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GUN MOUNT AMMUNITION UTILIZATION  
FEASIBILITY STUDY (U)

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GUN MOUNT AMMUNITION UTILIZATION FEASIBILITY STUDY (U)

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ABSTRACT: This report is a compilation of current U. S. Army ammunition which could be utilized as a basis for development for new Naval Gun Mounts. Current standard and developmental Army ammunition for guns, howitzers, mortars and recoilless rifles of caliber 75mm through 280mm is included. Army projectiles including fuze interchangeability and environmental considerations for Naval usage are tabulated. Conclusions are offered regarding the applicability of the ammunition to future Naval Gun Mount usage. Certain rounds requiring special security clearance are omitted from this compilation.

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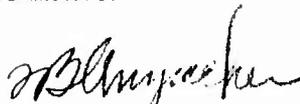
15 May 1963

GUN MOUNT AMMUNITION UTILIZATION FEASIBILITY STUDY (U)

This report covers a Naval Ordnance Laboratory, White Oak study into Army ammunition having potential Naval application. This study was performed for the Bureau of Naval Weapons under WEPTASK RREN-ST-038/212/5/0000-00-000. Information for this report was obtained from several Army sources and the authors wish to acknowledge the assistance of personnel at Army Materiel Command Headquarters, Picatinny Arsenal, Aberdeen Proving Ground, and the University of Pittsburgh Ordnance Research Staff.

A preliminary copy of this report was forwarded to the Bureau of Naval Weapons as an enclosure to NOL letter KS:EHS:gs Ser 0587 of 29 March 1963. Known differences and revisions from the preliminary report of the Type Classification status of ammunition are reflected in Table I of this NOLTR.

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## GUN MOUNT AMMUNITION UTILIZATION FEASIBILITY STUDY

### INTRODUCTION

1. The U. S. Naval Ordnance Laboratory, White Oak, was requested (by WEPTASK RREN-ST-038/212/5/0000-00-000) to "provide BUWEPS with a compilation of current U. S. Army ammunition which could be utilized as a basis for development for new Naval Gun Mounts." The WEPTASK specified that the study include 75-millimeter to 5-inch calibers but as the study progressed it became apparent that the additional effort to expand the study to 280 millimeters would be relatively minor. Therefore, for completeness, this compilation includes all current Army ammunition from 75 millimeter to 280 millimeter for guns, howitzers, mortars and recoilless rifles.

2. Sources of information for this study were primarily Army Technical Manuals (TM's) and Army Materiel Command (formerly Office Chief of Ordnance) Technical Information Reports (TIR's). In addition, conferences were held with personnel of Army Materiel Command Headquarters, Aberdeen Proving Ground, and Picatinny Arsenal. A bibliography of applicable TM's and TIR's is given in Appendix A.

### Current Army Ammunition Status

3. Present day Army weapons are classified according to the following basic types:

a. Gun - A term generally applied to all fire arms but as a type of artillery it is a cannon with a relatively long barrel, low angle of fire, and high muzzle velocity. Present calibers are 75, 76, 90, 105, 120, 155, 165, 175 and 280 millimeter. In a special category is the 152-millimeter gun-launcher cannon (shillelagh system).

b. Howitzer - A cannon with a medium length barrel operating at a relatively high angle of fire and medium muzzle velocity. Present calibers are 105 and 155 millimeter and 8 inch.

c. Mortar - A cannon with a short barrel having a shorter range and a higher angle of fire than a Howitzer. Present calibers are 81 millimeter and 4.2 inch.

d. Recoilless Rifles - A type of gun designed to eliminate the rearward recoil force of firing. These weapons are light weight and primarily used as anti-tank weapons. Present calibers are 90, 106 and 120 millimeter.

In addition, some rocket launchers are capable of firing conventional projectiles but these weapons are unique and not considered a type of gun. Only the XM70E1, 115-millimeter weapon falls in this category and is included in this study.

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4. Ammunition for the above weapons is classified into one of the following functionally descriptive categories:

- HE - High explosive
- HEP - High explosive plastic
- HEAT - High explosive anti-tank (shaped charge)
- WP - White phosphorus (smoke)
- AP - Armor piercing (solid shot)
- APC - Armor piercing capped (with heat-treated steel caps, some rounds contain small HE-filled cavities)
- CAN - Canister
- HVAP - High velocity, armor piercing
- HVAP-DS - High velocity, armor piercing, discarding sabot
- ILL - Illuminating
- APDS - Armor piercing, discarding sabot
- GB or VX - Nerve gas
- HD or H - Mustard gas
- LEAFLET - Propaganda
- BEEHIVE - Anti-personnel
- HEAT Multipurpose - HEAT, HE and WP
- ATOMIC - Nuclear

In addition to the service ammunition listed above there are also several types of non-tactical ammunition. These include target practice ammunition, dummy ammunition, training ammunition, blank cartridges, etc. Only service-type ammunition has been included in this study.

5. For the purpose of recording the status of items of materiel from the standpoint of development and suitability for service use, items are type classified by appropriate ordnance technical committee action. Type classification provides a basis upon which to broadly judge the current qualitative adequacy of Army materiel and to plan and carry out its procurement, issue, maintenance and disposal. Items are authorized status in one of the following types:

- a. Development category - materiel currently under development.
- b. Limited-production type - (LP) - an item under development considered to be promising enough operationally to warrant initiating procurement and production prior to completion of development and adoption as a standard item.
- c. Standard types - the standard types designate the items that have been adopted as suitable for U. S. Army use (or other agencies when the Army is the supply agency) which are acceptable as assets to meet operational requirements; are authorized for inclusion in equipment authorization documents; and are described in published adopted items lists. There may be more than one standard type or more than one item of any specific standard type to fulfill the same requirement. Standard types are

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subdivided as follows:

(1) Standard A - the most advanced and satisfactory items currently available to fill operational requirements.

(2) Standard B (substitute standard) - items which have limited acceptability to fill operational requirements. These items are normally used and issued as substitutes for Standard A items.

(3) Standard C (limited standard) - items which have only marginal acceptability for operating requirements and are being forced out of the system as stocks of more adequate items become adequate to meet requirements.

d. Obsolete category - Items which are no longer acceptable for U. S. Army use.

Normally, following a program of evaluation and acceptance, ammunition will go from the development status to Standard A status; as newer ammunition is developed and becomes Standard A, the older Standard A ammunition reverts to Standard B, then to Standard C, and finally obsolete.

6. To prevent any ammunition compilation from becoming unwieldy and because it would be of no interest for future Navy planning, all ammunition for weapons which are currently obsolete, of marginal acceptability by Army standards (Standard C), or for which development has been terminated without standardization has been omitted from subsequent tables. Weapons systems thereby removed from further consideration in this report are listed below so the reason for their omission will be understood.

- a. All 75 mm Howitzers (Standard C or obsolete)
- b. All 75 mm Recoilless Rifles (Standard C)
- c. 75 mm Gun M3 (Standard C)
- d. All 110 and 156 mm Howitzers (program terminated)
- e. 105 mm Mortar (program terminated)
- f. Also the development of the following specific weapons has been terminated: T-185E11 76 mm gun, T132E3 90 mm gun (shallow rifling), T-178 90 mm gun, T-140 105 mm gun, T-179 120 mm gun, T-180 155 mm gun, T-208 90 mm gun (smooth bore), T-210 105 mm gun (smooth bore).

Compilation of Current Army Ammunition

7. Current Standard A, B, and developmental ammunition is listed in Table I. The table is arranged according to weapon caliber and nomenclature for the applicable family of compatible ammunition. Since the weapons are

usually one component of a weapon system (i.e. 76 mm M32 gun used on M41 tank), the weapon system application is given for information. Ammunition is categorized as fixed, semi-fixed, or separate loading; and as Standard A, B, or developmental. Where available the ammunition weight, length, muzzle velocity and range are given for Standard A items. For fixed and semi-fixed ammunition the dimensions and weight of the projectile and complete cartridge are given, whereas for separate loading ammunition the projectile and charge are dimensioned separately. Nomenclature for fixed and semi-fixed ammunition is for the complete cartridge, whereas nomenclature for separate loading ammunition is for the projectile only. The 90 mm anti-aircraft guns M1 and M2 and the 120 mm anti-aircraft gun M1 are now Standard B. Since the ammunition is compatible with similar caliber weapons, these weapons are excluded from Table I and the ammunition is listed as Standard B for the appropriate similar weapons.

8. Table I is intended to be only a summary of current Army ammunition. The many characteristics and minor variables between various types and modifications of ammunition are quite extensive and such detail would detract from the overall conciseness and clarity of this report. Army ammunition is described in excellent detail in the TM's and TIR's referred to in Appendix A. No purpose is served by copying Army documents so only the current nomenclature and major characteristics are extracted, and the reader is referred to the appropriate Army literature for detailed information. Except in certain instances, only the family of ammunition (i.e. M313) is tabulated and current modifications (i.e. M313 A1, M313 B2 etc.) are not indicated. It is believed that to refer to specific mods as the latest may be misleading since changes are in continuous process and most mods are of a minor nature.

#### Fuze Interchangeability

9. Tables II A and II B are projectile-fuze interchangeability charts, cross referenced against Table I. Current fuzes for use with Standard A projectiles listed in Table I are listed. No Standard B or developmental fuzes are included on this chart. Fuzes shown on this chart are only those which are completely authorized for the projectiles shown and do not include any combat emergency-only type fuzes. As with projectiles, fuzes are covered completely in the TM's and TIR's referred to in Appendix A. This chart is only a summary of current applicable artillery and mortar fuzes.

#### Environmental Considerations

10. Personnel at Army Materiel Command, Aberdeen Proving Ground and Picatinny Arsenal were consulted to determine the environmental qualifications of the projectiles and fuzes listed in Tables I and II. There was a general lack of readily available environmental information for the specific projectiles and fuzes under consideration. Comments, with references to the appropriate TIR's, on the environmental qualifications of projectiles and fuzes as determined from the available data are listed in

Appendix B. Of course the Army ammunition is evaluated with the expected Army environmental conditions in view; however, it is believed that any Army ammunition that is Standard A would meet the majority of the Navy environmental qualifications. Before a projectile or fuze is adopted as Standard A, several hundred items are tested and the ability of the item to meet the Military Standard and JAN test specifications such as standard shocks, vibrations, temperatures, humidities, etc., is well demonstrated. It is therefore recommended that any projectile or fuze tentatively considered for Navy use be studied in more detail on a per case basis. If considered necessary for Navy certification, a small sample lot should be procured and subjected to certain specific tests to substantiate that any unique Navy environment which may possibly differ from Army environment is satisfied.

#### Conclusions

II. The following conclusions are offered for this study:

- a. Complete data pertaining to Navy usage of Army ammunition are not available, making a definite "accept or reject" conclusion difficult. However, one logical conclusion is that only Standard A material should be considered for Navy application. If tentatively selected for consideration as Navy ammunition, any item must be studied in more detail for the purpose of substantiating qualifications within the Navy environment. An evaluation program should be conducted where necessary.
- b. System compatibility of ammunition in a Navy weapon system must be demonstrated by tests. Caution must be exercised in converting ammunition from a single-loading Army weapon to a rapid-loading automatic Navy weapon.
- c. Repackaging of ammunition will normally be required for the Navy stockpile-to-target sequence. This is a relatively minor consideration and should not affect the tactical aspects of Navy utilization of Army ammunition.
- d. This report summarizes information currently available on Army projectiles, cartridges, and fuzes. Much specific and detailed information is available in the TM's, TIR's, and other publications referred to in Appendix A. These documents are continually being revised and updated, giving the latest current information on all ammunition under development and being standardized by the Army. Since 1954 a TIR has been prepared and maintained in a constant state of updating on all projectiles, cartridges, and fuzes under Army development. The Navy could best keep abreast of current Army ammunition developments by means of the appropriate TIR's as they are published since the information contained in this report will rapidly become obsolete as Army developments progress.
- e. With judgment guided by anticipated Navy requirements, the following items are not recommended:

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(1) All 75 mm ammunition. This is Standard B or lower and is rapidly being phased out of Army planning.

(2) All other Standard B or lower projectiles, cartridges or fuzes which are compatible with current Standard A weapon systems.

(3) Fuze M 520 Al. May not arm when used with a 155 mm Howitzer at the lowest charge in a worn tube. The fuze is sensitive to shock and friction. A pull wire provides safety during shipment and rough handling.

(4) Fuze M 514 Al. Will result in 50% failure of proximity functioning under the following circumstances: 155 mm gun and Howitzer at 55° elevation; 8-inch Howitzer at 50° elevation; 240 mm gun at 45° elevation.

(5) M 328 Smoke Shell for 4.2-inch Mortar. There is excessive pillaring and dissipation of the smoke with inadequate duration of screening. It is unsuitable in the extreme heat of the desert. It is unsuitable for aerial delivery because it is unsafe in case of a malfunctioning parachute.

12. Current Army ammunition developmental trends are as follows:

a. Projectiles - At the present time the principal effort is being exerted on the improvement of HE, HEAT, chemical and anti-personnel rounds.

b. Fillers for Projectiles - The current trends in the development of fillers for projectiles are to provide explosives with a higher rate of detonation and better stability at high temperatures than those used in World War II, and to improve all other fillers.

c. Combustible Cartridge Cases - Such cases have been developed for the 40 mm gun. Under development are a fully combustible cartridge case and primer system for the T-384 105 mm HEAT round. Sufficient knowledge has been acquired to permit the design of a combustible cartridge case for any set of ballistic requirements. None have been standardized to date.

d. Fuzes - Numerous improvements in the design of fuzes have been made since World War II as the result of demands for better performance and because of the introduction of new rounds, particularly those with fin-stabilized projectiles. Fuzes have been made more sensitive, accurate, and versatile by application of new materials, new techniques and new mechanisms. Safety and environmental insensitivity have been improved. Standardization of contour, thread, ruggedness, etc., has been done where possible to make a single fuze applicable to an increased number of projectiles.

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CALIBER	WEAPON	USE	APPLICATION	FIXED OR SEPARATE LOADING	AMMUNITION		FOR STANDARD A AMMUNITION PROJECTILE			FOR STANDARD A AMMUNITION VELOCITY (FPS)	FOR STANDARD A AMMUNITION RANGE (YDS)	REFERENCE
					STANDARD	DEVELOPMENTAL	LENGTH (IN)	WEIGHT (LBS)	LENGTH (IN)			
75 MM	M 55 GUN	ANTI-AIRCRAFT & TERRESTRIAL	SKY SWEEPER	F	M334HE							TM9-1300-203 TIR CD-9
76 MM	M32 (T9E3) M48 GUN	ANTI-TANK	M41 TANK	F	M339AP M363 CANISTER M332 HE (T14) M331HWP (T140)			14.56 15.00 14.49 10.59 8.95 14.46	27.32 27.18 25.83 19.35 20.72 25.82	3,200 2,400 4,125 2,400	16,080 15,680 23,630 16,070	TM9-1300-203 TIR CD-5 TIR CD-7
81 MM	M11, M29, & M9'S MORTAR (SEE NOTE 2) M FOR M9'S MORTAR ONLY UNLESS CHARGE IS REDUCED	TERRESTRIAL	INFANTRY T257E1 SELF PROPELLED MORTAR	SF	M362A1 HE (T376) M360 HE (T30E9) M370 WP (T30E9) M362 HE (T28E6) M45 HE M56 HE			20.79 22.48 20.767	7.20 10.71 9.34	800 2,300 870	3,897 2,300 4,500	TM9-1300-205 TIR CD-6 TIR CD-7 TIR CD-9
90 MM	M56 M41, & M54 GUN (SEE NOTE 3)	ANTI-TANK	M56 SELF PROPELLED GUN M48A2 TANK	F	M318 AP (T33) M431 HEAT (T30E5A) M71A1 HE M377 CANISTER (T22) M313 WP M82 APC M334 CANISTER M332 HWP M71 HE			14.18 16.79 11.06 23.64	24.18 23.57 23.74 37.46	2,800 2,800 2,800	21,400 21,400 21,400	TM9-1300-205 TIR CD-5
90 MM	M67 RECOILLESS RIFLE	ANTI-TANK	INFANTRY	F	M371 HEAT (T249)			27.0	6.8	700	500	TM9-1300-204 TIR CD-5 TIR CD-7 TIR CD-9
105 MM	M68 GUN	ANTI-TANK	M68 TANK	F	M392A1 APDS M375A1 HEP M456 HEAT (T36A) M392 APDS M393 HEP			12.75 24.8	33.0 37.0	4,850	NOTE 9 " " " "	TM9-1300-203 TIR CD-5 TIR CD-9

NOTES:  
1. CARTRIDGE DIMENSIONS ARE FOR COMPLETE ROUND FOR FIXED AND SEMI-FIXED AMMO. FOR CHARGE ONLY FOR SEPARATE LOADING AMMO.  
2. FOR 81 MM MORTAR RANGE VARIES WITH CHARGE. MAX RANGE IS FOR LARGEST CHARGE.  
3. 90 MM GUNS M12 M3 (AA) STD B. MOST AMMUNITION USEABLE IN M41 AND M54 EXCEPT M71 HE WITH CERTAIN FUZZES.  
4. FOR 105 MM HOWITZER, RANGE VARIES WITH CHARGE. MAX RANGE IS FOR LARGEST CHARGE.  
5. FOR 101 MM MORTAR, RANGE VARIES WITH CHARGE. MAX RANGE IS FOR LARGEST CHARGE.  
6. ROTATING BAND NARROW FOR 65 MM HOWITZER, AMMO. CAN BE USED IN GUN WITH BASE CHARGE ONLY. ROTATING BAND WIDE FOR 155 MM GUN, AMMO. CANNOT BE USED IN HOWITZER.  
7. FOR 155 MM & LARGER, PROPELLING CHARGE IS IN CLOTH BAGS, NO METAL CASE. RANGE VARIES WITH CHARGE. MAX RANGE IS FOR LARGEST CHARGE.  
8. CERTAIN ROUNDS REQUIRING SPECIAL SECURITY CLEARANCE ARE OMITTED FROM THIS TABLE.  
9. MAX. RANGE NOT APPLICABLE FOR MOST ANTI-TANK ROUNDS. MAX. EFF. R. AGAINST ARMY TARGETS IS APPROX. 2,000 YDS.  
(NOTES CONTINUED ON SHEET 2)

TABLE 1. COMPILATION OF ARMY AMMUNITION

CALIBER WEAPON	USE	APPLICATION	AMMUNITION TYPE CLASSIFICATION (SEE NOTE #)		FOR STANDARD PROJECTILE		AMMUNITION CARTRIDGE LENGTH (IN.)	AMMUNITION WEIGHT (LBS.)	FOR STD. A VELOCITY (FPS)	FOR MAXIMUM RANGE (YDS)	REFERENCE		
			STANDARD A	STANDARD B	LENGTH (IN.)	WEIGHT (LBS.)							
105 MM M2, M4, M49 AND XM105E3 HOWITZER *FOR XM05E3 HOWITZER ONLY UNLESS CHARGE IS REDUCED (SEE NOTE 4)	ARTILLERY	M52A1 SELF PROPELLED HOWITZER T195 SP HOWITZER XM104 SP HOWITZER M101A1 TOWED HOWITZER XM102 TOWED HOWITZER	M4A2 HE (T198B)						2,725	16,100			
			M50 GB						1,550	12,330			
			M60 GAS			19.51	35.59	31.48	43.86	1,550	12,330		
			M84 SMOKE			18.84	32.86	30.49	41.97	1,550	12,330		
			M84 LEAFLET			19.51	34.83	31.10	43.81	1,550	12,330		
			M327 HEP			18.84	32.86	30.19	41.97	1,550	12,330		
			M1 HE			23.38				1,550	12,330		
			M314 (ILL)			36.55				1,550	12,330	TM9-1300-203 TIR CD-6 TIR CD-9	
			M346 HEP							17.55	39.31	37.93	NOTE 9
			M34A HEAT (T119)							17.55	39.31	36.72	"
107 MM (4.2 IN.) M130 AND XM195 MORTAR (SEE NOTE 5) *FOR XM195 MORTAR ONLY UNLESS CHARGE IS REDUCED	ANTI TANK	M50 SELF PROPELLED MULTIPLE RIFLE	M346 HEP						1635	NOTE 9			
			M34A HEAT (T119)						17.55	39.31	36.72	TM9-1300-204 TIR CD-5 TIR CD-9	
			M329 HE						25.77	27.07	960	5931	
107 MM (4.2 IN.) M130 AND XM195 MORTAR (SEE NOTE 5) *FOR XM195 MORTAR ONLY UNLESS CHARGE IS REDUCED	TERRESTRIAL	M84 SELF PROPELLED MORTAR XM106 SELF PROPELLED MORTAR INFANTRY	M328 WP						960	5931			
			M355 ILL						25.77	28.66	960	5931	
			M2A1 GAS						25.7	26.0	931	5272	
115 MM XM70E1 TOWED ROCKET LAUNCHER	ARTILLERY	MARINES	M328A1 WP								TM9-1300-205 TIR CD-6 TIR CD-7 TIR CD-9		
			M3 HE										
120MM XM105 RECOILLESS RIFLE	ANTI TANK		M2 WP										
			UNDESIGNATED NONCONVENTIONAL HE AND GAS										
115 MM XM70E1 TOWED ROCKET LAUNCHER	ARTILLERY	MARINES	M54 HE								TIR CD-6		
			BOOSTED ROCKET XM378 HE PROJECTILE										
120MM XM105 RECOILLESS RIFLE	ANTI TANK		M419 HEAT								TIR CD-5 TIR CD-7		

NOTES (CONT'D)  
10. KNOWN DIFFERENCES FROM  
PRELIMINARY REPORT OF TYPE  
CLASSIFICATION ARE SHOWN  
BY CORRECTION  
M319 HVAP NO LONGER  
STANDARD  
M301 ILL NOW STD. B  
M 54 HE NOW STD. C  
M332 HVAP NOW STD. C  
M314 ILL NOW STD. A  
M344 HEAT NOW STD. A

TABLE I COMPILATION OF ARMY AMMUNITION

CALIBER	WEAPON	USE	APPLICATION	AMMUNITION TYPE CLASSIFICATION (SEE NOTE 6)		FOR STANDARD A AMMUNITION (SEE NOTE 1)				FOR STD. A AMMUNITION (MUZZLE VELOCITY (FPS))	FOR STD. A AMMUNITION (RANGE (YDS))	REFERENCE	
				STANDARD	DEVELOPMENTAL	LENGTH (IN.)	WEIGHT (LBS)	LENGTH (IN.)	WEIGHT (LBS)				WEIGHT (LBS)
120MM	M58 GUN STANDARD AMMUNITION FOR M1A1 GUN BUT CAN ALSO BE FIRED FROM M58 GUN	ANTI TANK	M10'S TANK SEP	M356 HE (T153) M356 WP M358 AP (T116) M469 HEAT (T153)			24.02	50.41	34.75	38.74	2,500	19,910	
152 MM	XM181 GUN LAUNCHER CANNON		SHILLELAGH		M13 GUIDED MISSILE MULTIPURPOSE XM408 HEAT MULTIPURPOSE XM410 WP								TIR CD-3 TIR CD-5
155 MM	M1, M45, T258 AND T258 HOWITZER (SEE NOTE 6) FOR T255 AND T258 ONLY UNLESS CHARGE IS REDUCED	ARTILLERY	M44, XM62 AND T196 SELF PROPELLED HOWITZERS M14 TOWED HOWITZER	M107 HE M110 GAS M110 SMOKE M12A1GBHX M470 HE (T387)		27.57	95.75	21.0	13.65	18.50	16,355		
155 MM	M2 AND M46 GUN (SEE NOTE 6)	ARTILLERY	M53 AND T245 SELF PROPELLED GUNS M59 TOWED GUN	M121 GB M122 GB M124 GAS M126 SMOKE M182Z ILL M184Z ILL M121 GB XM396 BEEHIVE T78E2 ILL		27.57	98.49	21.0	13.65	18.50	16,355		
165 MM	M57 (T156) GUN	DEMOLITION	M102 COMBAT ENGINEER VEHICLE	M123 HEP								1,000	
175 MM	M115 (T256) GUN	ARTILLERY	M107 (T235) SELF PROPELLED GUN	M437 HE (T203E9)		37.5	147	49.50	55.0	3,000	36,500		TM9-1300-203 TIR CD-6 TIR CD-9
8 INCH	M2 AND M47 HOWITZER	ARTILLERY	M55 AND M10 (T236) SELF PROPELLED HOWITZERS M115 TOWED HOWITZER	M106 HE M426GB08 VK(T14E2) M422 ATOMIC		34.35	200	24.0	28.3	1,950	18,510		TM9-1300-203 TIR CD-6 TIR CD-9
280MM	M66 GUN	ARTILLERY	M65 MOTORIED GUN	M124 HE M566 ATOMIC		52.43	600	75.0	156	2,500	31,400		TM9-1300-203 TIR CD-6 TIR CD-9

TABLE I COMPILATION OF ARMY AMMUNITION

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TABLE II A  
ARTILLERY AUTHORIZED FUZES

Weapon	Cartridge or Projectile	PD	PD-CP	VT	MT	YSQ	MTSQ	BD	PIBD	Reference*
76 MM Gun	M352	M48 M51 M535	M78		M67		M500 M520			
	M361	M48 M57	- -	- -	- -	- -	- -	- -	- -	
90 MM Gun	M71A1	M51	-	-	-	-	-	-	-	
	M513	M48 M57	- -	- -	- -	- -	- -	- -	- -	
	M431	- -	- -	- -	- -	- -	- -	- -	M509 M530	TIR CD-9
90 MM Rifle	M371							M530	TB9-1300-204/1	
105 MM Gun	M393							M534		
	M456	-	-	-	-	-	-		M509 M530	TIR CD-9
105 MM How	M360	M508 M51								
	M60	M508 M535 M57								
	M84 M327	- -	- -	- -	- -	M54	M501		M62 M91	
	M1	M51 M535	M78	M513	M67	M55	M500 M520			
105 MM How	M314					M54	M501			TIR CD-9
	M442	M507 M535		M513			M520			
106 MM Rifle	M346							M91		TM 9-1300-204
	M344							M509		TM 9-1300-204
120 MM Gun	M356	M51 M535	M78			M55	M500 M520			
	M357	M48 M51 M508 M535								
	M469	- -	- -	- -	- -	- -	- -	- -	M509 M530	TIR CD-9
155 MM How	M107	M51 M535	M78	M514	M67	M55	M500 M520			
	M110	M51 M508 M535 M57			M67					
	M121A1 M470	M508 M507 M535		M514			M520			TIR CD-9
165 MM Gun	M123							M62 M91		
175 MM Gun	M437	M535 M51	M78	M514	M67	M55	M520 M500			
8 In. How	M106	M51 M535	M78	M514	M67	M55	M520 M500			
	M426	M508								
280 MM Gun	M124	M535	M78	M514	M67	M55	M520			

\* Reference - TM9-1300-203 unless noted  
 PD-Point Detonating  
 PD-CP Point Detonating - concrete piercing  
 VT-Variable time (proximity)  
 MT-Mechanical Time  
 TSQ-Time and super quick  
 MTSQ-Mechanical Time and super quick  
 BD-Base detonating  
 PIBD-Point Initiating base detonating

TABLE 11B  
FUZE INTERCHANGEABILITY CHART - MORTAR AMMUNITION

Cannon	Authorized Fuzes	Mechanical Time and Superquick			Point Detonating			Proximity
		M500 Series	M501 Series	M520 Series	M51A5	M521	M524 M526 M535 Series	
81mm Mortar M1, M29 and XM93	HE M362 Series				X	X		M513 M517 Series X
	Smoke WP M370				X	X		X
4.2-inch Mortar M30 and XM95	HE M329	X		X	X		X	X
	Illuminating M335							
	Smoke M328						X	

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2. Department of the Army Technical Manual TM9-1300-203; Ammunition for Anti-aircraft, Tank, Anti-tank, and Field Artillery Weapons
3. Department of the Army Technical Bulletin TB9-1300-203/1; Assembly of Explosive Components; GB and VX Projectiles
4. TB 9-1300-203/2; Cartridge, 105mm: HEP, M393 and M393A1
5. TB 9-1300-234-10; Cartridge, 105mm: APDS, M392 and M392A1
6. TM 9-1300-204; Ammunition for Recoilless Rifles
7. TB 9-1300-204/1; Cartridge, 90mm: HEAT, M371
8. TM 9-1300-205; Ammunition for Mortars
9. TM 9-1900; Ammunition, General
10. TM 9-3305-1; Principles of Artillery Weapons
11. TM 9-500; Ordnance Corp Equipment Data Sheets
12. TB 9-AMM 2 Ammunition: Restricted or Suspended
13. (CONF) Army Materiel Command Technical Information Report B(14); List of Technical Information Reports (U)
14. TIR A (2); Classification System for Technical Information Reports
15. (SECRET) TIR CD-1 and CD-1 Supplement 1; Air Defense Weapons (U)
16. (SECRET) TIR CD-2 and CD-2 Supplement 1; Combat Vehicles (U)
17. (SECRET) TIR CD-5 and CD-5 Supplement 1; Anti-tank Weapons (U)
18. (SECRET) TIR CD-6; Conventional Artillery Weapons (U)
19. (SECRET) TIR CD-7 and CD-7 Supplement 1; Infantry Weapons (U)
20. (SECRET) TIR CD-9 and CD-9 Supplement 1; Conventional Artillery Ammunition (U)
21. (CONF) TIR S (24); Developmental items Classified Standard, Substitute Standard, or Limited Standard Since April 1954 (U)

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22. (CONF) TIR X (24); Developmental Items Terminated Since April 1954 (U)
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30. Ordnance Proof Manual ORD-M608-PM, Vol 1 - Arms and Ammunition Testing, Vol 2 - Automotive Testing, Vol 3 - Small Arms Testing, Vol 4 - Ordnance Instrumentation; Distributed by Development and Proof Services, Aberdeen Proving Ground; request must be approved by Army Materiel Command.
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Appendix B

Comments on Environmental Qualifications of Fuzes and Projectiles

1. Fuzes

Item - Fuze M 530 (T278E7)

TIR - 8-1-5A5(3)(C)

Pertinent information - Operability satisfactory against armor. Operable on graze impact with T-300 cartridge. Functioned with other cartridges after ricochet impact. Safe and operable after parachute delivery. Safe with malfunctioning parachute. Passed jolt, jumble, drop, transportation vibration, and temperature and humidity tests. Operable at temperatures from -40°F to +125°F. Bore safe.

Item - Fuze M 508A1 PD

TIR - 8-1-3A8(2)(U)

Pertinent information - Functioned on ground impact when tested in 4.2-inch mortar. Functioned against 0.02-inch aluminum when tested in 155 mm gun. Bore safe. Operable hot, cold and ambient. Area of concern: Do not use in rain or falling snow.

Item - Fuze M 535 (T177E3) PD

TIR - 8-1-3A1(2)

Pertinent information - Replaces M 51A5. Minimum arming delay 40-100 feet, except for antiaircraft rounds. Area of concern: Arming delay is 25-50 feet with antiaircraft 75 and 90 mm ammunition. Not Standard A with antiaircraft ammunition.

Item - Fuze M 513A2 (T226E3)

TIR - 8-1-7A4 (3)(C)

Pertinent information: VT with PD backup. Operable -40°F to +160°F  
Area of concern: Susceptible to jamming.

Item - Fuze M 514A1 (T227E3)

TIR - 8-1-7A5(2)(C)

Pertinent information - VT with impact firing backup. Operable at 0°F to +120°F. Area of concern: Will result in 50% failure of proximity functioning under the following circumstances; 155 mm howitzer and gun at 55° elevation, 8-inch howitzer at 50° elevation, 240 mm gun at 45° elevation.

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Item - Fuze M 520A1 (T288E1) MTSQ

TIR - 8-1-1B8(2)(U)

Pertinent information - Contains booster M125A1 (an auxiliary detonating fuze). Areas of concern: Spin of 2000 rpm necessary for arming may not be obtained in a 155 mm howitzer at lowest charge in a worn tube. A pull wire provides safety during shipment and rough handling. The fuze is sensitive to shock and friction and must be properly packaged.

Item - Fuze M 534A1 (M534E3) BD

TIR - 8-1-4A5(1)(C)

Pertinent information - Has graze functioning feature. Fuze functioning at low angles satisfactory. Should it not function at a low angle, it may function on a subsequent impact.

Item - Fuze M 521 (T247) PD

TIR - 8-1-3A11(2)(U)

Pertinent information - Mortar fuze. Superquick or 0.05-second delay. To be used with 4.2-inch chemical shell M 328. Satisfactory cold and ambient. Areas of concern: Not satisfactory hot. Cannot be dropped safely by parachute. High percent duds when fired with 75 mm T 262 chemical shell.

Item - Fuze M 524 (T186E11) PD

TIR - 8-1-3A24(2)(U)

Pertinent information - Mortar fuze. Superquick or delay. Safe for parachute delivery. Temperature limits -40°F to +160°F. Passed jolt and jumble tests. Areas of concern: Pull wire for safety in storage and transportation. Not moisture-proof.

Item - Fuze M 535 (T177E3) PD

TIR - 8-1-3A1(2)(U)

Pertinent information - Mortar fuze. Superquick or with 0.05-second delay. Waterproof. Has graze impact capability.

## 2. Cartridges or Projectiles

Item - M 352A1 HE-T

TIR - 6-6-7A1(2)

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Pertinent information - 76 mm gun. Passed accuracy tests at ambient temperature.

Item - M 361A1, Smoke, WP

TIR - 6-6-8A1(6)

Pertinent information - 76 mm gun. Accuracy satisfactory at ambient and -40°F from new and worn tube. Reliability satisfactory. Dispersion satisfactory. Satisfactory after rough handling and cross-country hauling.

Item - M 360, Gas, GB

TIR - 6-9-8A2

Pertinent information - 105 mm Howitzer. Report dated November 1954. User tests show satisfactory results.

Item - M 393 HEP-T

TIR - 6-9-6A5(1)(S)

Pertinent information - 105 mm gun. No test results given. M 393 is standard B. M 393A1 is Standard A.

Item - M 356 HE-T (T15E3)

TIR - 6-12-7A1(2)(U)

Pertinent information - 120 mm gun. Separated ammunition. Used with M 45 propelling charge. User tests satisfactory.

Item - M 121, Gas, GB

TIR - 6-14-8A2(2)(C)

Pertinent information - 155 mm howitzer. M 121A1 is Standard A. Can be parachute delivered. Works well in temperate zone and arctic.

Item - M 124 HE

TIR - 6-19-7A1(1)(C)

Pertinent information - 280 mm gun. Separate loading with M 43 bagged propelling charge. Area of concern: Neither the M 124 (forged) nor the M 124A1 (cast) will defeat a 6-foot concrete wall.

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Item - M 370, Smoke, WP

TIR - 6-7-8A1(1)(C)

Pertinent information - 81 mm mortar. No test results.

Item - M 329 HE (E85R7)

TIR - 6-10-7A1(1)(C)

Pertinent information - 4.2-inch mortar. Recommended use of comp B as the filler instead of TNT.

Item - M 328 (E84R7) Smoke

TIR - 6-10-8A1(1)(U)

Pertinent information - 4.2-inch mortar. Areas of concern: Excessive pillaring and dissipation of the smoke with inadequate duration of screening; unsuitability under extreme heat of desert; unsuitable for aerial delivery because unsafe in case of a malfunctioning parachute.

Item - M 371 (T249E6) HEAT

TIR - 6-8-5A3(3)(C)

Pertinent information - 90 mm recoilless rifle. Area of concern: Did not meet requirement of defeating six-inch armor at 64° obliquity 90% of the time.

Item - M 392A1 APDS

TIR - 6-9-1A3(2)(S)

Pertinent information - 105 mm gun. Service tests satisfactory.

Item - M 456 (T384E4) HEAT

TIR - 6-9-5A7(3)(C)

Pertinent information - 105 mm gun. Target operability satisfactory. Standard A in temperate climates. Summer and winter environmental tests to be conducted.

Item - M 442 (T388) HE

TIR - 6-9-7A12(1)(C)

Pertinent information - 105 mm Howitzer. No test results.

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Item - M 358 (T116E7) AP

TIR - 6-12-1A1(3)(C)

Pertinent information - 120 mm gun. Ballistic acceptance tests satisfactory.

Notes

1. Fuze M 535 PD replaces Fuze M 51A5, except for 75 and 90 mm AA ammo (TIR 8-1-3A1(2)).
2. M 525 Fuze standard C - TIR 8-1-3A21(3)(U)
3. M 526 Fuze standard B - TIR 8-1-3A21(2)
4. M 527 Fuze standard C - TIR 8-1-3A21(2)
5. 81 mm mortar smoke shell M 57 - standard C - TIR 6-7-8A1(1)(C)
6. Fuze M77 - standard C - TIR 6-7-8A1(1)(C)
7. 4.2 inch mortar chemical shell M2 - standard B - TIR 6-10-8A1(1)(U)

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63-115	63Ø115		
15 May 1963	Ø563		

SUBJECT ANALYSIS OF REPORT

DESCRIPTORS	CODES	DESCRIPTORS	CODES	DESCRIPTORS	CODES
Guns	GUNS	Fuze	FUZE		
Mount	MOUT	Compatibility	CMPB		
Ammunition	AMMU	Environment	ENVI		
Utilization	USAG				
Feasibility	FEAS				
Army	ARMY				
Navy	NAVA				
Howitzers	HOWI				
Mortars	MORT				
Recoilless	RCOL				
Rifles	RIFL				
Projectiles	PROJ				

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GUN MOUNT AMMUNITION UTILIZATION FEASIBILITY STUDY (U), by P. W. Naylor and L. J. Shkolnik. 15 May 1963. 6p. tables. BuWeeps task RREN-ST-038/212/5/0000-00-000. CONFIDENTIAL

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  2. Ammunition - Serviceability
  3. Ammunition - Small arms
  - I. Title
  - II. Naylor, Peter W.
  - III. Shkolnik, Leon J., jt. author
  - IV. Project
- Abstract card is unclassified.

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