DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

OPERATOR'S INFORMATION FOR CARTRIDGE, 105MM APFSDS-T M833 (TANK COMBAT, FULL TRACKED, 105MM, GUN, M48 SERIES, M60 SERIES AND M1)

Headquarters, Department of the Army, Washington DC
17 August 1992

REPORTING OF ERRORS

You can help improve this bulletin. If you find any mistakes or know of a way to improve the procedures, please let us know. Mail your DA Form 2028 (Recommended Changes to Publications and Blank Forms), direct to Commander, US. Army Armament Research, Development and Engineering Center, ATTN: SMCAR-LMB, Picatinny Arsenal, New Jersey 07806-5000. A reply will be furnished to you,

WARNING

FIRING THE M833 AT AMMUNITION TEMPERATURES ABOVE 126 DEGREES F (+52.0°C) MAY RESULT IN EXCESSIVE CHAMBER PRESSURES WHICH MAY LEAD TO WEAPON DAMAGE. FIRING THE M833 AT AMMUNITION TEMPERATURES BELOW -35 DEGREES F (-37.2°C) MAY RESULT IN WEAPON DAMAGE.

1. Introduction. The purpose of this TB is to provide operator-level information on Cartridge, 105mm: APFSDS-T, M833 and its care, handling, and maintenance, This armor defeating round is designed for firing by the M68 series gun in all tanks which mount it,

2. General. This technical bulletin is an interim document for use until changes to the following operator technical manuals are issued.

a. TM 9-2350-253-10- Operator's Manual: Tank, Combat, Full-Tracked: 105mm Gun, M60A3.

b. TM 9-2350-258-10- Operator's Manual: Tank, Combat, Full-Tracked: 105mm Gun, M48A5.

c. TM 9-2350-215-10- Operator's Manual: Tank Combat, Full-Tracked: 105mm Gun, M60A1 W/E (2350-00-756-8497) Tank: M60 W/E (2350-00-678-5773).

d. TM 9-2350-255 -10-3 - Operator's Manual: Tank, Combat, Full-Tracked: 105mm Gun Ml (2350-01-061-2445) General Abrams,

e. TM 9-2350-257-10-3- Operator's Manual: Tank, Combat, Full-Tracked: 105mm Gun, M60A1 (RISE) (NSN 2350-00-116-9765): (RISE PASSIVE) (2350-01-059-1503).

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* This bulletin supercedes TB 9-2350-357-10, 31 August 1990.

3. Information to be Incorporated into Operator Technical Manuals. The following information will be incorporated as changes to the ammunition chapter of the affected weapons manuals:

a. Description.

(1) The 105mm, M833, APFSDS-T, Cartridge (fig. 1) is an armor-piercing antitank cartridge and is intended for use on 105mm guns M68 cannon, against armored targets. The projectile consists of a subprojectile and sabot.

(2) The subprojectile consists of a monolithic staballoy (depleted uranium) core, and is fitted with an aluminum windshield with steel tip to eliminate aerodynamic heating and an aluminum fin assembly

(3) The aluminum sabot is composed of three 120° sections, which transfers momentum to the subprojectile through a series of mating buttress grooves.

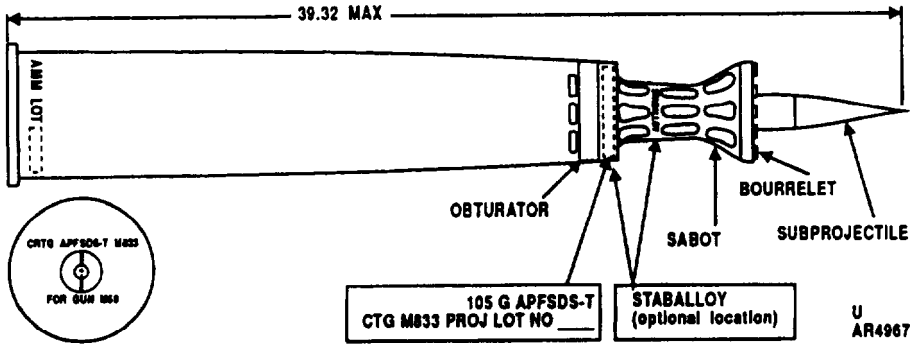

Figure 1. Cartridge, 105mm, M833, APFSDS-T.

(4) The sabot is an adaptation of the M735/M774 technology differing in design by the use of gussets in the sabot segments to retain strength and rigidity and reduce weight. A steel bourrelet, containing three shear cuts, is screwed to the sabot forward face. A two piece nylon obturator and polypropylene seal is assembled around the sabot and a silicone rubber seal is applied over the rear face of the sabot. An M13 Tracer is assembled to the fin and is held in place by a threaded plug and disc assembly. The projectile is crimped to an M148A1B1 Cartridge Case, which holds approximately 12.8 pounds of M30 propellant, and is fitted with an M120 electric primer. A gun tube wear-reducing titanium-dioxide liner is assembled to the interior wall of the cartridge case.

b. Functioning. During projectile flight, the tracer burns for a minimum of 2.5 seconds. The sabot discards upon leaving the gun tube by aerodynamic and centrifugal forces. The projectile is fin stabilized in flight. In order that only minimal spin is imparted to the projectile when the obturator engages the gun tube rifling, the plastic seal under the obturator reduces the coefficient of friction, producing approximately 80 percent slippage. The core penetrates the target solely by kinetic energy.

c. Tabulated Data.

Type Classification:

Cartridge, 105 mm:
APFSDS-T, M8-33---------- TC standard

NOTE

Classified tabulated data has not been included in this TB.

Complete round:
Type----------
Weight ----------
Length ----------
Cannon used ----------
Projectile

Temperature Limits:

Firing:	
Lower limit	-35°F (-37.2°C)
Upper limit	+ 125°F (+ 52.0°C)
Storage:	
Lower limit	-50°F (-46°C)
Upper limit	+ 145°F (+63°C)
Packing:	
Alternate	1 round per fiber container, 2 containers per wooden box
Standard	1 round per metal container, 30 containers to a pallet
Packing box:	
Weight	124 lb
Dimensions	48-3/4 X 14-1/16X 8-9/16 in.
Volume	3.3 cu ft
Part No.	9347387
Fed supply code for mfg	09781
Metal container:	
Weight	0.67 lb
Dimensions	45.67 X 7.13X 7.13
Volume	0.9 cu ft
Part No.	9345252
Fed supply code for mfg	09781
Fiber container:	
Part No.	9347384
Fed supply code for mfg	09781

NOTE

See SC for complete packing data including NSN's.

Shipping and Storage Data:

Quantity-distance class	(08) 1.2
Storage compatibility group	L
DOT shipping class	B
DOT designation	AMMUNITION FOR CANNON WITH SOLID PROJECTILES
DODAC	1315-C524
Drawing number	9342931

Limitations:

Projectile is not to be disposed of by burning or detonation.

The M774 and M833 are full service rounds which may only be fired during war emergency All peace time firings are prohibited except at times of NRC license and host nation agreement.

Authorized rounds for 105mm gun M68:

Cartridge, 105mm: APFSDS-T, M735:

Complete round:	
Weight (approx)	38.0 lb (17.1 kg)
Length (approx)	37.94 in. (94.8 cm)
Projectile weight as fired (approx)	12.78 lb
Primer	Electric M120

Cartridge, 105mm: APFSDS-T, M774:

Complete round:	
Weight (approx)	37.8 lb
Length (approx)	35.75 in. (90.8 cm)
Projectile weight as fired (approx)	12.75 lb
Primer	Electric M120

Cartridge, 105mm: APFSDS-T, M833:

Complete round:	
Weight (approx)	38.2 lb
Length (approx)	39.32 in.
Projectile weight as fired (approx)	13.45 lb
Primer	Electric M120

Ammunition, 105mm: HEAT-T M456A2:

Weight (approx)	48.0 lb
Length (approx)	39.3 in.
Projectile weight as fired (approx)	22.4 lb
Primer	Electric M83
Fuze	PI, BD, M509A1

NOTES:

PIBD - Point initiating, base detonating
TP-T - Target practice with tracer
WP-T - White phosphorous with tracer
APDS-T - Armor piercing discarding sabot with tracer
APFSDS-T - Armor piercing fin stabilized discarding sabot with tracer

WARNING

THE M774 AND M833 CARTRIDGE CONTAINS MATERIAL WHICH REQUIRES CONTROLLED DISPOSAL. ANY UNSERVICEABLE M774 AND M833 CARTRIDGE SHOULD BE REPORTED DIRECTLY TO THE POST RADIOLOGICAL PROTECTION OFFICER (RPO).

NOTE

- Loss of unauthorized firings of the M833 must be reported to the HQ, AMCCOM RPO within 24 hours of the discovery. Telephone reports should be followed with a written report to:

  Commander, USA AMCCOM
  ATTN: AMSMC-CG/Radiological Protection Officer (IWO)
  Rock Island, IL 61299-6000
  DSN: 703-3383134831494214728
  Commercial: (309) 794-3383/3483/494214728
  FTS: 367-4942/3383/3483
  Non-duty, post operator:
  DSN: 793-1110; Commercial (309) 794-6001 (ask for staff duty officer)

- All transmissions regarding incidents of this nature must be classified at least confidential. The possession of the source material (Depleted Uranium) is licensed to Headquarters, AMCCOM, in accordance with Federal Law, Title 10, Code of Federal Regulations. The AMCCOM Commander (Radiological Protection Officer) is responsible for the license compliance and personally accountable for the source material. Violations of this law may result in a personal fine or imprisonment. Failure to report a non-compliance is also punishable under Federal Law,

- Prior to 30 August of each year, a submittal of inventory (number of M833 rounds on hand) by location must be forwarded to:

  Commander, USA AMCCOM
  ATTN: AMSMC-SF (RPO)
  Rock Island, IL 61299-6000

  The submittal should be forwarded from each major depot listed in the AMCCOM license and each user command.

References:

SC 1305/30-IL
SC 700-20
DARCOM-P 700-3-3
TM 9-1300-250
TM 9-1300-251-20
TM 9-1300-251-34
TM 9-2350-215-10
TM 9-2350-255 -10-3
TM 9-2350-257-10-3

d. Care, Handling and Preservation.

(1) General,

(a) When it is necessary to leave ammunition in the open, raise it on dunnage at least 6 inches (15.2 cm) from the ground and cover it with a double thickness of paulin, leaving a minimum of 18 inches (46 cm) of space for the circulation of air.

(b) Whenever practicable, loading of the APFSDS-T Ammunition into tanks is best done with the rounds kept in their fiber containers until they are loaded into the tank.

(c) The M735, M774, and M833 cartridge should only be handled with one hand on the sabot and the other on the cartridge case.

(d) After removal of M735, M774, or M833 cartridges from their containers and before loading into the tank, inspect for the presence of a hose clamp on the sabot, If present, remove by fully opening clamp with a screwdriver.

CAUTION

FIRING OF THE M735, M774, OR M833 CARTRIDGE WITH A HOSE CLAMP AROUND THE SABOT WILL RESULT IN GROSS INACCURACY AND TOTAL INEFFECTIVENESS OF THE PROJECTILE.

NOTE

Retain Pull Collar of the M833 Cartridge for reuse, If lost, fabricate similar type Pull Collar from available tape when repacking into metal container.

(e) A small dent in or slight dislocation of the windshield on the M735, M774, or M833 cartridge can severely affect the accuracy of the subprojectile flight,

NOTE

- If an M774 or M833 APFSDS-T cartridge misfires or is damaged, the cartridge should be turned in for repacking and disposition.

- APFSDS -T Ammunition must not be grasped by the windshield or windshieid cushion — grasp this ammunition by the sabot.

(f) When loading 105mm ammunition into tank (fig. 2) grasp round by base of case with hand over primer (1) and sabot (2) with other hand. Pass round from person to person as shown. Always lower round through loader's hatch, projectile (2) first.

CAUTION

A SMALL DENT IN OR SLIGHT DISLOCATION OF THE WINDSHIELD ON THE M735, M774, OR M833 CARTRIDGE CAN SEVERELY AFFECT THE ACCURACY OF THE SUBPROJECTILE FLIGHT.

(g) The M735, M774, and M833 are packaged as other 105mm tank ammunition with one exception. Because even slight damage to the subprojectile's windshield can severely affect the round's accuracy a protective cushion is fitted over the windshield. Always remove this foam plastic cushion (fig. 3) before cambering a M774, M735, or M833 round.

(h) Firing table FT 105-A-2 is provided for the 105mm gun M68.

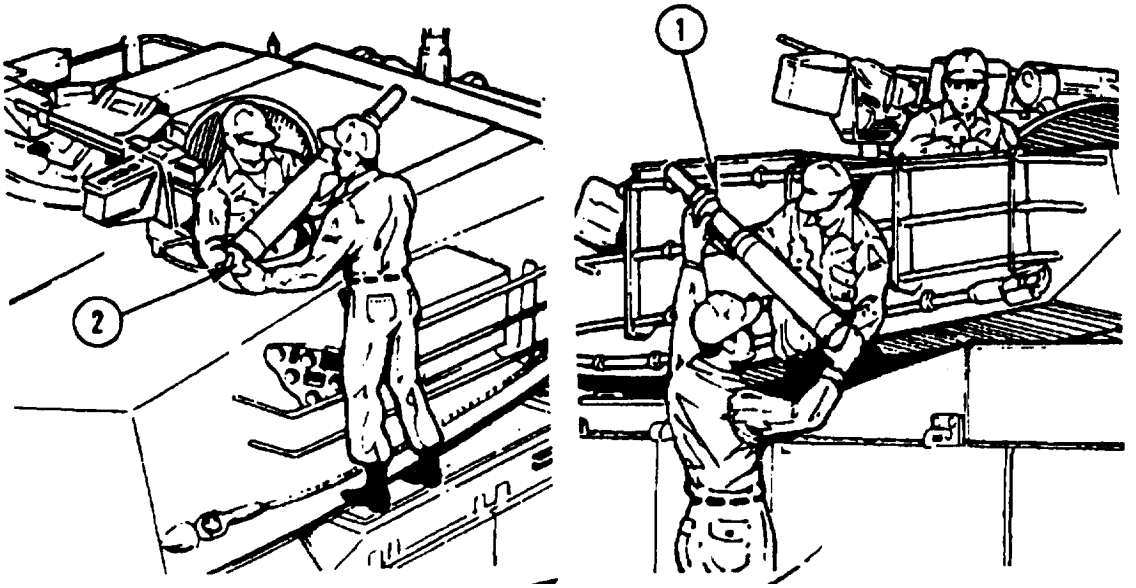

Figure 2. Loading 105mm Ammunition into Tank.

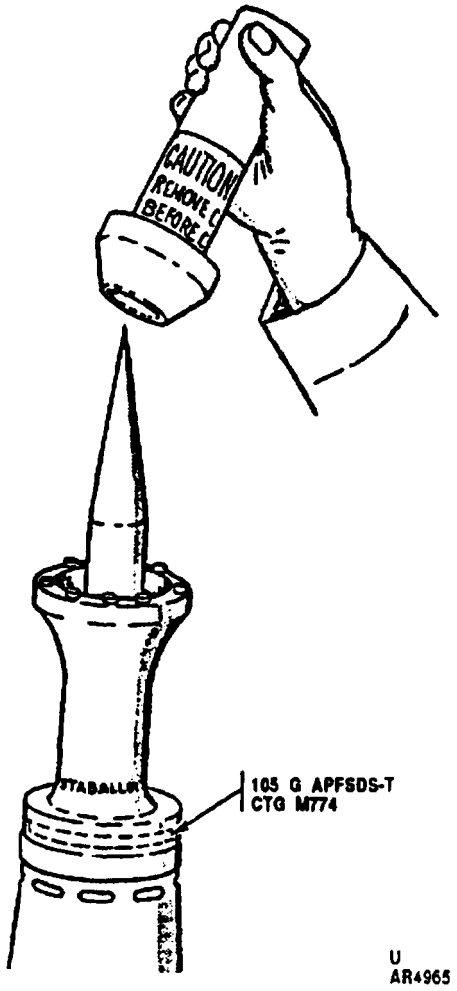

Figure 3. Removing Plastic Cushion from M774 Round.

NOTE

For additional information on ammunition maintenance, refer to TM 9-1300-251-20 Organizational Maintenance Manual Artillery Ammunition for Guns, Howitzers, Mortars, Recoilless Rifles, and 40mm Grenade Launchers.

(2) Classification (types of ammunition).

(a) The armor-piercing-discarding sabot, with tracer (APDS-T) ammunition and armor-piercing, fin stabilized, discarding sabot with tracer (APFSDS-T) (figs. 4 and 5) ammunition utilizes a projectile which is inert except for the live tracer element incorporated in the base.

(b) There are nine versions of armor-piercing (AP) cartridge currently authorized for the M68 gun. The newer rounds generally are of greater penetrating power than the older rounds.

1. The L28A1 Cartridge is a United Kingdom design and incorporates a bridge L1A3 primer.

2. The M392 (L36A1 United Kingdom designation) Cartridge is a United Kingdom design and incorporates a L4A1 primer. The L4A1 primer incorporates a bridge wire cap instead of the conductive cap utilized in the L1A3 primer.

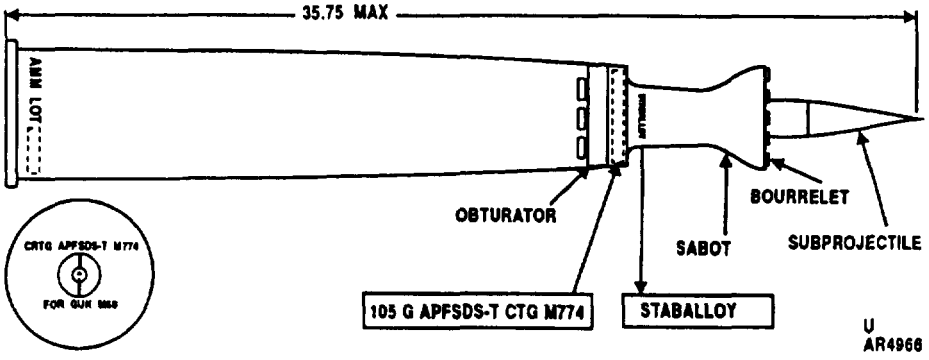

Figure 4. Ammunition 105mm: APFSDS-T, M774.

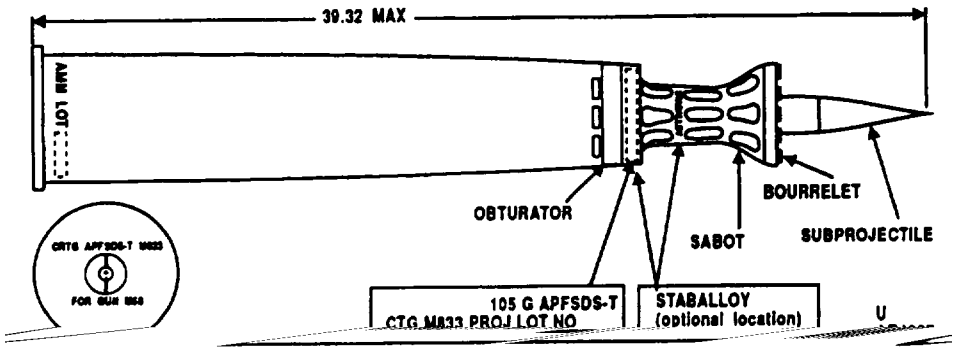

Figure 5. Ammunition 105mm: APFSDS-T, M833.

3. The M392A1 (M392E3) Cartridge is a United States design and incorporates a M80A1 primer. The M80A1 primer incorporates a bridge wire cap.

4. The M392A2 Cartridge is a modification of the M392A1 but incorporates a polyurethane liner (coolant) in the case.

5. The M393 (L37A1 United Kingdom designation) Cartridge is a United Kingdom design and incorporates a L4Al primer with a L19A3 or L29A2 fuze.

6. The M393A1 (M393E1) Cartridge is a United States design and incorporates a M86 primer with a bridge wire cap.

7. The M774, M735, M833 Cartridges are United States design. The M774 and M833 have a subprojectile of staballoy (depleted uranium) and
of by burning or detonation. In addition, M774 and M833 are full service rounds which may only be fired during war emergency All peace time firings of the M774 and M833 are prohibited except at times of NRC license and host nation agreement.

(c) Ammunition for 105mm gun M68 is issued in the form of fixed complete rounds (fig. 6). A complete round has all the ammunition components required to be fired. Each round has an electric primer, a propelling charge, a cartridge case, and a projectile. Projectiles which have an explosive charge are assembledwtith a fuze. The cartridge case is crimped tight to the projectile. When the term “fixed” is used with ammunition, the round comes as a complete unit, ready to be loaded into the main gun.

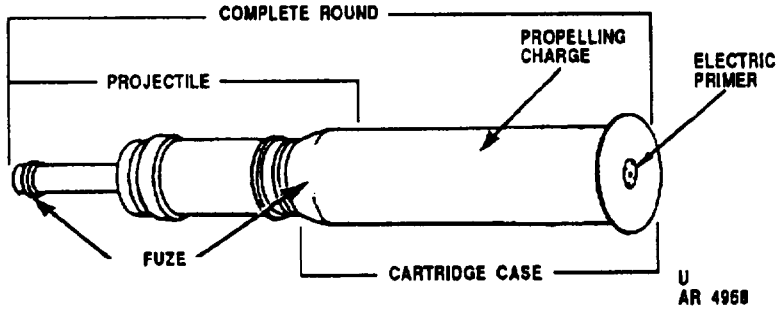

Figure 6. Complete Round Ammunition for 105mm Gun M68.

(3) Precautions in firing. If any APFSDS-T round is ever found with a hose clamp around the sabot, immediately remove the clamp (using a screwdriver to loosen it) and report the lot number of the round found with the clamp as you would a malfunction of the ammunition (in accordance with AR 75-l). Firing of a round with a clamp around the sabot will result in gross inaccuracy and total ineffectiveness of the shot.

W A R N I N G

APFSDS-T, APDS--T, TPDS-T AND HEAT-T-MP (456A2) ROUNDS WILL NOT BE FIRED OVER FRIENDLY TROOPS UNLESS TROOPS ARE PROTECTED BY ADEQUATE COVER. TROOPS MAY BE STRUCK BY A DISCARDED SABOT OR DEBRIS FROM AN AIRBUST. THE DANGER AREA EXTENDS UP TO 1,000 METERS (1,095 YARDS) FROM THE GUN AND 70 METERS (77 YARDS) ON EACH SIDE OF TEE TRAJECTORY. TEE FSDS-T AND APERS-T ROUNDS WILL NOT BE FIRED OVER FRIENDLY TROOPS AT ANY RANGE.

(4) Receipt of Ammunition

NOTE

When it is necessary to leave ammunition in the open, raise it on dunnage least 6 inches from the ground and cover it with a double thickness of paulin, leaving not less than 18 inches of space for the circulation of air, Where practicable, dunnage strips should be placed under each layer of ammunition boxes and other ammunition components. Suitable trenches should be dug to prevent water from running under the pile.

(a) Inventory. Be sure that items received match items on requisition, Check with ammunition supply personnel if nomenclature on list conflicts with nomenclature on packages.

(b) Inspection.

1. Inspect all packing boxes for evidence of damage that could be serious enough to render the contents unusable. Unless there is evidence of damage, do not open packaging until materiel is to be used, If there is damage, unpack only as far as is necessary to determine the serviceability of the materiel. If a container has been damaged, unpack ammunition and inspect (para 3d (5) and (6)). Repackage serviceable ammunition and give priority issue.

2. Inspect markings on packaging for legibility of lot number, If illegible, open box, note lot number stenciled on inner containers, and restore illegible numbers,

3. If the outer box or the containers are beyond repair, transfer the inspected contents to a serviceable box or container, and mark accordingly,

NOTE

Save some boxes and packing material for immediate reuse. Contact Direct Support Maintenance for disposition of remainder of boxes.

(5) Unpacking.

WARNING

- **WEAR GLOVES AND SAFETY GLASSES WHEN CUTTING METAL STRAPPING. HANDLE STRAPPING CAREFULLY STRAPPING HAS SHARP EDGES AND MAY FLY APART SUDDENLY WHEN TENSION IS RELEASED.**
- **TO HELP PREVENT INJURY, RELEASE TENSION IN STRAPS BY PRESSING DOWN ON THE TOP OF THE BOX WHILE CUTTING STRAPS ON THE SIDE OF THE BOX.**

(a) Cut steel strapping with metal cutting shears.

(b) Remove and dispose of straps.

(c) Cut lead seal wire with pliers and remove.

(d) Use screwdriver to disengage wire loops.

(e) Lift box top to open.

(f) Remove top padding/filler (if any) from box.

(g) Remove inner packs (fiber tube containers).

(6) Inspection of Ammunition, The most commonly encountered types of defects are listed below. For detailed inspection and corrective actions refer to TM 9-1300-251-20.

(a) Peeling, blistered, or scratched protective coatings on painted surfaces.

(b) Projectile rust and deterioration.

(c) Rust and corrosion on primers and cartridge case.

(d) Cracks, dents, and other obvious damage to metal components.

(e) Missing, illegible, incorrect, or misleading markings.

By Order of the Secretary of the Army:

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official: Milton H. Hamilton

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army
02364

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To be distributed in accordance with DA Form 12-37-E, block 2075, operator maintenance requirements for TB 9-2350-357-10.

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P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 045040-000