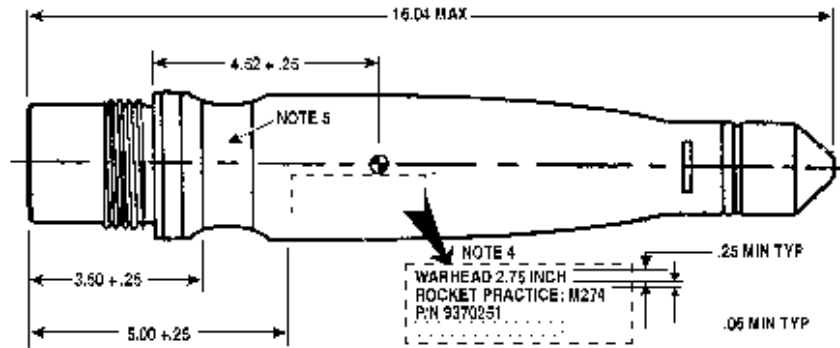
Tabulated Data:

Nomenclature: Grenade, General Purpose, Practice: M75

Tabulated Data: (continued)

Length, fuze with folded RAD (approx) -----	4 in.
Diameter (max) -----	2.55 in.
Material -----	Steel (low Carbon)
Weight, loaded -----	1.2 lb
Smoke charge (33% potassium chlorate/67% aluminum powder) -----	17 g (0.04lb)
Cone material -----	Copper
Diameter -----	50.9mm (2 in.)
Height (truncated) -----	33.02mm (1.31 in )
Angle (included) -----	44
Fuze: -----	M231
Drawing No. -----	9345168
Grenade Drawing No -----	9334151

# ROCKET, SMOKE, SIGNATURE, PRACTICE, 2.75-INCH WARHEAD, M274



**TYPE CLASSIFICATION:**

STD.

**USE:**

This warhead is used for training and support testing purpose.

**DESCRIPTION:**

The M274 warhead is a modified version of the WTU-1/B Cast Iron Inert Practice Warhead. The modification consists of the addition of a sealed S&A and smoke cartridge, nose cap, firing pin, retainer ring, and blow plugs. It is employed with the low-spin folding-fin MK40 motor and the spin-stabilized wrap-around fin MK66 motor Mods 1, 2, 3, and 4.

The rocket motors are described in chapter 5.

**FUNCTIONING:**

Functioning of the 2.75-inch rocket with an M274 warhead begins when the firing circuit switch is closed. Current passes through the launcher firing contact to the igniter in the rocket motor. This current generates the heat necessary to

initiate the igniter charge, which ignites the propellant grain. Combustion gases from the burn propellant pressurize the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust.

The acceleration of the rocket motor causes the S&A device to arm. Upon ground impact, the nose cap collapses and drives the firing pin into the primer, resulting in initiation of the smoke charge, which provides the visible signature.

**TABULATED DATA:**

Rocket:	
Type .....	MK40, Mod 3; MK66, Mod 1, 2, 3, and 4
Diameter .....	2.75 in. nominal
Length .....	52.7 in. (w/MK40 Mod 3 motor); 55.473 in. (w/ MK66 series motor)
Weight .....	20.7 lb (w/MK40 Mod 3 motor); 22.9 lb (w/MK66 series motor)

**TM 43-0001-30**

Warhead:.....  
 Model..... M274  
 Type..... Smoke signature,  
 practice  
 Body material..... Iron  
 Color..... Blue, white mark-  
 ings w/brown band  
 Length..... 16.04 in.  
 Weight..... 9.3 lb  
 Spotting Charge:  
 Type..... Potassium Perchlor-  
 ate/Aluminum  
 Powder  
 Weight..... 70.5 g  
 Explosive:  
 S&A device..... EX-100  
 Primer..... M104  
 Detonator..... M85  
 Lead..... NA  
 Booster..... NA

**TEMPERATURE LIMITS:**

Storage..... -65° to 150°F  
 (-54° to 65.5°C)  
 Operation..... -65° to 150°F  
 (-54° to 65.5°C)

**PACKING DATA:**

Packing..... 1 rocket consisting  
 of warhead M274  
 and motor per fiber  
 container, 4 fiber  
 containers per wood  
 box or metal con-  
 tainer

**Wood box:**

Weight w/contents (4 fiber  
 containers w/4 complete  
 rockets)..... 127 lb (w/MK40  
 Mod 3 motor);  
 142 lb (w/MK66  
 series motor)

Dimensions..... 62-13/16 in. x 8-11/  
 16 in. x 9-1/2 in.  
 (w/MK40 Mod 3  
 motor);  
 66 in. x 8-1/2 in. x  
 9-1/2 in. (w/MK66  
 series motor)  
 Cube..... 36 cu ft (w/MK40  
 Mod 3 motor);  
 37 cu ft (w/MK66  
 series motor)

**Container, Metal, Ammunition  
 (PA151):**

Weight w/contents..... 147 lb  
 Dimensions..... 70.70 in. x 9.24 in.  
 x 9.24 in.  
 Cube..... 3.5 cu ft

**SHIPPING AND STORAGE DATA:**

Storage class/SCG..... 1.3 C  
 DOT shipping class..... J  
 DOT designation..... ROCKET  
 AMMUNITION  
 WITH SMOKE  
 PROJECTILES  
 DODAC..... 1340-H872 (M274  
 warhead); 1340-  
 H971 w/MK40  
 Mod 3 motor; 1340-  
 H972 w/MK66  
 Mod 1 motor; 1340-  
 H973 w/MK66  
 Mod 2 motor; 1340-  
 H975 w/MK66  
 Mod 3 motor; 1340-  
 HA13 w/MK66  
 Mod 4 motor

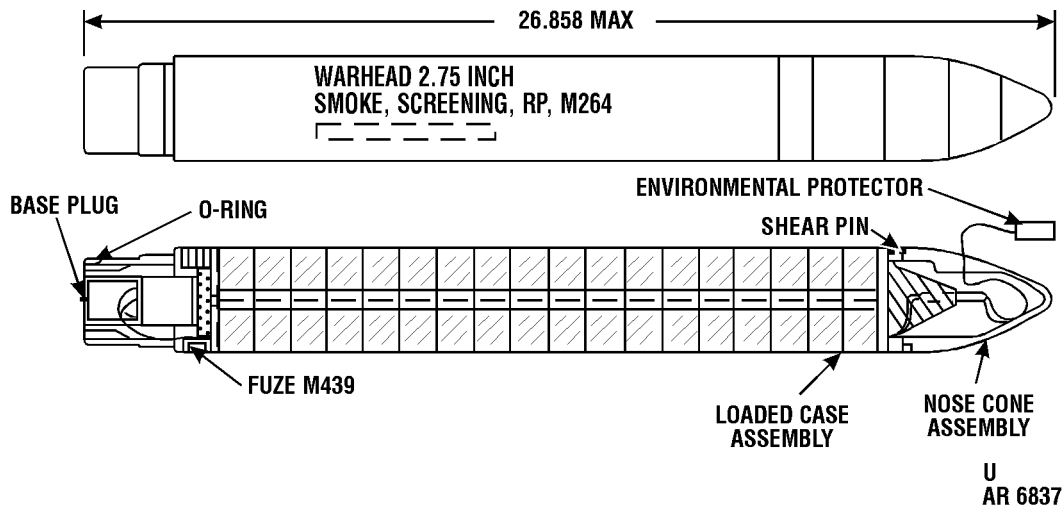
**DRAWINGS:**

M274 warhead..... 9370251  
 W/MK40 Mod 3 motor..... 13296200-1  
 W/MK66 Mod 1 motor..... 13058371-6  
 W/MK66 Mod 2 motor..... 13058371-7  
 W/MK66 Mod 3 motor..... 13058371-11

**REFERENCES:**

TM 9-1340-222-20  
 TM 9-1340-222-34

## ROCKET, 2.75-INCH SMOKE SCREENING, RP, M264



### TYPE CLASSIFICATION:

TBD

### USE:

This rocket is used to provide a protective smoke screen. A group of rockets will provide a smoke screen for approximately five minutes. It is usually deployed from low speed rotary-wing aircraft.

### DESCRIPTION:

The rocket warhead M264 consists of an aluminum casing, an M439 electronic time fuze, an expulsion charge assembly, 72 smoke pellets, felt separators coated with an absorbent material, a base nose cone assembly, and a (outer) nose cone assembly. The smoke pellets are made from a red phosphorus composition which contains an epoxy binder. Each pellet is a 1-inch high, 90 degree wedge with a 1.25 outer radius and a 0.25 inner radius. They are assembled into 18 layers of 4 pellets each separated by the felt separators. The inner radii forms a flash hole that extends the length of the stack. The fuze is located in the warhead base connected to a cable that runs the length of the warhead with an umbilical connector which protrudes out the nose cone. The warhead base is externally threaded for attachment to a standard MK66 Mod 3 or Mod 4 rocket motor.

### FUNCTIONING:

The 2.75-inch rocket with M264 warhead can only be fired off the APACHE helicopter platforms (AH-64A and AH-

64D) using either the M260 (7-tube) or M261 (19-tube) rocket launchers. When the rocket is loaded into the launcher, the warhead umbilical connector is plugged into the front of the launcher and the firing connection is made to the back of the rocket motor. The gunner selects how many rockets to fire, aims, and fires from inside the cockpit. An on-board computer calculates time-to-target, sets the fuze, and launches the rocket.

The fuze arms upon motor burnout and at the predetermined time will function the expulsion charge. The hot gases from the burning expulsion charge will travel up the center of the pellet stack igniting the RP pellets. Upon expulsion, the burning pellets disburse and fall to the ground producing a voluminous cloud of white smoke.

### TABULATED DATA:

Rocket:	
Model .....	M264
Type .....	Smoke, screening
Weight .....	22.2 lb (motor + whd)
Length .....	66.1 in. (motor + whd)
Diameter .....	2.75 in.
Warhead:	
Weight .....	8.5 lb
Length .....	26.9 in.
Diameter .....	2.75 in.
Filler:	
Type .....	Red phosphorous pellets

Weight..... 5.2 lb (2.3 kg)  
 Fuze:  
 Model..... M439  
 Type ..... Remote-Settable  
                     RC time  
 Weight..... 0.6 lb (272 g)  
 Motor:  
 Model..... MK66 Mod 3 and  
                     Mod 4  
 Weight..... 13.65 lb  
 Length..... 41.7 in.  
 Diameter ..... 2.75 in.

**DRAWINGS:**

Drawing number..... 90-1-350

**TEMPERATURE LIMITS:**

Firing ..... -50° to +150°F  
                     (-39.6° to +64.9°C)

**PACKING DATA:**

Packing container:  
 Weight (loaded)..... 145 lb  
 Dimensions ..... 78.45 in. x 9.25 in.  
                                     x 9.25 in.  
 Cube..... 3.88 ft<sup>3</sup>

**SHIPPING AND STORAGE DATA:**

Storage compatibility group/SCG ..... G  
 DOT hazard classification..... 1.2  
 Nomenclature ..... 4-Rocket 2.75 Inch:  
                                     Warhead, M264  
                                     and Motor MK66  
                                     Mod 3

DOT container marking ..... AMMUNITION,  
   INCENDIARY,  
   UN0009  
 Field storage..... Group 1.2 G  
 DODAC ..... 1340-H184 w/  
                                     MK66 Mod 3  
                                     motor; 1340-HA15  
                                     w/MK66 Mod 4  
                                     motor

**REFERENCES:**

TM 9-1055-460-13&P  
 TM 9-1340-222-20  
 TM 9-1340-222-34  
 TM 43-0002-33



Premature expulsion of pellets from the M264 warhead can cause burning red phosphorous to fall on unprotected friendly troops and flammable equipment and cause burns and fires. Firing over the heads of unprotected troops and flammable equipment is prohibited.

When firing the M264 at ranges beyond 5 km, reduce helicopter velocity to 90 knots or less prior to firing. This will preclude inadvertent ingestion of red phosphorous pellets into the engine intake if a premature function/expulsion of the M264 warhead occurs during launch.

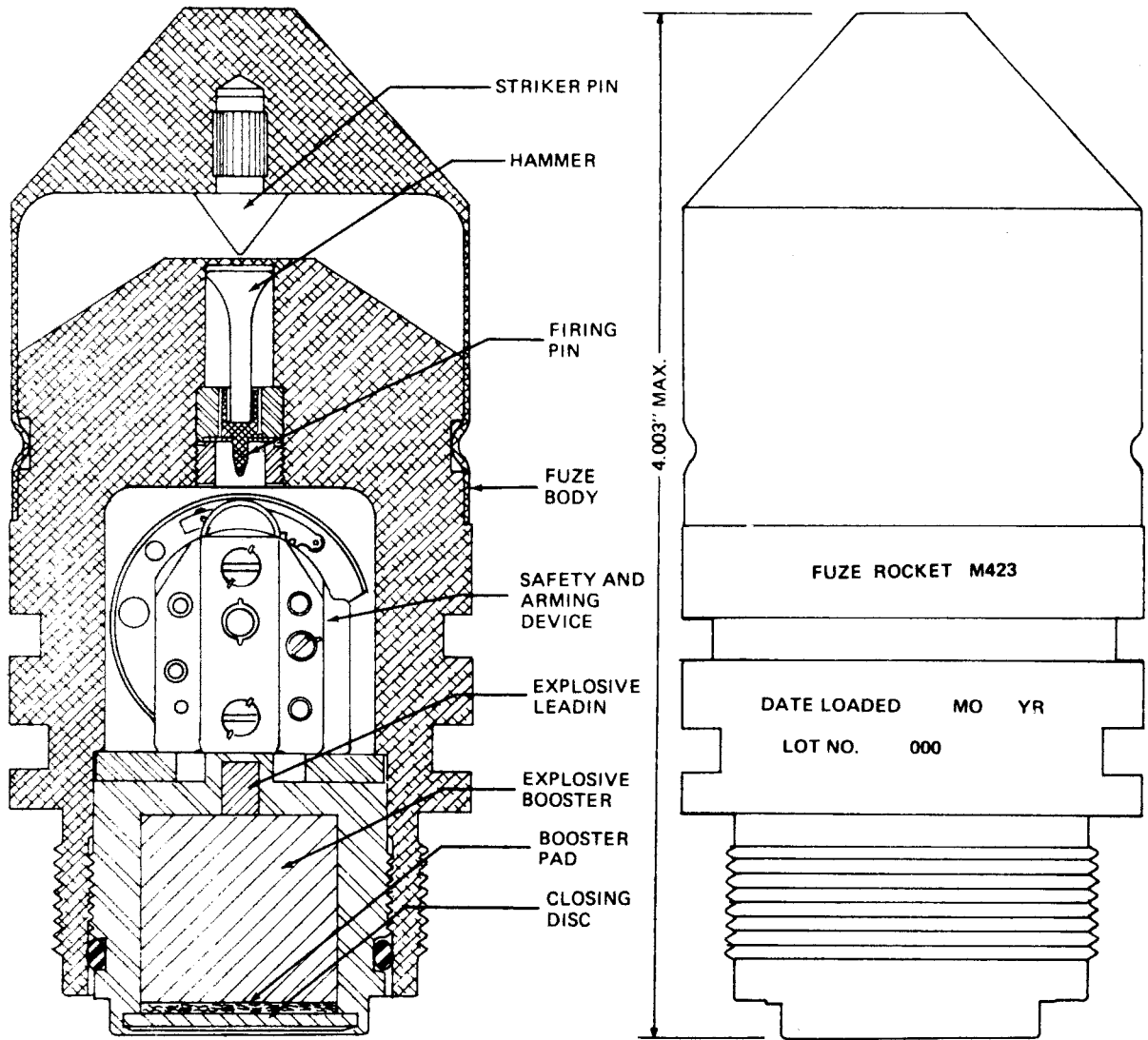
CHAPTER 4

FUZES W/2.75-INCH ROCKETS



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**FUZE, POINT DETONATING, M423 (M427)**



ARD80-0514

**Type Classification:**

STD AMCTCM 3233

**Use:**

These fuzes are oblique impact sensitive, point detonating, super-quick types. Refer to paragraph 3-1, Table 3-1 for the authorized warheads which use this fuze.

**Description:**

These fuzes consist of the following major assemblies:

- (1) The striker-pin body assembly consists of an aluminum body with a press-fitted steel striker pin. The lower portion of the body is secured to the firing pin body by a circumferential crimp. Upon impact,

crush-up initiates the primer and subsequent explosive train.

(2) The firing pin body assembly consists of a firing pin body, plastic hammer, firing pin sleeve, anti-setback washer, firing pin nut, and firing pin. The threads on the lower portion of the body assembly are used for assembling the fuze to the warhead.

(3) The safety-and-arming device consists of a rotor-housing assembly and unbalanced rotor assembly, an escapement assembly and setback weight. The unbalanced rotor assembly houses the primer and detonator and is maintained in the unarmed (out-of-line) position.

(4) The booster assembly consists of a booster housing, lead-in cup and appropriate explosive charges. The threads on the booster housing enable the booster assembly to be threaded into the lower portion of the firing pin body.

Differences between Models:

Externally the M427 fuze is identical to the M423 fuze. The M427 differs from the M423 in that its internal construction is designed to produce the longer arming time and arming distance required for launch from high-speed aircraft. For the authorized warheads which use these fuzes, refer to paragraph 3-2, Table 3-1.

Functioning:

When the rocket motor is fired, sustained acceleration permits the set-back (inertial mass) weight to move rearward. This releases the unbalanced rotor which, in rotating, drives the escapement and gear assembly. The rotor arms when it

has traveled the specified arming distance from the launcher. It is locked in the armed position by a spring-loaded pin. The rotor will return to the unarmed position if the minimum rocket energy (product of acceleration and time) is not sustained throughout the arming distance. Upon impact, the striker-pin body walls are crushed between the target and the firing pin body. The firing pin then impacts with the safety and arming mechanism, firing the primer and detonator, respectively. The detonator initiates the explosive train.

Tabulated Data:

Models	-----	M423, M427
Type	-----	Mechanical, point-detonating
Weight	-----	0.75 lb
Length (total)	-----	4.0 in.
Intrusion	-----	0.90 in.
Diameter	-----	1.75 in.

Shipping and storage data:

Storage class/	
SCG	-----M423-1.2 (04) M427-1.1
DOT shipping	
class	-----M423-C & M427-A
DOT	
designation	----- DETONATING FUZES, CLASS A/C EXPLOSIVES - HANDLE CARE- FULLY DO NOT STORE OR LOAD WITH ANY HIGH EXPLOSIVES
Field storage	--- Group B

DODAC :

M423	-----	1340-J349
M427	-----	1340-J346

Drawing numbers:  
 M 4 2 3 ..... 8883683  
 M427. .... 8883745

Color ..... Olive drab w/black markings

Temperature Limits:  
 Firing ..... -65° to +165°F (-53.35° to +73.15°C)  
 Storage ..... -65° to +165°F (-53.35° to +73.15°C)

Explosive: train:  
 Primer ..... Stab M104  
 Detonator ..... Mk 59  
 Load ..... Tetryl  
 Booster ..... Tetryl

Explosive weight ..... 0.32 oz (9g)

Arming distance:  
 M 4 2 3 ..... 46.9-101 yd (43-92 m) **█**  
 M427 ..... 220-396 yd (200-360 m)

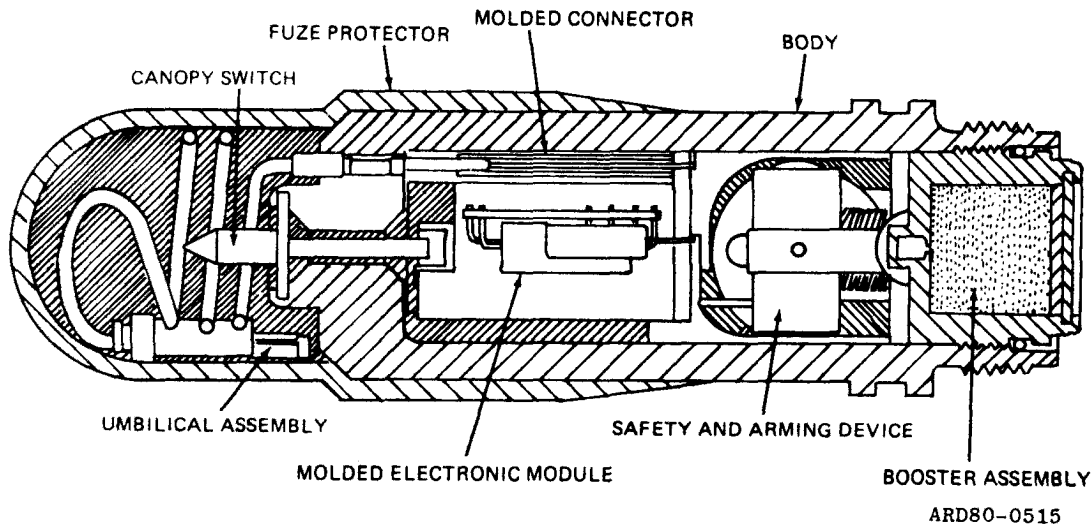
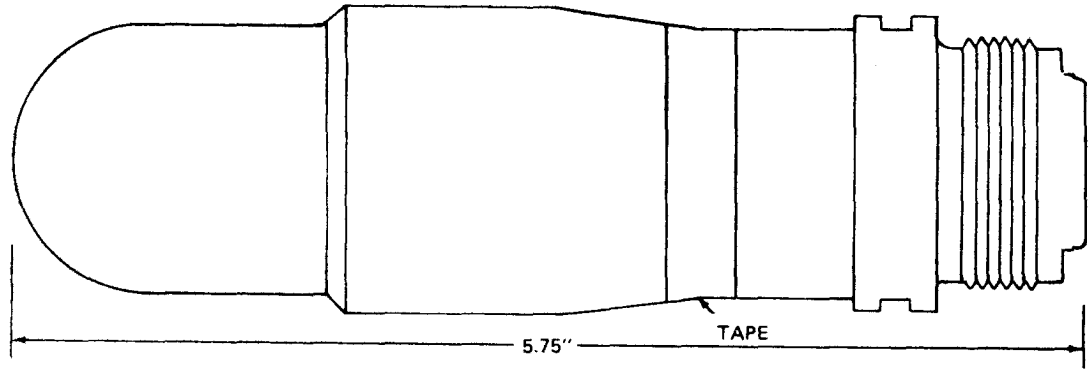
Rocket terminal angle ..... 5° - 90°  
 Packing ..... 12 per metal container; 2 containers per wire bound box

Packing box:  
 Weight ..... 39.8 lb (17910 g)  
 Dimensions ..... 14-5/8 in. x 12-13/16 in. x 9-1/8 in.

Cube ..... 1.0 ft<sup>3</sup>



**FUZE, ROCKET, ELECTRONIC TIME, M433**



Type Classification:

STD MSR

Use:

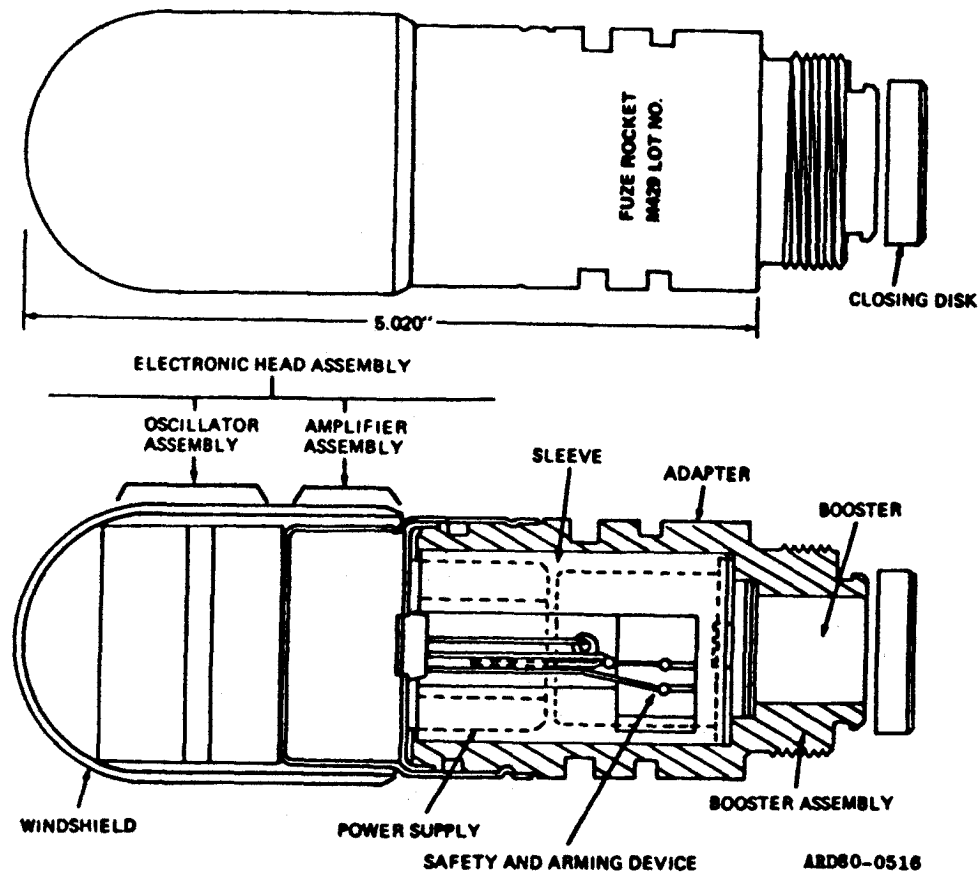
This fuze is an electronic multi-option time delay fuze with selectable functioning modes for forest canopy penetration, bunker structure penetration and super-quick for open terrain. Refer to paragraph 3-2, Table 3-1 for the authorized warheads which use this fuze.

Description:

The fuze body is steel. A forest canopy switch extends from the nose of the fuze to signal to the fuze electronic circuit when first contact is made with the forest canopy. An umbilical assembly is positioned at the nose of the fuze for electrical connection to the M433 Fuze Safety and Timing Device located in the helicopter. Internally, the fuze consists of a resistance capacitance (RC) electronic time circuit, a safing and arming mechanism with an electrical M84



**FUZE, ROCKET, PROXIMITY, M429**



**Type Classification:**

AMCTCM or OTCM 6393

**Use:**

This fuze is an all transistorized, continuous wave, doppler device to provide airburst characteristics. It was designed primarily for use with HE warheads for improved anti-personnel effectiveness. Refer to paragraph 3-2, Table 3-1 for the authorized warheads which use this fuze.

**Description:**

A super-quick impact switch serves as a backup in the event of failure of the

airburst electronics. The arming mechanism is similar to that contained in the M423/M427 Fuze except that it has been modified to include an electric detonator as well as a battery starter assembly to initiate an electric battery. An electric detonator is assembled in the rotor. A plastic (lexan) sleeve houses the thermal battery which is located directly above the safety and arming device.

**Differences between Models:** N/A

**Functioning:**

The battery starter assembly is activated when an interlock arm secured to the rotor releases a spring-activated firing



pin after the first 25° of rotor rotation. After 60° of rotation the electrical circuit is completed. Activation of the battery initiates a continuous radio frequency (RF) signal and charges the firing capacitor. When the reflected signals reach a specific intensity, the amplifier firing circuit provides a pulse to the firing circuit by discharging a firing capacitor through the electric detonator.

**Tabulated Data:**

Model - - - - - M429  
 Type - - - - - Electrical  
 Weight - - - - - 0.80 lb  
 Length (total) - - - - - 5.91 in.  
 Intrusion - - - - - 0.9 in.  
 Diameter - - - - - 1.89 in.  
 Color - - - - - Olive drab w/black marking; white nose

**Temperature limits:**

Firing - - - - - -40° to +140°F  
 (-39.6° to +59.0°C)  
 Storage - - - - - -40° to +140°F  
 (-39.6° to +59.0°C)

**Explosive train:**

Detonator - - - - - Stab, M81  
 Booster - - - - - Tetryl

**Total explosive weight** - - - - - 0.32 oz (9 g)  
**Arming distance** --- 165-363 yd  
 (150 - 330 m)  
**Rocket terminal angle** - - - - - 50-150  
**Packing** - - - - - 10 metal containers per wooden box with fuze wrench

**Packing box:**

**Weight**  
 w/contents - - - - - 39.8 lb (17910 g)  
**Dimensions** - - - - - 14-5/8 in. x  
 12-13/16 in. x  
 9-1/8 in.

**Cube** - - - - - 1.0 ft<sup>3</sup>

**Shipping and storage data:**

**Storage class/SCG** -1.2B (04)  
**DOT shipping class** - C  
**DOT designation** - - - DETONATING  
 FUZES, CLASS C  
 EXPLOSIVES -  
 HANDLE  
 CAREFULLY

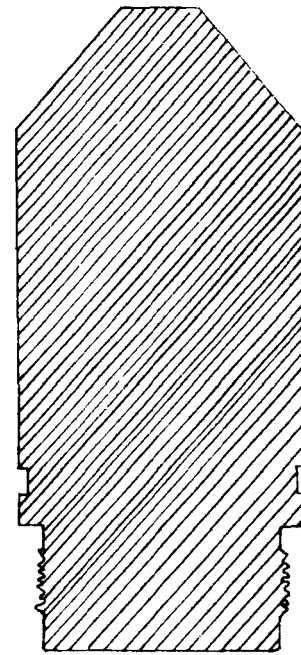
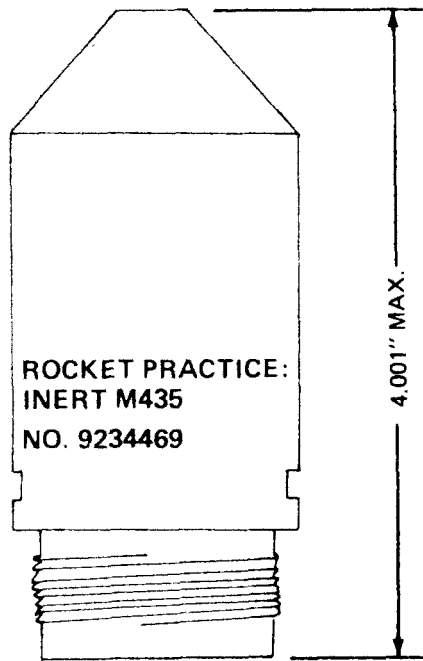
**Field storage** - - - -Group B

**DODAC** - - - - - 1 3 4 0 4 3 5 0  
**Drawing number** - - - -11705900

WARNING

MULTIPLE FIRING OF 2.75-INCH ROCKETS WITH M429 FUZE IS NOT PERMITTED (NO PAIRS, NO SALVOS NOR RIPPLE FIRE), FIRE IN SINGLE ROCKET MODE ONLY. CROSS TALK/RADIO FREQUENCY (RF) INTERFERENCE BETWEEN FUZES (IF TWO ROCKETS ARE FIRED AT THE SAME TIME) CAN CAUSE PREMATURE FUNCTIONING .

**FUZE, PRACTICE, ROCKET, M435**



ARD80-0517

Type Classification:

Functioning: N/A

Use:

This fuze is used with practice warheads for training purposes. Refer to paragraph 3-2, Table 3-1 for the authorized warheads used with this fuze.

Tabulated Data:

Model	-----	M435
Type	-----	Practice
Body material	-----	Aluminum
Length (total)	-----	4.0in.
Intrusion	-----	0.9 in.
Diameter	-----	1.75 in.
Color	-----	Blue w/white markings

Description:

This is an inert fuze. It simulates point detonating fuzes M423 and M427 generally in length, weight and configuration.

Packing - - - - - 81 per carton; 1 carton per wooden box

Packing box:

Weight  
w/contents - - - - - 70.0 lb

Differences between Models: N/A

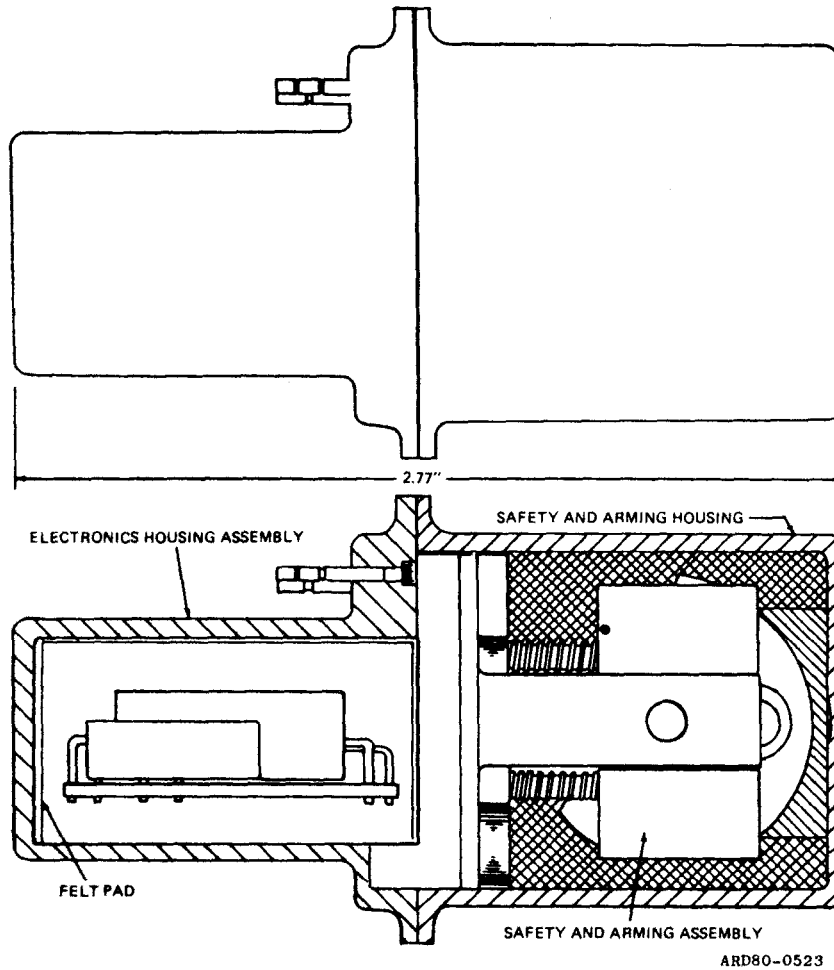
Dimensions - - - - 19-5/16 in. x 18 in.  
x 5-3/8 in.

Cube - - - - - 1.1 ft<sup>3</sup>

DODAC - - - - - 1340-J318

Drawing number - - - - 9234469

**FUZE, ROCKET, M439, RC, VARLABLE TIME DELAY,  
REMOTELY SETTABLE**



Type Classification:

Limited Procurement (LP)-T

Use:

This electronic fuze is designed to be base mounted in flechette and cargo warheads. The output is a forward, axially directed detonation. It is a resistance-capacitance variable time delay fuze which allows the pilot to remotely set the fuze for an air burst at the desired functioning range from the cockpit just prior to firing the round. The fuze and Remote Set Fuze

Subsystem are calibrated to provide proper standoff of the warhead when fired at ranges of five hundred (500) to six thousand nine hundred (6900) m. Refer to Table 3-1 for authorized warhead.

Description:

The fuze consists of a module plastic housing assembly, a safety and arming device plastic housing, a mechanical safety and arming device, and a molded electronics assembly.

The S&A device consists of an unbalanced

rotor assembly which houses the M84 electrical detonator, an escapement and gear assembly (delay mechanism), a single pole double-throw (SPDT) switch, and a spring loaded setback weight. The SPDT switch is in the closed position to connect the fuze electronic time circuit to the umbilical cable assembly for charging.

On initial setback, the switch is transferred to the open position which disconnects the fuze time circuit from the umbilical assembly, as a safety provision. If the fuze is armed or partially armed prior to rocket launch, it cannot be charged. A rocket launch in this condition will result in a dud. The detonator is held shorted and disconnected from the fuze circuit until it reaches an in-line position with the expelling charge.

The fuze must be subjected to a sustained acceleration in order to arm. If acceleration is too low, the spring loaded setback weight will not release the rotor. If acceleration is sufficient for the setback weight to release the rotor, but time-of-acceleration (rocket motor burn) is too short, the setback weight will return the rotor to the unarmed (safe) condition.

The fuze has a selectable time delay range which may be set manually by the pilot or automatically by the advanced fire control system. It has no internal battery and the required voltage is supplied by the aircraft via the Remote Set Fuze Subsystem, just prior to firing the round.

If the fuze has been charged and fired, and duds, it will take approximately 45 days for the charge to decay so that the fuze is safe. If the fuze is set (charged) and the motor fails to ignite, it may be loaded into another tube and fired. The fuze may be set a second time; however, it will function

longer than set time and should not be used for accurate measurements: for accuracy, 10 days should elapse before resetting.

#### Functioning:

Upon receipt of the fire signal from the pilot, the remote fuze setter processes the proper time constant (delay) to the fuze immediately prior to firing the rocket. The intervalometer circuit delivers a 60 ms or up to 180 ms pulse interval, depending upon the firing rate selected and the particular fire control subsystem. The pulse is divided into a 45 ms fuze charging pulse (constant time window regardless of firing rate) and a rocket firing pulse of from 10 ms to 45 ms. The remaining ms are used as a dwell interval to maintain spacing between pairs of rockets.

After the rocket is fired and experiences sustained acceleration, the setback weight moves rearward and allows the unbalanced rotor to rotate; the fuze timing is started. Rotation is delayed by a runaway escapement to provide an arming delay (0.63 to 0.83 seconds, a function of the acceleration) until the rocket is a safe distance from the aircraft. When the rotor has locked into place with the M84 detonator lined up with the propellant charge, the fuze is armed; the detonator is now electrically connected to the firing circuit, the connection between the electronic module and the umbilical cable assembly is broken.

From 1.2 to approximately 25 seconds after firing, depending upon the range setting, the detonator is initiated electrically and ignites the expelling charge. The energy required to fire the M84 detonator, in M439 Fuzes, is 500 ergs at approximately 8 volts. This energy is supplied from the firing capacitor after time rundown in the fuze. The

resistance of the M84 detonator varies from 2.0 to 5.0 ohms.

Tabulated Data:

Model - - - - - Faze, Rocket M439  
 Type - - - - - Electronic (resistance-capacitance time delay)  
 Weight - - - - - 0.4 lb  
 Length (overall) - - - 2.77 in.  
 Diameter (max) - - - - 1.48 in.  
 Operational temperature - - - - - -55° to +160°F (-47.85° to 70.4°C)  
 Detonator - - - - - M84 electrical  
 Setback to arm - - - - 0.79 + 0.18 oz (22 + 5 g)  
 Arming distance - - - - 105.6-138.6 yd (96 - 126 m)  
 Delay - - - - - 0-25 sec  
 Packing - - - - - 25 per wood or fiber box, w/partitions

Packing box:

Weight w/contents - - - - - Wood box, 25 fuzes, 22.0 lb  
 Dimensions - - - - - 8-3/4 in. x 8-3/4 in. x 3-1/2 in.

Cube - - - - - 0.4 ft<sup>3</sup>

Shipping and storage data:

Storage class/SCG - - - - - 1.2B (04)  
 DOT shipping class - - - - - C  
 DOT designation - - - - - DETONATING FUZES, CLASS C EXPLOSIVES - HANDLE CARE-FULLY

Field storage - - - - - Group B

DODAC - - - - - 1340-

Drawing numbers

Fuze - - - - - 9260704  
 Packaging - - - - - 9270749,9270750, 9270751

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CHAPTER 5  
ROCKET MOTORS

5-1. INTRODUCTION

a. A motor, which propels the rocket, is assembled to the rear of the warhead or base-detonating fuze. Generally, the motor consists of the following major components (fig. 5-2):

- (1) Motor body (combustion chamber)
- (2) Propelling charge
- (3) Igniter assembly
- (4) Nozzle(s)
- (5) Trap assembly (optional)
- (6) Resonance rod assembly (optional)

The base of the motor is constricted to form the throat of one or more nozzles. Flight of the rocket is stabilized by fins attached to the rear of the motor, or by spin of the rocket about its axis. This spin is produced by high-velocity gases passing through canted nozzles in the base of the motor. In some larger motors, an assembly of spin rockets provides the initial thrust required to rotate the rocket.

b. The motor body, usually a hollow metal cylinder fitted with a nozzle at the rear, is either closed at the forward end or threaded for assembly with the warhead. The body houses the propelling charge and the igniter assembly.

c. The propelling charge consists of one or more grains of solid propellant,

either double-base or composite. Double-base propellant consists principally of nitrocellulose and nitroglycerin. Composite propellant is a mixture of an organic fuel, an inorganic oxidizing agent and a binding agent. To control the burning rate, propellant grains may be coated with sheets of a slower burning inhibitor material. However, if the propellant has center-perforated grains, resonance rods running through these perforations serve the same purpose by dampening pressure waves created by the burning propellant.

d. The igniter assembly consists of a charge of black powder housed in a cylindrical plastic container, and one or more electric squibs.

e. The nozzle is convergent-divergent (Venturi-type) in shape to eliminate turbulence and to provide a relatively frictionless flow of escaping gas. The throat (constricted portion) of the nozzle may be lined with a refractory substance, such as graphite. This prevents heat of the propellant gases from changing dimensions of the throat. A small change in throat area affects functioning of the motor by altering flow rate and direction of the escaping gases. Nozzles on most rocket motors are canted (scarfed). However, motors used with highspeed aircraft rockets have straight nozzles. Nozzle closures or seals prevent moisture from entering the motor. In some cases, the closure or seals aid ignition of the propellant by causing pressure to build up within the chamber when the igniter is fired. Special safety devices (pressure relief valves,



etc.) limit pressure and prevent rupture of the chamber.

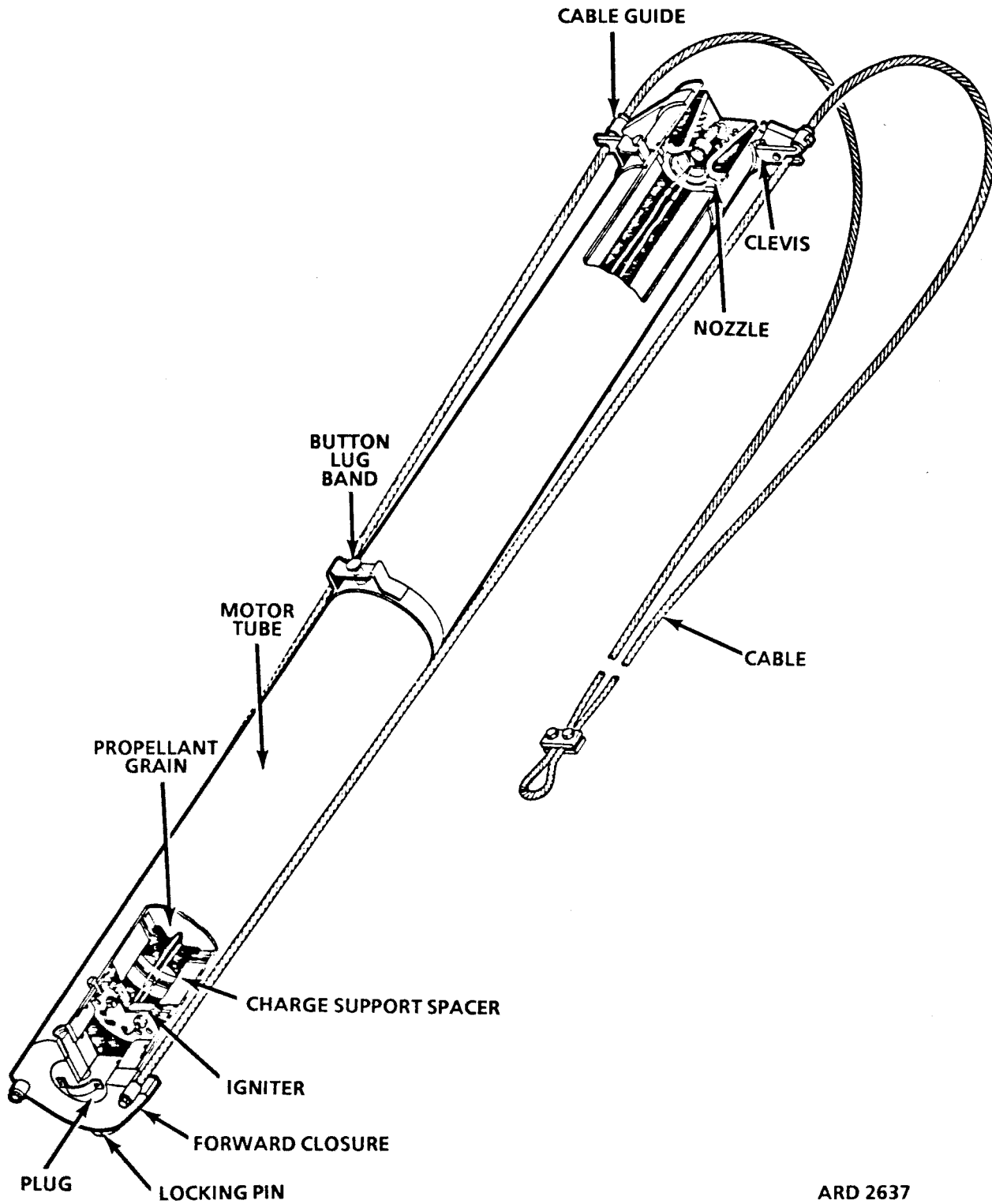
f. A grid-like trap assembly may be located on the approach side of the nozzle to prevent ejection of unburned portions of the propellant. Some

propelling charges are suspended in the motor body in a manner which eliminates the need for a trap.

#### 5-2. ROCKET MOTOR DATA

The following pages contain pertinent data for rocket motors.

ROCKET MOTOR MK22, MOD 2



ARD 2637

Type Classification:

Use:

The Mk22 Mod 2 Rocket Motors are used to tow the M58A1, M58A1 (Mod), M58A2, M58A3 and M59 Linear Demolition Charges and the M68, M68A1 and M69 Practice (inert) Linear Demolition Charges.

Tabulated Data:

Type ----- Mk22 Mod 2  
 Length ----- 76.5 in.  
 Weight, lbs, as shipped (nominal) - 115 lbs  
 Burn time ----- 2.10-4.48 sec  
 Impulse ----- 6820-8450 lb/see  
 Igniter:  
     Resistance, ohms- 0.3 to 0.9  
 Propellant ----- N-4  
     Type ----- Extruded double base, ethyl-cellulose inhibited, cartridge loaded  
 Weight ----- 46 lbs  
 Configuration -- 8-point internal burning star

Temperature Limits:

Storage ----- -40° to +125°F  
 Operation ----- -40° to +125°F  
 DODAC ----- 1340-J143

Color Code ----- Case is blue-gray with a brown band near the head, and black markings

Packing ----- 1 motor per wooden box

Packing Box:

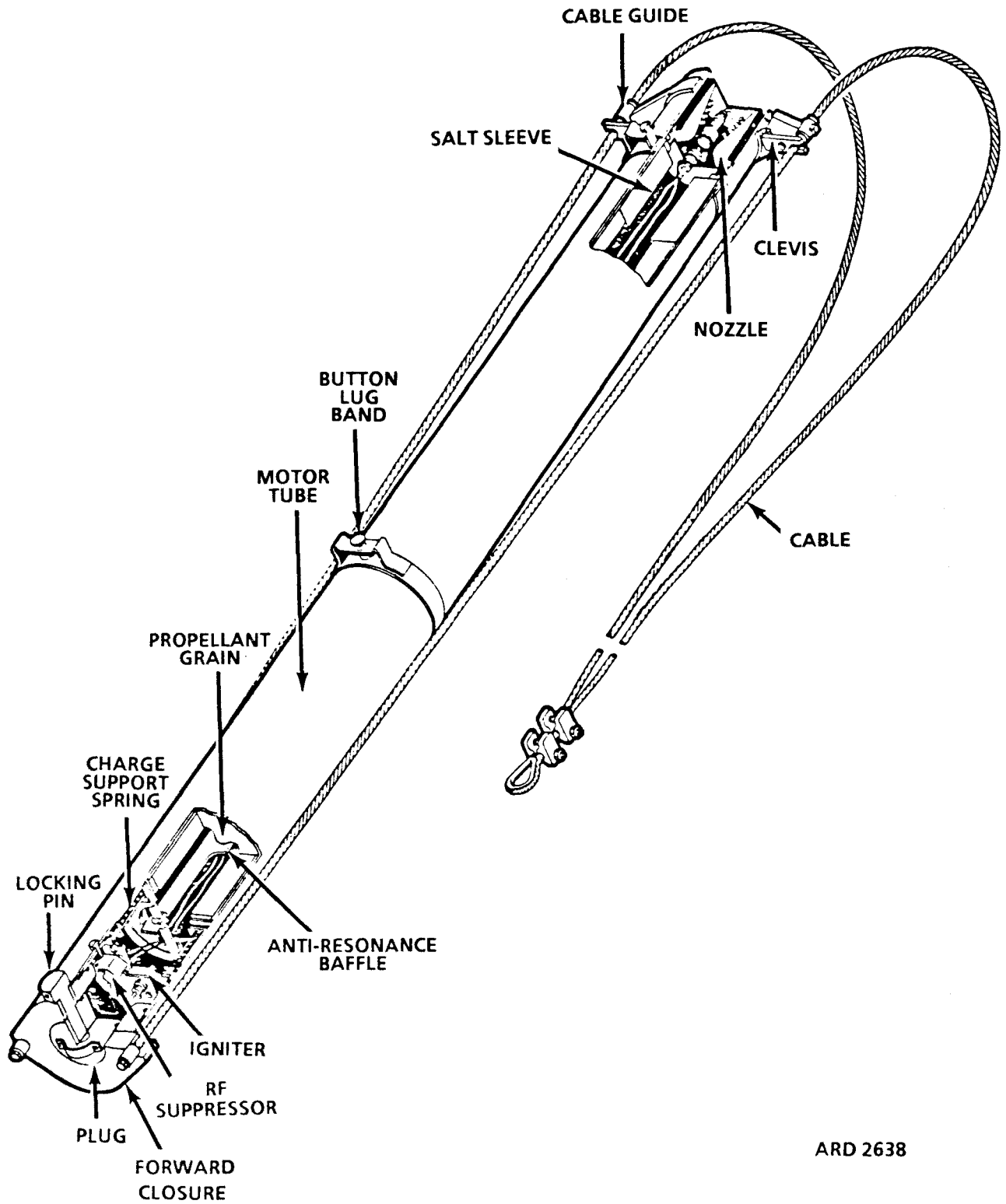
Weight w/contents - 186 lbs  
 Dimensions ----- 86-7/8 in. x 12-9/16 in. x 10-1/16 in.  
 Cube ----- 6.5 cu ft

Shipping and storage data:

Quantity-distance hazard class ----- 2  
 Storage compatibility group ----- J  
 DOT shipping class- B  
 DOT designation --- ROCKET MOTORS, CLASS B EXPLOSIVES  
 Field storage ----- Group J

Drawing numbers ----- 10001-2847573 (Navy)

ROCKET MOTOR MK22, MOD 3



ARD 2638

Type Classification:

Temperature limits:

Storage ----- -40° to +125°F  
 Operation ----- -40° to +125°F

DODAC ----- 1340-J143

Use:

The Mk22 Mod 3 Rocket Motors are used to tow the M58A1, M58A1 (Mod), M58A2, M58A3 and M59 Linear Demolition Charges and the M68, M68A1 and M69 Practice (inert) Linear Demolition Charges.

Color Code ----- Case is blue-gray with a brown band near the head, and black markings

Packing ----- 1 motor per wooden box

Tabulated Data:

Packing Box:

Weight w/contents 186 lbs  
 Dimensions ----- 86-7/8 in. x  
 12-9/16 in. x  
 10-1/16 in.  
 Cube ----- 6.5 cu ft

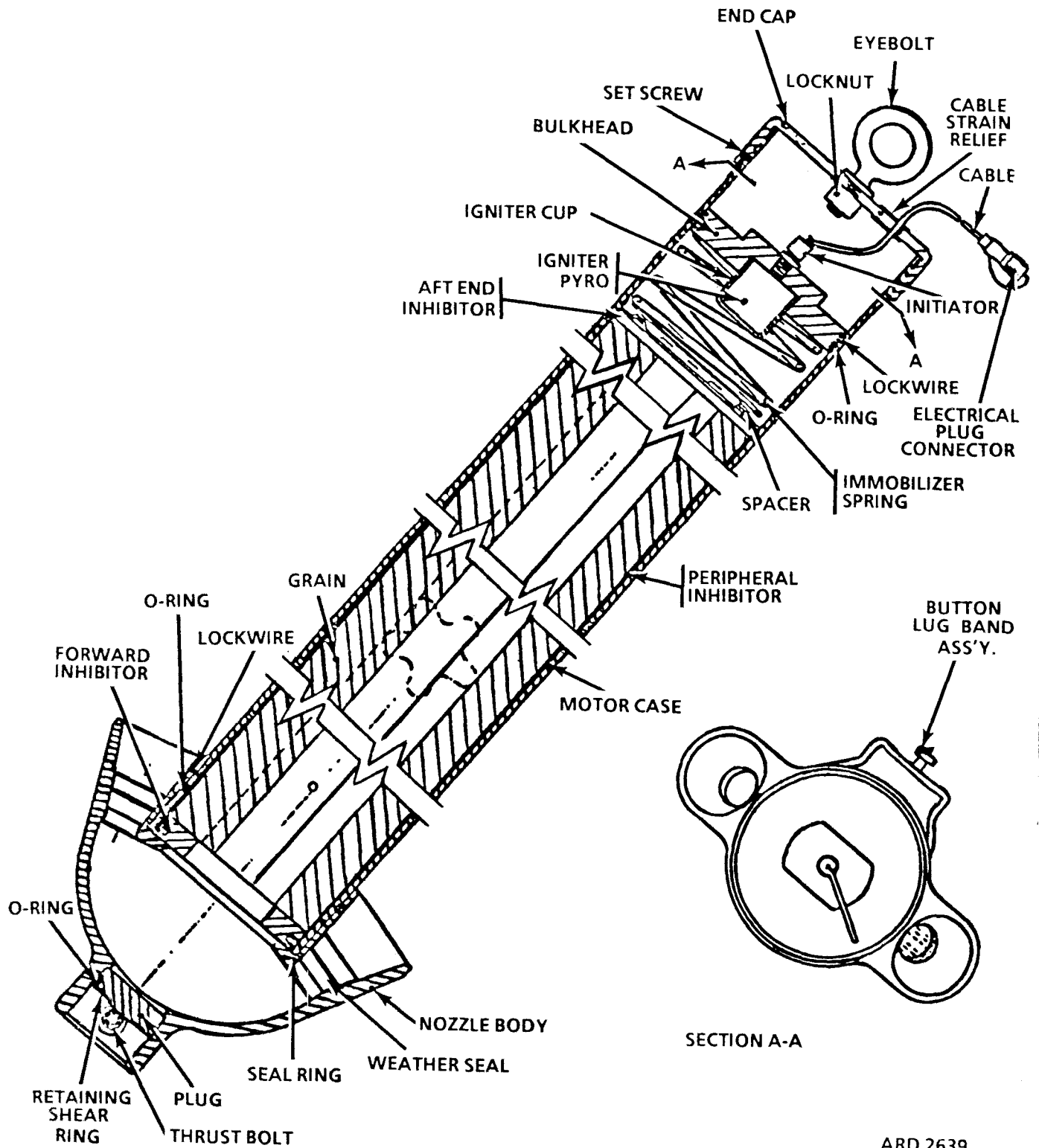
Type ----- Mk22 Mod 3  
 Length ----- 76.5 in.  
 Weight, lbs, as shipped (nominal)- 115 lbs  
 Burn time ----- 2.40-3.00 sec  
 Impulse ----- 7700/8640 lb/see  
 Igniter:  
   Resistance, ohms- 0.4 to 0.6  
 Propellant ----- N-5  
   Type ----- Extruded double base, ethyl-cellulose inhibited, cartridge loaded  
 Weight ----- 45 lbs  
 Configuration -- 5-point internal burning star

Shipping and storage data:

Quantity-distance hazard class ----- 2  
 Storage compatibility group ----- J  
 DOT shipping class-- B  
 DOT designation ---- ROCKET MOTORS, CLASS B EXPLOSIVES  
 Field storage ----- Group J

Drawing numbers ----- 14083-525-174-0050 (Navy)

ROCKET MOTOR MK22, MOD 4



ARD 2639

Change 4

5-2.5

Type Classification:

Temperature limits:

Storage ----- -40° to +125°F

Operation ----- -40° to +125°F

DODAC ----- TBA

Use:

The Mk22 Mod 4 Rocket Motors are used to tow the M58A3 Linear Demolition Charge and the M68A1 Practice (inert) Linear Demolition Charge. It is part of the US Army's Mine Clearing Line Charge (MICLIC) System.

Color Code ----- Case is blue-gray with a brown band near the head, and black markings

Packing ----- 1 motor per wooden box

Tabulated Data:

Packing box:

Weight w/contents-- 186 lbs

Dimensions ----- 86-7/8 in. x  
12-9/16 in. x  
10-1/16 in.

Cube ----- 6.5 cu ft

Type ----- Mk22 Mod 4

Length ----- 76.5 in.

Weight, lbs, as

shipped (nominal)- 115 lbs

Burn time ----- 2.40-3.00 sec

Impulse ----- 7700/8640 lb/sec

Igniter:

Resistance, ohms- 0.4 to 0.6

Propellant ----- N-5

Type ----- Extruded double  
base, ethyl-  
cellulose  
inhibited,  
cartridge loaded

Weight ----- 45 lbs

Configuration - 5-point internal  
burning star

Shipping and storage data:

Quantity-distance

hazard class ----- 2

Storage compatibility

group ----- J

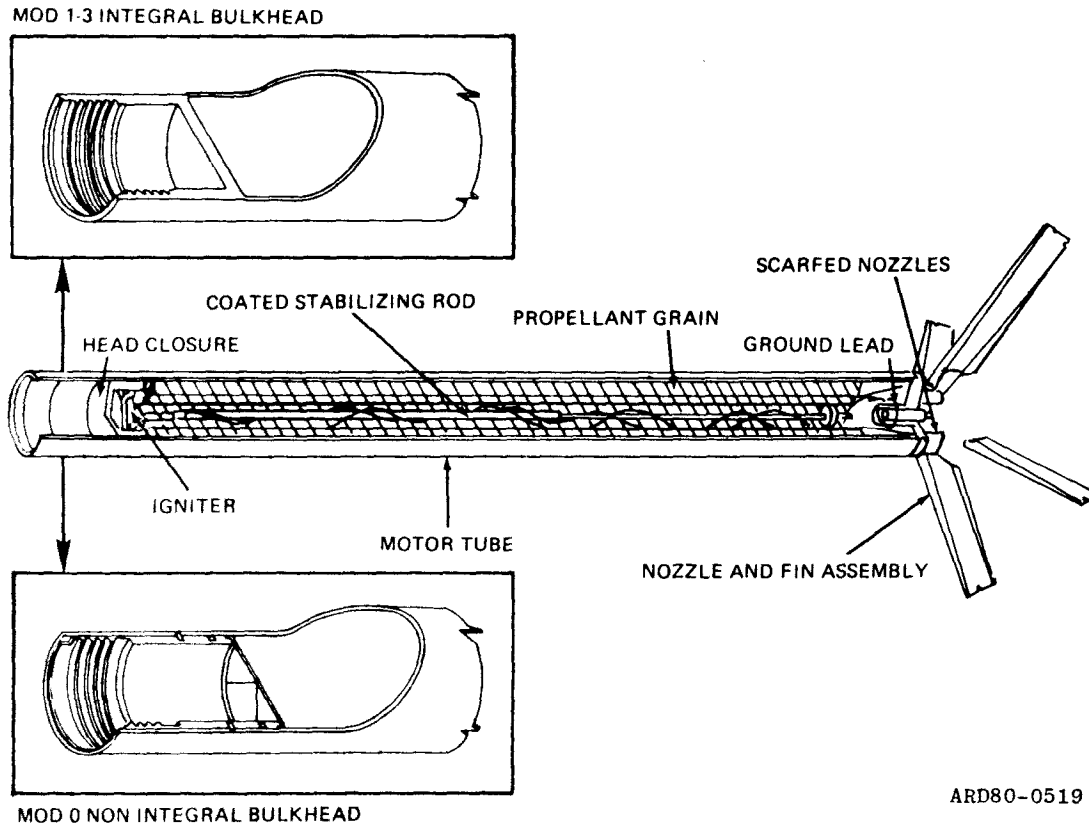
DOT shipping class- B

DOT designation --- ROCKET MOTORS,  
CLASS B  
EXPLOSIVES

Field storage ----- Group J

Drawing Number ----- TBA

MOTOR, ROCKET MK40 MOD 3



ARD80-0519

Type Classification:

Use:

The motors are used by rotary-wing and other low-speed aircraft. Refer to paragraph 3-2, Table 3-1 for authorized warheads using these motors,

Differences between Models:

Models 1 and 3 have integral bulkhead motor tubes; Mod 0 has a nonintegral bulkhead tube. The igniter of the Mod 3 motor

differs from that of the Mods 0 and 1 motors in that the igniter has been modified to incorporate a carried, frangible case in lieu of the blowout plug and the squib is located on the periphery of the case in lieu of at the center of the case.

NOTE

The nozzle closure on Mods DOD 1 was a blow-out plug which has been changed to frangible steel burst diaphragm on the Mod 3. Stocks of obsolete Mk 40 Mod 0 or 1 motors, if still available, should be disposed of and replaced with Mk40 Mod 3 motors.



Functioning:

Current passes through the launcher firing contact to the igniter in the rocket motor. This current generates the heat necessary to initiate the igniter charge which ignites the propellant grain. Combustion gases from the burning propellant pressurize the chamber and exhaust through the nozzle, providing the unequal forces required for rocket thrust.

Tabulated Data:

Model - - - - - Mk 40, Mods 0, 1, and 3  
 Weight (nominal) - - - 11 lb  
 Length (overall) - - - 39.3 in.  
 Propellant grains:  
     Model - - - - - Mk 43, Mod 1  
     Configuration - - - 8-point star perforated cylinders  
     Propellant - - - - - N5 (Mk 43)  
     Type - - - - - Double base  
     Burn time - - - - - 1.55 - 1.69 sec  
     Weight - - - - - 5.9 lb  
 Thrust  
     (over at 77°F) - - - 720 lb  
 Impulse (77°F) - - - - 1150 lb/see  
 Igniter:  
     Mods 0, 1 - - - - - Mk 125, Mod 4  
     Mod 3 - - - - - Mk 125, Mod 5  
 Resistance:  
     Mk 125, Mod 4 -- 0.70 ohms to 1.50 ohms  
     Mk 125, Mod 5 -- 0.70 ohms to 2.00 ohms  
     Squib - - - - - Mk 1, Mod 0  
 Igniter charge:  
     Black powder - - - 80 percent  
     Coated magnesium powder - - - - - 20 percent  
     Weight - - - - - 0.3602 (10 g)  
     Burning time - - - - 0.2 sec

Temperature limits:

Firing - - - - - -65° to +150°F  
 (-53.35° to 64.9°C)  
 Storage- - - - - -65° to +150°F  
 (-53.35° to 64.9°C)

Motor Burnout:

Range - - - - - 1460 ft (445 m)  
 Velocity - - - - - 1965 fps (599 reps)

Launch spin rate

(at launch) - - - - - 1 rps

Launcher exit velocity

(64.5 in. tube) - - - 112 fps

Acceleration:

Initial - - - - - 35-40  
 Final - - - - - 40-45

Range - - - - - Max at 43° QE  
 with MPSM warhead  
 8,080 m

Color code: - - - - - White w/brown band near head and black markings

Packing - - - - - 1 motor w/propellant grain, coated stabilizing rod ignition and fin assy in fiber container; 6 containers per wooden box

Packing box:

Weight  
 w/contents - - - - 131 lb  
 Dimensions - - - - 46-3/16 in. x 11-7/8 in. x 9-9/32 in.

Cube - - - - - 2.8 ft<sup>3</sup>

Shipping and storage data:

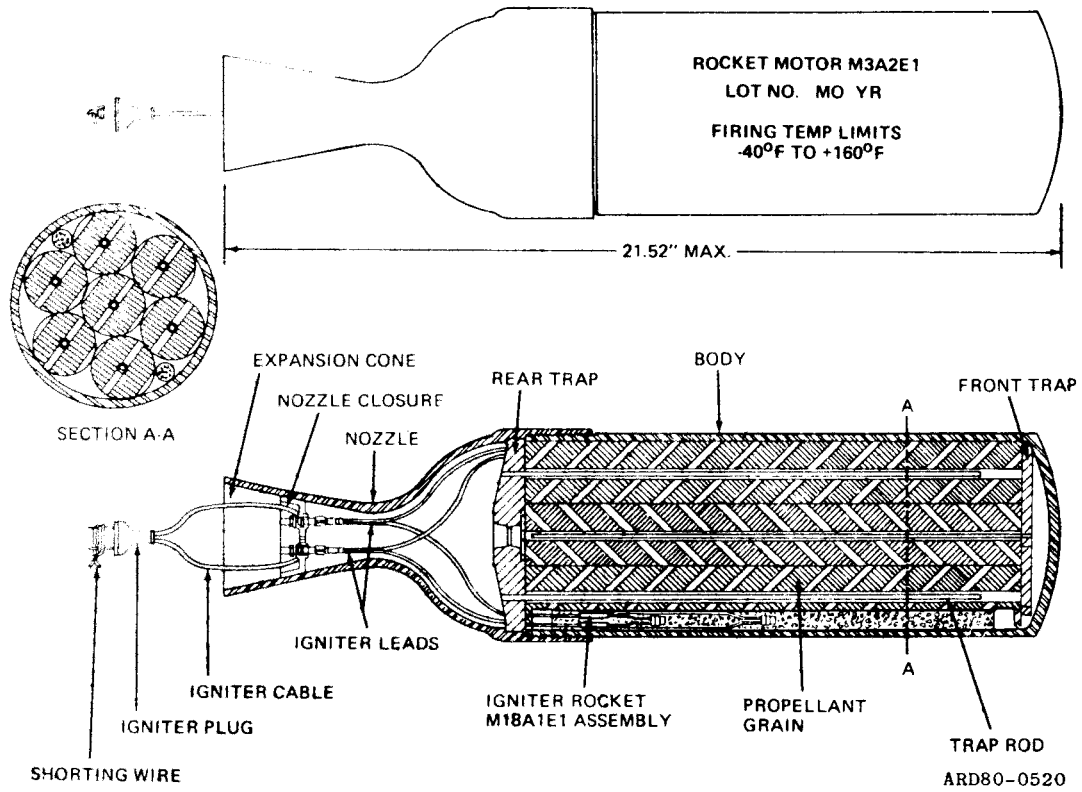
Storage class/  
 S C G - - - - - 1.3 C  
 DOT shipping  
 class - - - - - Group B  
 DOT  
 designation - - - - ROCKET MOTORS

DODAC - - - - - 1340-J106, Mk 4  
Mod 10  
1340-J107, Mk 40  
Mod 0

1340-J108, Mk40  
Mod 13  
Drawing numbers - - - 1373658  
9220803

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**ROCKET, MOTOR (JATO)M3A2**



Type Classification:

STD AMCTC 1106

Use:

The rocket motor is a solid-propellant thrust unit used primarily for launching target planes from a catapult, although it may be used for other applications requiring a unit of the same characteristics.

Description:

The JATO M3A2 rocket motor consists of the following:

**Body assembly.** The body assembly is a cylindrical steel tube closed at the forward end by the head and threaded externally at the open rear end to receive the nozzle.

**Nozzle.** The nozzle, which is of steel,

is of the convergent-divergent type comprising a conical rear portion and cylindrical forward portion. The cylindrical forward end of the nozzle is threaded internally to engage the rear of the body assembly.

Igniter plug assembly. The igniter assembly consists of a "shorted" igniter plug and a nozzle closure which are connected by two lengths of igniter cable. The nozzle closure is a plastic, cup-shaped disk into which two copper terminal inserts are molded. The closure is cemented permanently into the expansion cone. The igniter plug is a standard, two-pronged, rubber-bodied electric plug which is short-circuited by a copper wire tied across its prongs. The two cables from the plug are crimped into the terminal inserts in the nozzle closure.

Igniter assembly. The igniter assembly is designated "Igniter, JATO, M21." It consists of a plastic igniter case containing a 463-grain charge of black powder, two squibs, each of 1.0 ohm resistance, and two 24-in. long external lead wires which are connected to the squibs. Electric terminals for the squibs and lead wires are riveted to the plastic wall of the igniter case. The lead wires pass through the center of the JATO and are crimped into the copper terminal inserts in the nozzle closure.

Propelling charge. The propelling charge consists of seven monopropellant cylindrical extruded grains of double-base propellant M16 (T6). The grains are arranged in the JATO lengthwise with one grain in the center and six grains surrounding it.

Rear trap assembly. The rear trap assembly is a star-shaped steel casting with six equally spaced radial arms and

a hexagonal center hole. Six cylindrical trap rods, one each from each radial arm, extend axially toward the forward end of the JATO to form a cage-like support which receives six of the seven propellant grains.

Front trap assembly. The front trap assembly is a wheel-shaped steel casting comprising an outer ring, center hub, and three radial spokes. A cylindrical trap rod extends from the center of the hub axially toward the rear of the JATO. This rod receives the seventh (center) grain of the propelling charge.

Functioning:

The JATO is designed to function safely and reliably when connected to any electrical source which will deliver 2 amperes at a minimum of 1-1/2 volts, although higher voltages may be used if desired. Satisfactory results have been obtained by ignition from ordinary 110-volt house current. Applying current through the igniter cable activates the 463-grain charge of black powder, which ignites the propelling charge. Burning creates a rapid expanding gas which can only escape through the nozzle assembly. The nozzle assembly is designed for a venturi effect which further compresses the gas and increases the thrust required to launch the rocket or aircraft.

Tabulated Data:

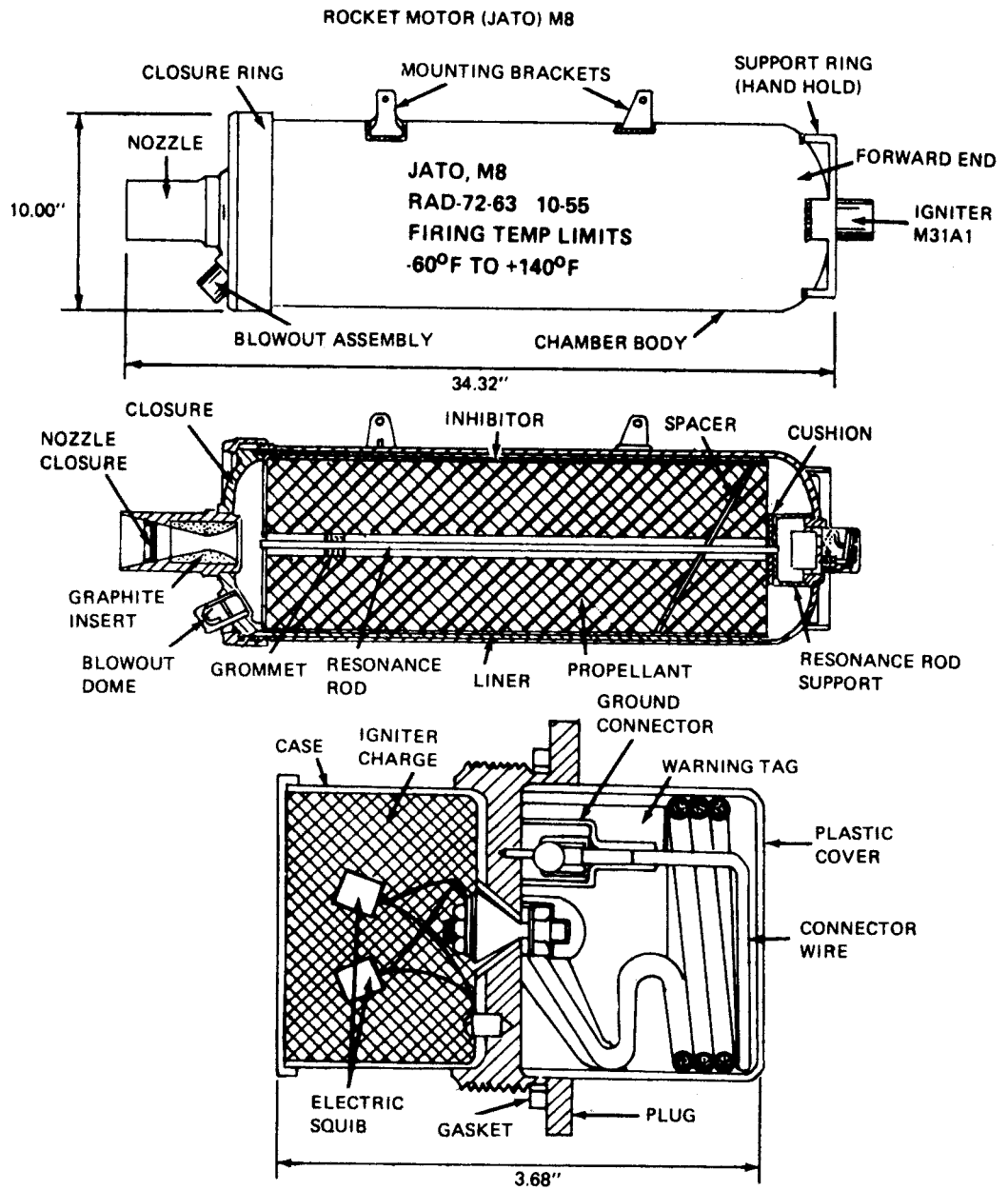
Complete Rocket, Motor:

Type - - - - - JATO M3A2  
 Weight, loaded - - - 27.1 lb  
 Weight,  
 after fired - - - - - 17.6 lb  
 Length (including  
 nozzle) - - - - - 21.51 in.  
 Diameter Outside  
 (nozzle) - - - - - 5.38 in.  
 Diameter Body - - - - 5.12 in.

Diameter (inside body) - - - - -	4.75 in.	Packing - - - - -	Two per wooden box
Diameter, Nozzle throat - - - - -	L 28 in.	Packing box:	
Catapult used with - - - - -	A-7	Weight	
		w/contents - - - - -	71. 7 lb
		Dimensions - - - - -	26-7/8 x 12-1/2 x 7-1/2 in.
Components:			
Propelling charge:		Volume - - - - -	1.44 ft <sup>3</sup>
Type - - - - -	M21 extruded solid tabular		
Weight - - - - -	9.2 lb	Shipping and storage data:	
Igniter:		Storage class/	
Type - - - - -	M18A1E1	SAG - - - - -	J
Weight - - - - -	0.14 lb	DOT shipping	
Weight (plug assembly) - - - - -	0.12 lb	class - - - - -	A
Performance:		DOT	
Burning time - - -	CONF	designation - - - - -	ROCKET MOTOR FOR ASSIST IN LAUNCH OF TARGET PLANES
Thrust - - - - -	CONF		
Temperature limits:		DODAC - - - - -	1340-H305
Firing - - - - -	-40° to +160°F (+4° to +70°C)	Drawing number - - -	8799792
Storage - - - - -	-60° to +70°F (+15° to +21°C) (cool dry area)		

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ROCKET MOTOR (JATO) M8



ARD80-0521



Type Classification:

STD OTCM/AMCTC 36841

Use:

The JATO M8 is a solid-propellant thrust unit used primarily for applying thrust to assist aircraft on take-off. It can be used for other applications requiring units of the same characteristics.

Description:

The JATO M8 rocket motor consists of the following:

Body assembly — a deep-drawn steel case with a thicker ring welded to the rear (aft) end, which provides the chamber for loading the propelling charge.

Closure assembly — which seals the rear (aft) end of the JATO and provides a mount for the nozzle and blowout assemblies.

Igniter assembly — consists of a plastic igniter case which contains the igniter charge.

Functioning:

The igniter assembly is ignited by two electric squibs, Mk 1 Mod 0, connected in parallel. In turn, the propellant is ignited. The pressure created by the expanding propellant gases can only be vented through the nozzle assembly. The nozzle assembly is designed for a venturi effect which compresses the gases generated and increases the thrust required to assist launch of the desired item.

Tabulated Data:

Complete Rocket Motor:

Type - - - - - JATO M8  
 Weight, loaded - - - 158.5 lb  
 Length (max) - - - - 34.32 in.  
 Diameter (max) - - - 10.0 in.  
 Used with - - - - - Assist aircraft on take-off

Components:

Propelling charge:

Type - - - - - M301, Cast OGK  
 Weight - - - - - 70.0 lb

Igniter assembly:

Type - - - - - M31A1  
 Igniter charge - - - 87 grains of igniter composition  
 Electric squibs - 2 (Mk 1 Mod 0)  
 Length - - - - - 3.68 in.

Performance:

Burning time - - - - 14.0 sec  
 Thrust - - - - - 1000 lb

Temperature limits:

Firing - - - - - -60° to +140°F  
 (-51° to +59°C)  
 Restricted to temperature ranges marked on JATO)  
 Storage - - - - - 60° to 70°F  
 (15° to 21°C) (cool dry area)

Packing - - - - - One per wooden box

Packing box

Wooden  
 Weight - - - - - 224.9 lb  
 Dimensions - - - - - 39-3/4 in. x 16-7/32 in. x 12-1/8 in.

Volume - - - - - 4.5 ft<sup>3</sup>

Shipping and storage data:

Storage class/

SCG - - - - -

DOT shipping

class - - - - -

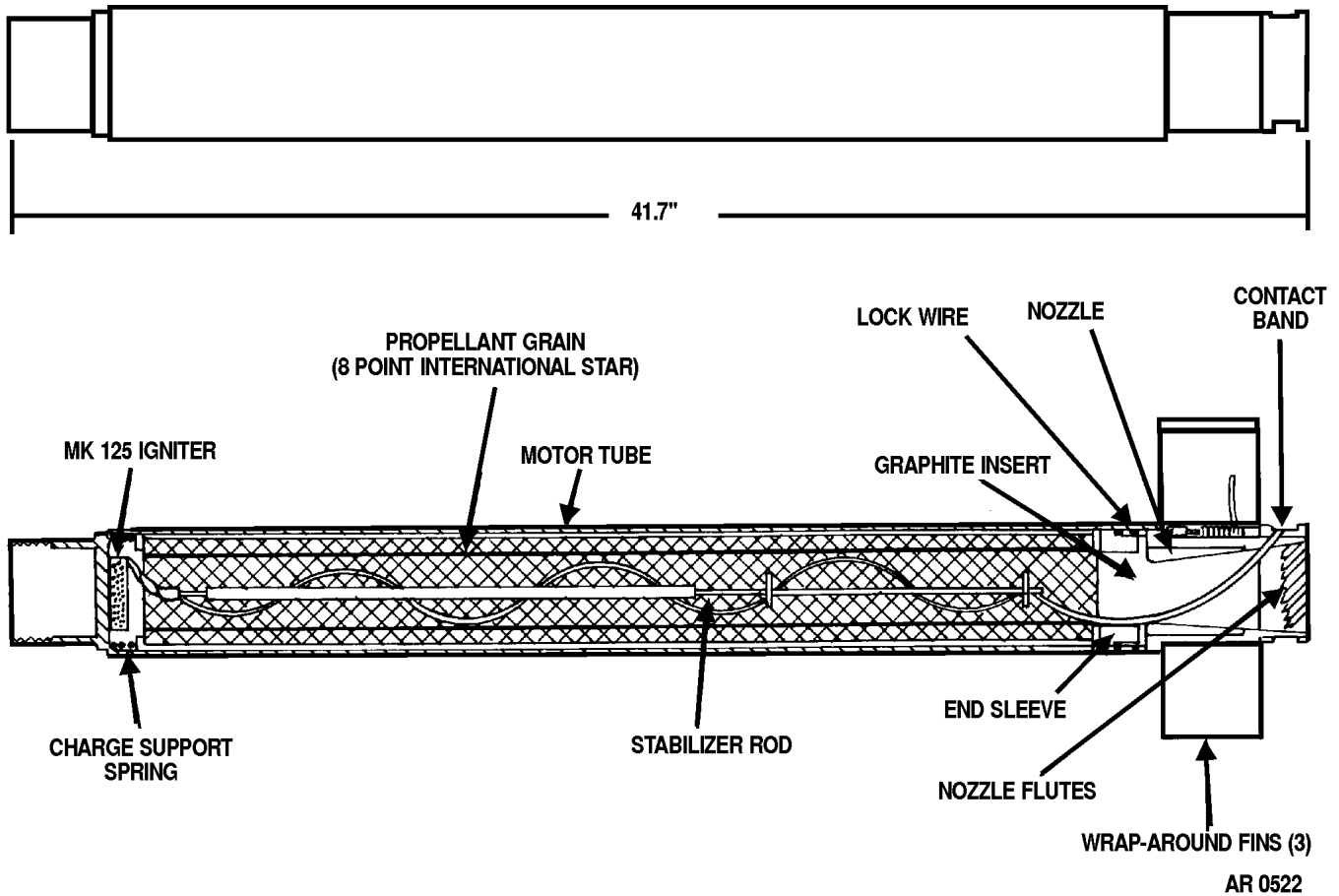
DOT designation ---ROCKET MOTOR  
TO ASSIST IN AIR-  
CRAFT TAKE-OFF

DODAC - - - - - 1340-

Drawing number - - - 82-6-25

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## ROCKET MOTOR MK66, MODS 0, 1, 2, 3, AND 4



### TYPE CLASSIFICATION:

STD AMCTCM 955

### USE:

The motors are used by rotary-wing and other low-speed aircraft; they may also be used with high performance aircraft.

### DIFFERENCES BETWEEN MODELS:

The MK66 motors utilize a longer motor tube (than the MK40) of a different aluminum alloy, and a new nozzle and fin assembly. The fins are of a spring loaded, wrap-around design and are attached around the circumference of the single nozzle. The propellant grain is longer and of a different

formation than the standard grain; however, the stabilizing rod and igniter are essentially the same as used on the MK40 motor. The MK66 motors have a substantially higher thrust, 1300 lb, and a longer range. The MK66 Mod 0 was developed by the Navy but never fielded.

The MK66 Mod 1 motor is a nozzle modification of the Mod 0 to increase the spin rate from 4 - 5.5 rps to 9 - 10 rps (at launch) for increased accuracy and provide interface with existing and improved launchers. A detent groove has been added forward of the wrap-around fins.

The MK66 Mod 2 motor is the same as the Mod 1 motor except that it contains a Hazards of Electromagnetic Radiation to Ordnance (HERO) filter which allows it to be handled and stored in electromagnetic radiation environments.

The MK66 Mod 3 motor is physically and functionally the same as the Mod 1 motor except that it has a radio frequency (RF) filter in the firing circuit. The filter is physically located on the igniter can. It also has a metallic brass shield over the fin and nozzle assembly to shunt any arc formed during loading/unloading rockets into or from the launcher. The RF filter resists inadvertent firing by stray RF currents.

The MK66 Mod 4 motor is an improvement on the MK66 Mod 2 motor and is tri-service compatible. Changes include a new E<sup>3</sup> filtering system located under the contact band, a new initiator, a new igniter, and a new stabilizing rod and attachment assembly. The new ignition mechanism reduces variations in ignition delay time. The bare MK66 Mod 4 motor is considered Hazards of Electromagnetic Radiation to Ordnance (HERO) safe without special precautions. The MK66 Mod 4 motor is also considered safe in Electrostatic Discharge (ESD) environments.

TABULATED DATA:

Type .....	MK66 Mod 1, 2, 3, or 4
Length.....	41.7 in.
Weight, shipped (nominal) .....	13.6 lb
Burn time (77°F) .....	1.05-1.10 sec
Average thrust (77°F) .....	1300-1370 lb
Impulse (77°F).....	1500 lb/sec
Motor burnout:	
Range .....	1300 ft (397 m)
Velocity .....	2425 fps
Launch spin rate .....	10 rps
Launcher ext (64.5 in. tube):	
Velocity .....	148 fps
Acceleration, G:	
Initial.....	60-70
Final .....	95-100
Range - max at QE 43:	
w/MPSM warhead .....	11407 yd (10,426 m)
Igniter:	
Resistance, ohms.....	Mod 1 0.64-2.5 Mod 2 2.2-3.5 Mod 3 0.64-2.5 Mod 4 0.9-1.9
Propellant .....	NOSIH AA-2
Type .....	Extruded double base, ethylcellulose inhibited, cartridge loaded
Weight.....	7 lb

Configuration .....	8-point, internal burning star
DODAC .....	MK66 Mod 1 1340-J146; MK66 Mod 2 1340-J147; MK66 Mod 3 1340-H309; MK66 Mod 4 1340-HA07
Color code.....	Case: white w/ brown band near head, black markings

DRAWINGS:

Drawing number .....	233AS100 (Navy)
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TEMPERATURE LIMITS:

Storage .....	-65° to +165°F (-53.35° to +73.15°C)
Operation .....	-500° to +150°F (-45° to +64.9°C)

PACKING DATA:

Packing.....	1 motor w/propellant grain, coated stabilizer rod, igniter and fin assembly in fiber container; 6 containers per wooden box (when packed separately from warheads)
Packing box:	
Weight w/contents .....	146 lb
Dimensions.....	48-5/8 in. x 11-7/8 in. 9-9/32 in.
Cube .....	2.9 ft <sup>3</sup>

SHIPPING AND STORAGE DATA:

Storage class/SCG.....	1.3C
DOT shipping class.....	B
DOT designation.....	ROCKET MOTORS
Field storage.....	Group F

**WARNING**

The MK66 rocket motor shall not be continuously stored above 140°F for more than 24 hours.

Unpackaged (bare) MK66 rocket motors dropped from any height will not be fired.

During training, 2.75-Inch rockets will not be fired from helicopters with open doors.

When firing rockets with the MK66 moor, the following restrictions apply:

- U/MH60: Limit ripple fire to 7 per side at standard firing rate (no fuze setting) and 15 per side at slow firing rate (fuze setting on).
- A/MH6: Firing more than three rockets in five seconds or less is prohibited due to possible engine flame-out.

Electrical tests shall not be performed with rockets in launcher. (This will prevent inadvertent rocket firing). The contact arm of launcher may provide direct electrical path to motor ignition circuit if power source is accidentally applied to contact arm when the launcher is loaded/unloaded. All other possible sources of inadvertent electrical power shall be kept away from the launcher. Ensure electrical equipment, even if turned off and unplugged, is not in the vicinity of a loaded launcher.

For Mod 1 and Mod 3 motors: avoid contact of any kind, especially metal objects with the contact band of MK66 rocket motors when loading rockets into launchers on aircraft in a HERO environment. This, along with established procedures and restrictions on the use of the Mod 1 motor, must be followed to minimize exposure to potential HERO environment.

For the OH-58D only: The number of rounds fired at the crew member location nearest the rocket is restricted to no more than 150 rounds per 24 hour period.

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## APPENDIX A REFERENCES

### A.1 SCOPE.

This appendix lists all Army regulations, field manuals, forms, pamphlets, supply catalogs, technical bulletins, and technical manuals, and miscellaneous publications referenced in this manual. The publication index (DA PAM 25-30) should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to the material covered in this manual.

### A.2 ARMY REGULATIONS.

Dictionary of United States Army Terms.....	AR 310-25
Authorized Abbreviations and Brevity Codes .....	AR 310-50
U.S. Army Explosives Safety Program.....	AR 385-64

### A.3 FIELD MANUALS.

Fundamentals of Flight.....	FM 1-203
Light Antiarmor Weapons .....	FM 23-25

### A.4 FORMS.

Recommended Changes to Publications and Blank Forms.....	DA Form 2028
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### A.5 PAMPHLETS.

Ammunition and Explosives Safety Standards .....	DA PAM 385-64
Consolidated Index of Army Publications and Blank Forms.....	DA PAM 25-30

### A.6 SUPPLY CATALOGS.

Ammunition and Explosives: Classes 1305 through 1330 .....	SC 1305/30-IL
Ammunition and Explosives: Classes 1340 through 1398.....	SC 1340/98-IL

### A.7 TECHNICAL BULLETINS.

Munitions Restricted or Suspended.....	TB 9-1300-385
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### A.8 TECHNICAL MANUALS .

Operator's and Organizational Maintenance Manual (Including Repair Parts and Special Tools List): Launcher, Rocket: 66-MM, 4-Tube, M202A1 (NSN 1055-00-021-3909) .....	TM 3-1055-456-12
Operator's, Aviation Unit and Intermediate Maintenance Manual (Including Repair Parts and Special Tools) for Hydra 70 Rocket Launchers (Formerly 2.75-Inch Rocket Launchers).	TM 9-1055-460-13&P



**TM 43-0001-30**

**A.8 TECHNICAL MANUALS - Continued.**

Operator’s Manual for 66MM Light Antitank Weapon (LAW) System M72A1 and M72A2 W/Coupler M72A3 and Practice Rocket Launcher M190 with M73 Practice Rocket .....	TM 9-1340-214-10
Unit Maintenance Manual for 2.75- Inch Low Spin, Folding Fin Aircraft Rockets; 2.75-Inch Spin Stabilized, Wrap Around Fin Aircraft Rockets; 66MM Light Antitank Weapon Systems; 3.5-Inch Rockets; and M3A2E1 Rocket Motor (JATO).....	TM 9-1340-222-20
Direct Support and General Support Maintenance Manual for 2.75- Inch Low Spin, Folding Fin Aircraft Rockets; 2.75-Inch Spin Stabilized, Wrap Around Fin Aircraft Rockets; 66MM Light Antitank Weapon Systems; 3.5-Inch Rockets; and M3A2E1 Rocket Motor (JATO) .....	TM 9-1340-222-34
Organizational Maintenance Manual: Rocket Launcher M190 W/Subcaliber 35-MM Practice Rocket M73 .....	TM 9-1340-224-12
Direct Support and General Support Maintenance Manual for Military Pyrotechnics.....	TM 9-1370-203-34
Destruction of Conventional Ammunition and Improved Conventional (ICM) Munitions to Prevent Enemy Use .....	TM 43-0002-33

**A.9 SUPPLY BULLETINS.**

Ammunition Surveillance Procedure for Hydra 70 Rocket, Complete Rounds, Motors MK40 and MK66 Series; Warheads M151, M229, WDU 4A/A, M156, M247, M259, M251 and M267 and Fuzes M423, M427, M429, M433, and M439.....	SB 742-1340-92-010
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**A.10 MISCELLANEOUS.**

Ammunition Lot Numbering.....	MIL-STD 1168A
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**By Order of the Secretary of the Army:**

**E. C. MEYER**  
*General, United States Army*  
*Chief of Staff*

**Official:**

**ROBERT M. JOYCE**  
*Brigadier General, United States Army*  
*The Adjutant General*

Distribution:

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