MOBILE ARTILLERY vs. JAP FORTIFICATIONS

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Mobile Artillery vs. Jap Fortifications

OFFICE OF THE CHIEF OF ORDNANCE
WASHINGTON, D.C.

MAY 1945

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INTRODUCTION

This booklet describes weapons, vehicles and ammunition especially adapted to the attack of fortifications likely to be encountered in the war with Japan. Types of fortifications covered are concrete pillboxes, log and/or earth bunkers and caves.

Data in this brochure are for the 155 mm Gun Motor Carriage, M40 (T83), which mounts either the 155 mm Gun, M1A1 or M2, the Heavy Tank M26 (T26E3), and the Gun Motor Carriages of the M36 Series which mount the 90 mm Gun, M3.

The mounting of heavy field pieces and powerful tank and anti-tank guns on motor carriages and tanks provides great mobility and protection to the gun crews for close-in fighting.

For the terminal effects of materiel of other calibers, reference is made to TM 9–1907, "Ballistic Data, Performance of Ammunition," Vol. III, of the "Terminal Ballistic Data" Series, and "Standard Artillery and Ammunition Against Reinforced Concrete Pillboxes" (Second Progress Report, dated 15 February 1944).

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CARRIAGE, MOTOR, 155 mm GUN, M40 (T83)

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THIS gun motor carriage was designed to provide highly mobile heavy artillery capable of being put into action in the minimum time. It can be used effectively against targets of the type likely to be encountered in the war with Japan.

Principal armament is the 155 mm Gun M1A1 or M2 on Mount M13 (T14), a mount consisting essentially of the top carriage, recoil mechanism, and the elevating and traversing mechanisms from the standard field piece. Mounted in the center rear of the vehicle, the gun can be elevated from −5° to +55° and can be traversed 18° left and 18° right. A spade at the rear of the vehicle can be dropped to the ground and imbedded for the purpose of increasing the stability of the vehicle while firing.

This vehicle is based on a chassis that uses components of the Medium Tank M4 but is wider, lower, longer and lighter in weight than the M4 chassis. The power train components are standard items used in current production models of medium tanks of the M4 series, as are also the

suspensions and tracks. The suspension is of the horizontal volute spring type, with three bogies on each side. The tracks are 23 inches wide and have center guides.

Power is supplied by a Continental R–975–C4 engine through a constant mesh synchronized transmission that provides five speeds forward and one reverse.

The vehicle has stowage for 20 rounds of 155 mm ammunition, including propelling charges, primers and fuzes, and for small arms ammunition and grenades.

The differential and final drive housing used is the same as for M4 Series tanks, varying from 4 inches to 2½ inches in thickness. Side armor below the fender line is 1-inch and other armor is ½-inch. It has, in addition, gun shields of ½-inch armor plate.

The 155 mm Gun Motor Carriage M40 (T83) has a maximum speed of 24 m.p.h. and a cruising range of approximately 150 miles.

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CARRIAGE, GUN MOTOR, 155 mm, M40 (T83)—CHARACTERISTICS

Crew 8

Physical Characteristics:

Weight (gross)	83,000 lb.
Length, Hull	21 ft., 9 in.
Over-all, with armament	30 ft.
Width	10 ft., 4 in.
Height (center line of bore)	8 ft., 6 in.
Ground Clearance	17 in.
Tread (center to center of tracks)	101 in.
Ground contact length	173 in.
Ground pressure	10.4 lb./sq. in.

Armament:

155 mm Gun M1A1 or M2 in Mount M13 (T14)	
Elevation	−5° to +55°
Traverse	18° right and 18° left
Provision for:	
Cal. .30 carbines	8
Grenade Launcher M8	1

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Ammunition: Stowage:

155 mm (HE, M101 or M101B)	20 rounds
Cal. .30	960 rounds
Grenades, Hand	12
Grenades, Rifle, M9A1	10

Armor:	**Actual**	**Basis**
Hull, Front, Upper	½ in.	1¼ in.
Lower	4 in.-2½ in.	4 in.
Sides, Below sponson	1 in.	1 in.
Above sponson	½ in.	½ in.
Rear	½ in.	½ in.
Top	½ in.	½ in.
Bottom, First 36 inches	1 in.	1 in.
Remainder	½ in.	½ in.
Gun Shield	½ in.	¾ in.

Performance:

Maximum speed on level	24 m.p.h.
Maximum grade ability	60%

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Trench crossing ability	7 ft., 8 in.
Vertical obstacle ability	34 in.
Fording depth (slowest forward speed)	36 in.
Fuel capacity	200 gal.
Cruising Range (approx.)	150 miles

Vision and Fire Control:

Periscope M6	2
Panoramic Telescope M12, w/Instrument Light M19, on Telescope Mt. M75 (T122)	1
Telescope M69F w/Instrument Light M36, on Telescope Mt. M75 (T122)	1
Elbow Telescope M16A1F (T135) w/Instrument Light M36, on Telescope Mt. M71 (T124)	1
Quadrant Mount M1, w/Instrument Light M12	1
Gunner's Quadrant M1	1

Engine, Make and Model	Continental R-975-C4
Type	Radial, A.C.
No. of cylinders	9
Fuel (gasoline)	80 octane
Gross hp	460 at 2,400 r.p.m.
Max. torque	1,025 lb.-ft. at 1,800 r.p.m.
Transmission: Type	Constant mesh, synchronized

Communications:

Radio	SCR-608, 610, 619, or British No. 19
Interphone stations	4
Battery: Voltage, total	24

Fire Protection and Decontamination:

Fire Extinguisher, CO_2–10 lb. (fixed)	2
CO_2–4 lb. (hand)	2
Suspension: Type	Horizontal volute spring
Track: Type	T66 or T80 Steel
Width	23 in.
Pitch	6 in.
No. of shoes per vehicle	176

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Trench crossing ability	7 ft., 8 in.
Vertical obstacle ability	34 in.
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Vision and Fire Control:

Periscope M6	2
Panoramic Telescope M12, w/Instrument Light M19, on Telescope Mt. M75 (T122)	1
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Elbow Telescope M16A1F (T135) w/Instrument Light M36, on Telescope Mt. M71 (T124)	1
Quadrant Mount M1, w/Instrument Light M12	1
Gunner's Quadrant M1	1

Engine, Make and Model	Continental R-975-C4
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Battery: Voltage, total	24

Fire Protection and Decontamination:

Fire Extinguisher, CO_2–10 lb. (fixed)	2
CO_2–4 lb. (hand)	2
Suspension: Type	Horizontal volute spring
Track: Type	T66 or T80 Steel
Width	23 in.
Pitch	6 in.
No. of shoes per vehicle	176

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TANK, HEAVY, M26 (T26E3)

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THIS vehicle was designed to provide a tank with mobility comparable to the Medium Tank, M4 Series, but with considerably more firepower and armor protection. The heavy armor allows this vehicle to be employed close to the targets being engaged.

Compact in design, it is lower and wider than Heavy Tanks M6 and M6A1, and is not as heavy. It has greater firepower and heavier armor, and has better mobility and maneuverability.

Weighing 46 tons, the vehicle has a ground pressure of only 12.7 lb./sq. in. and can be operated at speeds up to 25 m.p.h. The unit ground pressure can be reduced to 10.9 lb./sq. in. by using the T80E1 type track with extended end connectors. It will climb a 60% grade and will cross a trench 7 feet 11 inches wide.

Principal armament is a 90 mm Gun M3, mounted coaxially with a Cal. .30 Machine Gun M1919A4 in the turret. These guns can be depressed to $-10°$ and elevated to $+20°$ and can be traversed through 360°, either

manually or by power. The 90 mm Gun is equipped with a muzzle brake.

The suspension is of the individually sprung torsion bar type, with bumper springs and double-acting shock absorbers to give additional protection. This type of suspension provides a more stable firing platform. A center guided track, 23 or 24 inches wide, is used.

Power is supplied by a Ford GAF gasoline engine through a torqmatic transmission and a controlled differential, the tracks being driven by sprockets at the rear.

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TANK, HEAVY, M26 (T26E3)—CHARACTERISTICS

Crew 5

Physical Characteristics:

Weight (gross)	92,000 lb.
Length, gun forward	28 ft., 10 in.
gun to rear	23 ft., 8 in.
Width (over-all)	11 ft., 6¼ in.
(reducible to)	10 ft., 4 in.
Height	9 ft., 1⅜ in.
Turret ring diameter (inside)	69 in.
Ground clearance	17 3/16 in.
Tread (center to center of tracks)	110 in.
Ground contact length, right side	152¼ in.
left side	148 7/16 in.
Ground pressure	12.7 lb./sq. in.

Armament:

1 90 mm Gun M3 and
1 Cal. .30 Machine Gun M1919A4 (flexible)
in Combination Gun Mount M67 (T99E2) in power operated turret

Elevation	−10° to +20°
Traverse	360°
1 Cal. .30 Machine Gun M1919A4 (flexible)	In ball mount in bow
1 Cal. .50 Machine Gun M2 HB (flexible)	On turret for A.A. defense

1 Cal. .30 Machine Gun Tripod Mount M2

Provision for:
5 Cal. .45 Submachine Guns, M3
1 Cal. .30 Carbine M2 and Grenade Launcher M8

Ammunition: Stowage

90 mm	70 rounds
Cal. .30	5,000 rounds
Cal. .50	550 rounds
Cal. .45	900 rounds
Grenades, Hand	12
Flares, Signals	12

Armor:		**Actual**	**Basis**
Hull,	Front, Upper	4 in.	6.9 in.
	Lower	3 in.	6 in.
	Sides, Forward	3 in.	3 in.
	Engine Compartment	2 in.	2 in.
	Rear	2 in.	2 in.
	Top	⅞ in.	
	Bottom	1 in. & ½ in.	

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Turret, Front	4 in.	4 in.
Sides and Rear	3 in.	3 in.
Top	1 in.	
Gun mount shield		4½ in.

Performance:

Sustained speed on level	20 m.p.h.
Maximum grade ability	60%
Trench crossing ability	7 ft., 11 in.
Vertical obstacle ability	46 in.
Fording depth (slowest forward speed)	48 in.
Turning diameter	60 ft.
Fuel capacity	186 gal.
Cruising range (approx.)	75 miles

Vision and Fire Control:

Commander's Vision Cupola	1
Periscopes M6	6
Periscope M10F, w/Instrument Light M30	1
(1 Periscope M4A1, w/Telescope M77F as spare)	
Periscope Mount, M73 (T113)	1
Telescope M71C, w/Instrument Light M33	1
Telescope Mount M72 (T90)	1
Elevation Quadrant M9, w/Instrument Light M30	1
Gunner's Quadrant M1	1

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Azimuth Indicator M20	1
Pistol Port	1

Communications:

Radio	SCR-508, 528, 608, British No. 19, or AN/VRC 3
Interphone stations	5
Battery: Voltage, total	24

Fire Protection and Decontamination:

Fire Extinguisher CO_2-10 lb. (fixed)	2
CO_2-4 lb. (hand)	2
Decontaminating Apparatus M2, 1½ qt.	2
Engine: Make and Model	Ford, GAF
Type	V8, L.C.
No. of cylinders	8
Fuel (gasoline)	80 octane
Maximum governed speed	2,600 r.p.m.
Gross hp	500 at 2,600 r.p.m.
Maximum torque	1,040 lb.-ft. at 2,200 r.p.m.
Transmission: Type	Torqmatic
Suspension: Type	Torsion bar
Track: Type	T80E1 or T81 Steel
Width	23 or 24 in.
Pitch	6 in.
No. of shoes per vehicle	164

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CARRIAGE, MOTOR, 90 mm GUN, M36

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This is a modification of the 3-inch Gun Motor Carriage, M10A1, designed to provide a more powerful self-propelled antitank gun. This weapon may be advantageously utilized for direct fire against reinforced concrete or log and/or earth bunkers or caves.

Principal weapon is the 90 mm Gun, M3 in 90 mm Gun Mount, M4A1, in a turret with 360° power traverse. The gun has a muzzle brake.

Essentially the same hull and chassis of the 3-inch Gun Motor Carriage, M10A1, have been used. A new turret with a partial turret basket has been added. Seats, traversing with the turret, are provided for the gunner, loader, and commander.

To provide for the stowage of 47 rounds of 90 mm ammunition, the sponson stiffener brackets have been moved forward.

Power is supplied by a Ford GAA gasoline engine. It has a maximum speed of 26 m.p.h. on level road and a cruising range of 150 miles.



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CARRIAGE, GUN MOTOR, 90 mm, M36—CHARACTERISTICS

Crew 5

Physical Characteristics:

Weight (gross)	62,000 lb.
Length	20 ft., 2 in.
Width	10 ft.
Height—pedestal A.A. gun folded	8 ft., 11 in.
Ground clearance	17⅛ in.
Tread (center to center of tracks)	83 in.
Ground contact length	147 in.
Ground pressure	12.7 lb./sq. in.

Armament:

90 mm Gun, M3, in Mount, M4A1	In turret
Elevation	−10° to +20°
Traverse	360°
Cal. .50 Machine Gun, M2, HB (flexible)	On pedestal mount
1 Tripod Mount, Cal. .50, M3	
Provision for:	
5 cal. .30 Carbines	

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Ammunition: Stowage:

90 mm (H.E., M71, A.P.C., M82)	47 rounds
Cal. .50	1,000 rounds
Cal. .30 Carbine	450 rounds
Grenades, Hand (Fragmentation, Mk II, 6; Smoke, M15, 6)	12
Smoke Pots, H.C., M1	4

Armor:		**Actual**	**Basis**
Hull,	Front, Upper	1½ in.	3¼ in.
	Lower	4 in.-2½ in.	4 in.
	Sides, Upper	¾ in.	1⅜ in.
	Lower	1 in.	
	Rear, Upper	¾ in.	1 in.
	Lower	1 in.	
	Sides, Lower	1 in.	
	Top, Forward	¾ in.	
	Rear	⅜ in.	
	Bottom	½ in.	

Turret, Front	3 in.
Sides	1¼ in.
Top	1⅛ in.
Rear	4 in.

Performance:

Maximum speed on level	26 m.p.h.
Maximum grade ability	60%
Trench crossing ability	7 ft., 5 in.
Vertical obstacle ability	24 in.
Fording depth (slowest forward speed)	36 in.
Fuel capacity	192 gal.
Cruising range	150 miles

Vision and Fire Control:

Periscope, M6	4
Telescope, M70P, or M76D or M76F, w/Instrument Light, M33	1
Telescope Mount, M64 (T92)	1
Elevation Quadrant, M9, w/Instrument Light, M30	1
Gunner's Quadrant, M1	1
Panoramic Telescope M12, with Telescope Mount M69 and Instrument Light M31	1

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Communications:

Radio	SCR-510 or 610 (with Reel Assembly, RL-106/VI) or British No. 19
Interphone stations	5
Flag Set, M238	1

Fire Protection and Decontamination:

Fire Extinguisher–10 lb.–CO_2 (fixed)	2
4 lb.–CO_2 (hand)	2
Decontaminating Apparatus, M2, 1½ qts.	2
Engine: Make and Model	Ford, GAA
Type	V8 W.C.
Number of cylinders	8
Fuel (gasoline)	80 octane
Maximum governed speed	2,600 r.p.m.
Gross hp	500 at 2,600 r.p.m.
Maximum torque	1,040 lb.-ft. at 2,200 r.p.m.
Transmission: Type	Constant mesh, synchronized
Suspension: Type	Vertical volute spring
Track: Type	Rubber or steel block
Width	16 9/16 in.
Pitch	6 in.
No. of shoes per vehicle	158

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CARRIAGE, MOTOR, 90 mm GUN, M36B1

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THE urgent requirement for 90 mm Gun Motor Carriage, M36 resulted in the conversion of Medium Tanks, M4A3 to 90 mm Gun Motor Carriages. This conversion consists of removal of the Medium Tank Turret, Gun Mount and Basket, revision of interior stowage and ammunition arrangements and reinstallation of the turret group from the 90 mm Gun Motor Carriage, M36. Minor exterior and interior hull changes are also required.

This vehicle has a gross weight of 65,000 pounds, length of 20 feet, 6½ inches, and a width of 8 feet, 8 inches. The hull armor is the same as for the Medium Tank, M4A3.

Power is supplied by a Ford GAA engine.

CARRIAGE, MOTOR, 90 mm GUN, M36B2

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THE continuing demand for the 90 mm Gun Motor Carriages, M36 and M36B1 cannot be met due to the shortage of 3-inch Gun Motor Carriages, M10A1 and Medium Tanks, M4A3 available for conversion. This shortage can be overcome by the conversion of 3-inch Gun Motor Carriages, M10.

This conversion consists of removal of the M10 turret, revision of interior storage and ammunition arrangements, removal of engine mounted generators and replacement with transmission mounted type, installation of an auxiliary generator set and installation of the turret group from the 90 mm Gun Motor Carriage, M36. Minor exterior hull attachments are also required. In addition, the conversion requires the application of spaced suspension and inside and outside end connectors on the track.

This vehicle has a gross weight of 66,000 pounds, length of 20 ft., 2 in. and a width of 10 ft.

Power is supplied by a General Motors 6046 Diesel Engine having a cruising range of 200 miles.

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TERMINAL EFFECTS

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THE use of the Fuze, C.P., M78 with Shell, H.E., 155 mm, M101 and 90 mm, M71 makes the 155 mm and 90 mm guns, mounted upon the vehicles described in this booklet, highly effective for use against targets likely to be encountered in the war with Japan.

Strongly fortified positions, such as, concrete pillboxes, log and/or earth bunkers or caves fall easy prey to the fire power of these weapons.

The vulnerable points of any of these targets are the many openings present—such as, gun ports, doors or the opening at the mouth of caves. Hits secured through openings detonate inside the strong point and effectively reduce it by killing the personnel and destroying the materiel present.

For attack of this sort best results are obtained at close range by direct fire. The 155 mm Gun Motor Carriage, M40 (T83) is particularly suitable for just this type of mission. The mobile mount permits the piece to be brought up into position quickly while the armor protection affords a cover for the gun crew while the point is being reduced.

In all firings with the 155 mm gun the normal charge should be used as

the use of supercharge will result in the shell rupturing upon impact with extremely resilient targets.

Experience in France in the attack upon German pillboxes indicate that the normal charge will yield satisfactory results. Pillbox walls 7 feet thick were perforated with a single round.

Against earth bunkers the M101 Shell with the M78 C.P. Fuze will penetrate 23 feet when the normal charge is used. As with concrete the normal charge only should be used in attack on this type of target.

The 90 mm Gun Motor Carriages, M36 Series and Heavy Tank M26 (T26E3) provides a companion piece to the 155 mm Gun Motor Carriage M40 (T83) for attack on the type of targets described above.

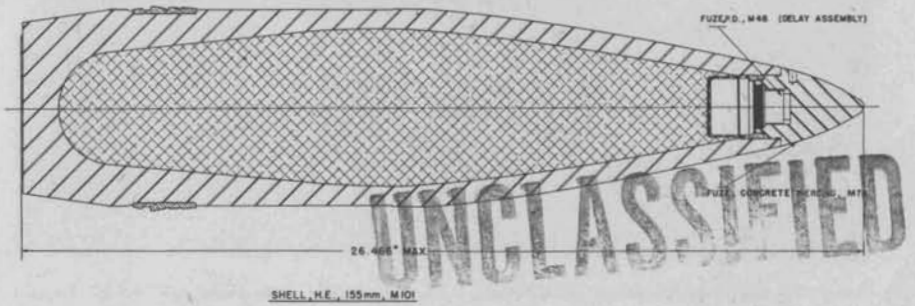
The higher muzzle velocity gives a flatter trajectory and greater accuracy. This is helpful when small openings are under attack.

Three rounds of the C.P. M78 fuzed M71 H.E. Shell will perforate a 5-foot reinforced concrete wall while 6 rounds will perforate a wall 7 foot thick.

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Against earth bunkers the round is also effective as it will penetrate 20 feet of earth.

Following this discussion is an illustration showing the Fuze, C.P., M78 assembled to the Shell, H.E., 155 mm, M101. Also included are illustrations showing some of the results obtained with this round during test firing against German-type reinforced concrete pillboxes.



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Gun, 155 mm, M1A1 firing Shell, H.E., 155 mm, M101 with Fuze, CP, M78. Range 2,400 yd. using supercharge. Crater 84 in. deep, 148 cu. ft. of reinforced concrete removed. Wall completely perforated. This is an exceptional round, results consistent with this can not be expected with all rounds fired, as results at this range gave less penetration.



Gun, 155 mm, M1A1, firing Shell, H.E., 155 mm, M101, with Fuze, CP, M78. Range using normal charge point blank range. View of damage to German-type reinforced concrete pillbox resulting from two rounds of shell.

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ATTENTION OF 13074

WAR DEPARTMENT
OFFICE OF THE CHIEF OF ORDNANCE
WASHINGTON, D. C.

28 MAY 1945

SUBJECT: Mobile Artillery vs. Jap Fortifications

TO : The Commandant
Command and General Staff School
Fort Leavenworth, Kansas

ATTENTION: Archives

1. Transmitted herewith are copies of the booklet, "Mobile Artillery vs. Jap Fortifications." This booklet describes weapons, vehicles and ammunition especially adapted to the attack of fortifications likely to be encountered in the war with Japan. Types of fortifications covered are concrete pillboxes, log and/or earth bunkers and caves.

2. The mounting of heavy field pieces and powerful tank and anti-tank guns on motor carriages and tanks provides great mobility and protection to the gun crews for close-in fighting.

3. The booklet, "Recoilless Weapons," dated February 1945, previously sent you, was prepared prior to the above booklet and may be used in connection with the same problem.

4. Additional copies of either may be supplied by Air upon request.

L. H. Campbell Jr.

2 Incls
1. Booklet (4)
2. Receipt

L. H. CAMPBELL, Jr.
Lieutenant General, Chief of Ordnance



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