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PREFACE


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Grateful acknowledgement is made to the staff of the United States Army Infantry School Library for their cheerful and competent help in the research of this subject. I also wish to express my gratitude to Major James E. Morrow, my faculty advisor, for his assistance in securing photographs and arranging interviews.

The point of view expressed in this paper is that of the author - not necessarily that of the United States Army Infantry School or the United States Army.

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INTRODUCTION

The purpose of this monograph is to determine whether or not a need exist for changing the current Infantry division battle group by assignment of carrier type tracked vehicles in sufficient numbers to insure 100% mobility. The problem in this paper will deal with the need for this carrier and the advantages and disadvantages of providing the battle group with organic armored personnel carriers.

"Should carrier type tracked vehicles be made organic to the Infantry division battle group in sufficient numbers to insure 100% mobility?" An examination of this title will reveal two closely related questions: (1) Is there a need for a carrier type tracked vehicle in the Infantry division battle group? and (2) Should these vehicles be organic in sufficient numbers to insure 100% mobility?


The discussion of these questions will be developed by first looking into history and determining if there is a need for mobility in our Infantry units. Then, realizing that the two questions contained in the title are closely related and in some ways overlapping, seek an answer to the title by answering each of the two questions separately.

This approach will intentionally limit the scope of this research due to the length limitation placed on this study. In the event it is determined the answer to the title is in the affirmative, no discussion will be directed toward where in the battle group these vehicles should be assigned.


Other limitations are placed upon this study through the use of two assumptions. The first assumption is that the carrier type tracked vehicle referred to in the title is the present M-59. This assumption is made realizing that, even now, improved armored carriers are being

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planned. Throughout this monograph, any reference to armored personnel carriers, armored carriers, carriers, or APC's will be synonymous with the M-59. The second assumption is that the battle group is the present TOE 7-11 ROCID battle group.

It should also be noted that rapidly changing concepts in our military organization and doctrine preclude making conclusions which have validity beyond the near future. Only through constant examination, evaluation, and revision of our concepts can the United States Army remain a powerful fighting force.



DISCUSSION

Since the beginning of time, man has searched for better ways to defend and protect himself from hostile weapons. As new weapons were invented and used, new measures and degrees of protection were required. This cycle not only goes back to the beginning of time but will no doubt continue until the end of time.

Looking back into early history the chariot could be depicted as the forerunner of the present armored personnel carrier. King Nimus of Assyria, as early as 2059 B. C., was probably the first to use a war chariot in combat. Later the Greeks, Egyptians, Persians, Romans, Britons, and Carthaginians all used war chariots. (1:80)

The present day armored carrier can probably be traced directly to the British development of a cross country armored train for use in South Africa during the Boar War. The train was made up of a Fowler steam tractor, armored with 1/4-inch plates, and special armored trailers which were drawn behind the tractor. Each trailer could carry 30 men or one field-piece. (1:80-81)

With the introduction of Blitzkrieg warfare by the Germans in World War II, U. S. Army commanders began searching for an armored infantry vehicle. The half track was our first attempt in answering this challenge. However, the half track offered little protection to the driver or its occupants and failed in many instances to keep pace with the more mobile tank. (1:81)

More recently, in the Korean conflict, the M-75 and M-39 armored personnel carriers were utilized by the 7th United States Infantry Division, during the period 6-11 July, 1953, in the battle for "Pork Chop." During this operation M-75's and M-39's successfully supplied, reinforced,

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and evacuated wounded from a company size combat outpost. This was accomplished over a narrow, muddy, Korean road under continual artillery and mortar fire. The use of these carriers further enabled the relief of units on the outpost and the successful accomplishment of a daylight withdrawal on 11 July, 1953. (7: 7-9)

These cited examples only touch the highlights in the history and development of armored carriers. This was intended to emphasize the fact that the need for a vehicle of this type is far from new.

On any battlefield of the future, involving a major national power, armies will be forced to prepare for the use of and defense against atomic weapons. This will be true even though atomic weapons may never be employed by either side. The devastating destructive power which the atomic capability affords a fighting force cannot be overlooked or ignored. For this reason, "atomic warfare has become conventional warfare."
(10:32)

At the present the ground commander's best defense against an atomic weapon is to avoid a critical density. "We can define a critical density on the modern battlefield as that density of forces constituting a profitable atomic target." (10:34) A commander may follow two general courses in avoiding a critical density. He may conceal his unit from the enemy or he may disperse his unit and minimize the enemies atomic capabilities to such an extent that the effects will not justify the expenditure of an atomic weapon. Combinations of dispersion and concealment may also prove effective. With these facts in mind, how will atomic warfare effect our massing of forces, which are still required for successful operations?
(10:34) Massing must now be accomplished by massing in time and not in space. To accomplish this, armies must be more mobile. No longer can they be restricted by the mobility of the foot soldier. Mobility is one field in which we may gain an advantage over a numerically superior enemy, for when a force is required to disperse, the advantage of its superior numbers is minimized. (10:33)

An outstanding example of the use and value of mobility was the

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operations of the German panzer leader Heinz Guderian. "His 10 panzer divisions whipped the French Army of 114 divisions plus 10 British, and more than a score of Belgian and Dutch ones - without the Westerners ever being able to get into proper position to fight; ... As a result, the Germans lost few of their own men, killed few of the enemy. They seized by their swift movement, more stock of perishable goods (like gasoline) than their automotive-air team expended in the whole campaign." (12:29)

A person has only to project his thoughts onto the future battlefield to foresee how the relative mobility of the opposing forces will influence the final decision. There is little doubt that "the side which produces mobile minded leaders who develop armies properly balanced between mounted and dismounted and, on the battlefield, effect a balanced use of mass and mobility, will win the land battles of the next war." (3:9)

The fact that the M-59 is not the ultimate armored personnel carrier is readily conceded. Attempts will be made on future models to improve and emphasize its advantages and minimize or reduce its limitations. With this in mind it is still believed that an examination of the M-59's characteristics, capabilities, and uses will be of value.

The M-59 is fully tracked and capable of traveling at a maximum speed of 32 miles per hour on land and 4.3 miles per hour in the water. It provides almost complete cross-country mobility. Its cruising range is approximately 120 miles. (Annex A)

In the M-59 infantry can move through small arms, artillery, and mortar fire in comparative safety. It provides a degree of protection from the blast, thermal, and radiation effects of atomic weapons. (8:58) Personnel in this vehicle also receive considerable protection while moving through chemically or biologically contaminated areas. Safe movement through antipersonnel minefields is afforded personnel riding in the M-59. (8:58) Still lacking absolute protection, the M-59 provides the moving infantryman a degree of protection never before realized.

One distinct capability of the M-59 is its inherent amphibious characteristic. This vehicle, without any modification, can ford streams,

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rivers, and similar inland bodies of water with its normal load. (Annex D) As a personnel carrier, the M-59 is capable of carrying ten fully equipped infantrymen plus a driver and a vehicle commander. (Annex A) This allowable load favorably complements our present 11 man squad of the Infantry division battle group rifle company. When not utilized as a personnel carrier, it can transport up to 3100 pounds of cargo. (Annex A) Pieces of equipment as large as a 1/4 ton truck may be transported across land and water safely. (11:218)

The uses of the armored personnel carrier are many and varied and, in many ways, limited only to the imagination and ingenuity of the user. In addition to its normal troop carrying role, it can be utilized to carry six wounded on stretchers. (11:216) Adaptations allow it to mount recoilless rifles and permit mortar squads to fire without dismounting. (11:217) This carrier makes a very good mobile command post or observation and reconnaissance vehicle. (1:82) It provides mobility, radio communications, a degree of protection, and an area large enough to accommodate briefing of several key personnel at the same time in relative security and comfort. Its blackout facilities make it readily adaptable to fire direction work or protected repair of signal equipment. (11:216)

The additional communication made possible by radios mounted in the carriers is one other major advantage of the M-59. This affords a commander improved control over dispersed formations and in rapidly moving situations. It should also be noted that the present family of vehicular radios is easily mounted in the carrier.

Another advantage of the M-59 is the additional firepower provided the infantryman by means of its mounted caliber .50 machine gun. (8:58) Although this weapon is primarily intended for protection against enemy aircraft, it can be effectively utilized against ground targets. An additional 18, number of carriers required to mechanize one rifle company (9:50), machine guns are usually a welcomed supplement to the firepower of a rifle company.

"Now that we know that fatigue breeds fear and fear breeds fatigue (in

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a vicious spiral of troop efficiency deflation), not the least of the M-59's advantages is its comfort." (11:221) By riding in the carrier to the assault position or even onto the objective, the troops are delivered into close combat as fresh as possible. "Veterans of World Wars I, II, and Korea who remember the exhaustion that comes from long and rough truck rides, with men packed like sardines in the cargo bodies, will appreciate the smooth, vibrationless, noiseless, almost dustless 'luxury jaunt' the M-59 affords. Wounded especially will appreciate not being jounced over ruts and choked with dust." (11:221)

This discussion cannot obviously mention all the advantages of the M-59. The ones discussed here are the ones which an infantryman will be most interested in.

In evaluating any object or piece of equipment, the disadvantages and limitations must also be considered.

The armored personnel carrier, like any other armored vehicle, will make avoiding an atomic weapon more difficult. A unit utilizing armored carriers reaches a critical density at a lower level of organization. For example, an enemy may not consider an infantry rifle company a profitable atomic target; however, with the addition of armored carriers the target becomes more attractive. This leaves only one other course open to a commander in avoiding an enemy atomic weapon; that is to conceal his unit from the enemy. When armored carriers are used, concealment becomes more important and also much more difficult. The M-59's size, large silhouette, and give-away tracks greatly increase a commanders task of camouflage. We should also logically assume that the enemy's progress in observation and detection closely parallels our own. Under these conditions the camouflage and concealment of all types of equipment will be of prime importance.

The cost of the M-59 must also be considered. This should be done in two areas: monetary cost and personnel cost. Although the 2½-ton truck represents a lower cost, there are some who think this is false economy. For example, Garrett Underhill states, "Moreover the Army and industry

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have lowered the cost (of the M-59) to \$25,000 per vehicle - startlingly little considering that a 2½-ton capacity truck cost over \$7,000, has no armor, can't swim, can't go cross country like a caterpillar, and can't match the 11-ton cargo load the M-59 can carry if necessary. As it is, its cost is based on a low production order while the truck is based on mass production." (12:25)

The personnel cost is listed to emphasize the fact that additional personnel will be required for maintenance and drivers. This is evidenced by comparing the size of the Carrier Maintenance Section and the Truck Maintenance Section of the Headquarters and Headquarters Company, Transportation Battalion, Infantry Division. (9:42)

Any vehicle or piece of equipment must be in a working and serviceable condition to be of value to its user. This makes maintenance an essential consideration in determining the merit of a piece of equipment.

Required maintenance for the M-59 should not be considered as a definite advantage or disadvantage. Maintenance is actually a relative thing. Some vehicles require more than others. It is the intent, therefore, to show where in the maintenance scale (time wise) the M-59 is located.

Table 15D, Reference Data Infantry Division Battle Group, March 1957, gives a guide to use in determining the time required for maintenance of the battle group vehicles. A study of this table reveals that the M-59 generally requires more time for maintenance than the 2½-ton truck but less than the tank. (Annex E)

The M-59 has a fuel consumption five times that of the 2½-ton truck and requires 130 gallons of fuel to fill its tanks. (9:69) From this it is evident that great quantities of additional fuel will be required to keep the armored carriers operational. This requirement for fuel will place an extra burden upon supply channels. This additional logistical support must then be considered another disadvantage of the M-59.

The previous discussion has been concerned with the need for a carrier type vehicle. The next step is to consider whether or not this carrier should be organic to the battle group. In order to justify a change in

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the organization and equipment of a functioning military organization, certain conditions must exist which are important enough to override the problem of economic expense and reorganization of the unit structure involved in the change.

The first advantage which comes to mind if the carriers were made organic is that of time. By having the carriers organic, the time needed for the carriers to move from higher headquarters to the battle group is eliminated. The war of tomorrow may not permit the infantryman to wait for transportation to transport him to where he is needed. The ultimate (time wise) would, of course, be to make the carrier organic at the lowest tactical level - the rifle squad. This would place the vehicle at a level which affords a commander immediate use.

The greatest advantage in organic armored personnel carriers is the collective additional capabilities afforded a commander by the vehicle. A reexamination of the capabilities and uses of the M-59 will suggest a partial list of advantages provided by organic carriers. Its speed will allow troops to arrive at the assault position faster and therefore give the enemy less time to react or bring up reserves. Companies can be expected to cover greater distances and seize deeper objectives when mounted in carriers. Carriers provide a much greater capability to a reserve. Due to ease of movement, positioning to facilitate commitment may not be necessary. This reserve may also be rapidly moved with a degree of protection while under fire from an enemy attack. The psychological aspects, both friendly and enemy, should also be included. To know he has some protection in an assault or while being evacuated after being wounded is of great importance to the infantryman. On the other hand, an enemy firing his rifle at an assaulting M-59 and having no effect is not in the healthiest state of mind. These are by no means all the individual advantages which fit into this category. These are merely listed to show and emphasize some of the additional capabilities afforded by organic carriers.

The determining factor lies not in the advantages, however, but in

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the disadvantages of providing the battle group with the additional vehicles.

The logistical disadvantage of the M-59 has already been discussed. Practically the same logistical support will be required for organic or non-organic carriers. The important factor will be who is responsible for this support. If the carriers are made organic, this responsibility is the battle group commander's. Furthermore, if they are made organic down to the rifle squad, then the platoon leader and company commander also become more directly concerned with this logistical support. This support then becomes another responsibility of the company commander, who already has little enough time for his duties. It is this additional burden which is the real disadvantage, concerning logistics, to organic armored carriers.

The evils in massing and problems in dispersing on the atomic battlefield have also been previously discussed. However, the effect organic carriers will have on this consideration must also be evaluated. Sufficient carriers to completely mobilize the battle group will present quite a dispersing problem to the commander. Dispersion is absolutely necessary to minimize the enemies atomic capability. Normally it will be desirable to disperse the carriers near or with the using troops. This enables the commander and the using troops to capitalize on the carrier's many and varied capabilities. However, it is easy to visualize circumstances which will prohibit retaining the carrier in the forward company areas. In this event, the carriers will have to be moved to a rear area. This separation from the using troops also creates disadvantages the major ones being the commander's partial loss of control and the time required for the vehicles to rejoin the unit. Another disadvantage of this separation, which is not so readily apparent, is that of security for the carriers in this rear area. This may not always exist, since it may be possible to locate them so that rear area troops will provide additional security. This, however, will constantly be a factor the commander will have to consider and may require a loss of fighting

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troops for this security.

One final disadvantage of organic carriers is economy. Not economy of dollars but economy of use. "We cannot afford to set aside a large number of infantry divisions for motorized operations only. Nor can we afford, in overseas theaters particularly, to tie up a large amount of motor transportation in such a way that it cannot be used for other purposes when idle in its primary mission." (2:11) In many situations, such as a static defensive one, the parent unit will be unable to fully utilize all of its carriers. This luxury of maintaining organic armored carriers, which would not be effectively utilized when not being employed in their primary role, is one the battle group can not afford.

Advantages and disadvantages to both an affirmative and a negative answer to the question presented by the title of this monograph have been pointed out and discussed. It is readily admitted that there are factors other than those discussed here which bear upon the question raised by the title. However, it is believed that this discussion points out the advantages and disadvantages which are most important and when viewed, in the light of present concepts, form the foundation for the answer to the title.

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CONCLUSION

1. The use of atomic weapons creates a definite need for increased mobility for the infantryman.
2. The armored personnel carrier will provide the infantryman with increased mobility, firepower, communications, and protection. There will be times when the battle group will gain a distinct advantage through the use of armored carriers.
3. The armored personnel carrier should not be made organic to the battle group in sufficient numbers to insure 100% mobility. There will exist times or situations when the battle group will have little need for armored carriers and no need for carriers in sufficient numbers to insure 100% mobility.
4. The validity of these conclusions is based upon factors subject to change. Our methods and means of achieving battlefield mobility must constantly be reviewed, evaluated, and changed if necessary to insure success in future land battles if and when they materialize.



ANNEX A - DATA FOR CARRIER PERSONNEL, FULL TRACK: ARMORED M59

(Extracted from Commander's Handbook for Preventive Maintenance,
United States Army Infantry School, Fort Benning, Ga., 1957)

GENERAL

Engine	Two (2) GMC Model 302 Water-cooled, 6-cylinder, in-line, valve-in-head with Hydra-Matic transmission
Weight:	
Gross (fighting)	41,800 lbs (approx)
Net	38,700 lbs (approx)
Payload.....	3,100 lbs (approx)
Length (over-all).....	17 ft 11 in
Height (over-all).....	8 ft 2 in
Width (over-all)	10 ft 8 1/2 in
Ground Clearance	1 ft 6 in
Ground Pressure	7.1 psi
Width of Track	21 in
Type Suspension System	Torsion Bar
Cargo Space.....	266 cu ft
Freeboard Loaded (MIM).....	13 in

FUEL AND OIL CAPACITIES

Fuel Tank	130 gal (approx)
Crankcase (each refill with filter)....	11 qts
Transmission (each complete system)....	14 qts
Right-angle Drive (each)	1 1/2 qts
Differential	28 qts
Final Drive (each)	6 1/2 qts
Carburetor Air Cleaner (each)	2 qts
Cooling System (each)	28 qts

PERFORMANCE

ON LAND:

Forward:

Maximum Vehicle Speed	Low Range--12 mph High Range--32 mph
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Reverse:

Maximum Vehicle Speed	Low Range--2.5 mph High Range--6.5 mph
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In Water	4.3 mph
Cruising Range (approx).....	120 mph
Maximum Grade Ascending Ability	60%
Width of Ditch Vehicle Will Cross ...	5 ft 6 in
Maximum Vertical Wall Climbing Capa- bility	1 ft 6 in
Maximum Fording Depth Capability	Unlimited
Fuel Consumption (average terrain) ..	1 gal per mile



ANNEX B - CARRIER, PERSONNEL, FULL TRACKED: ARMORED, M-59



ANNEX C - TROOP COMPARTMENT, M-59 ARMORED PERSONNEL CARRIER.



ANNEX D - FORDING OPERATIONS, M-59 ARMORED PERSONNEL CARRIER.



ANNEX E - TIME FACTORS IN VEHICLE SERVICING^a

(Extracted from Reference Data Infantry Division Battle Group,
United States Army Infantry School, Fort Benning, Ga., 1957)

TIME FACTORS IN VEHICLE SERVICING^a

OPERATION	TIME REQUIRED		
	2½-T	M-59	Tank
Perform "A" Service	30 min	1½ hrs	2 hrs ^b
Perform "B" Service	4 hrs	4 hrs	4 hrs
Perform "C" Service	8 hrs ^c	6-12 hrs	8-16 hrs ^d
Perform "D" Service		12-24 hrs	16-32 hrs ^d
Refuel Vehicle Using 5-gallon cans	20 min	30 min	35 min

- a. Based on studies and estimates of Automotive Department, TIS.
- b. If applicable, add two additional hours for each: cleaning main armament; cleaning vehicle after cross country operation in inclement weather.
- c. Computed using two mechanics in addition to driver.
- d. Computed using three mechanics in addition to crew. Exact time depends upon condition of vehicle and whether power package must be removed.

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