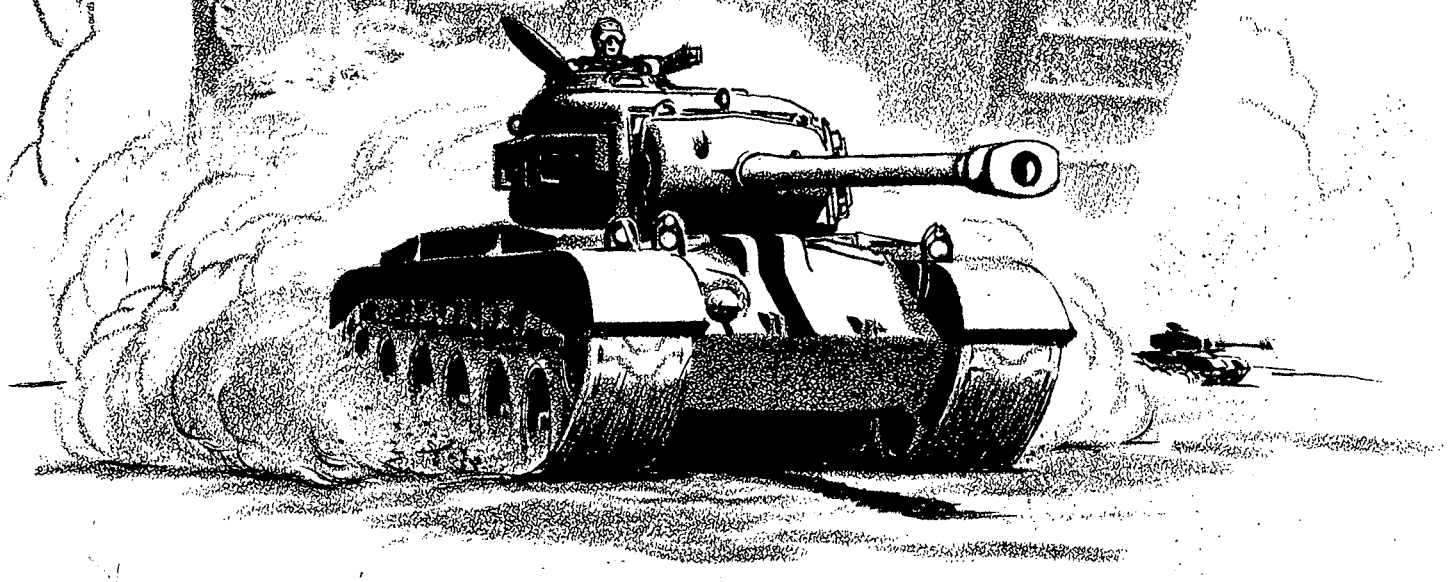
Maintenance, Tank Company, Infantry Regiment



A RESEARCH REPORT

Prepared at

THE ARMORED SCHOOL

Fort Knox, Kentucky

1951 - 1952

MAINTENANCE TANK COMPANY INFANTRY REGIMENT

A RESEARCH REPORT PREPARED

BY

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1951-1952

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Much of the information in this report was obtained from responses to the questionnaire which was sent to all Infantry Divisions and many smaller units and individuals. Units which returned answered questionnaires are:

1st Infantry Division
- 16th Inf Regt
- 18th Inf Regt
- 26th Inf Regt

2nd Infantry Division
- 9th Inf Regt
- 23rd Inf Regt
- 33rd Inf Regt
- 72nd Med Tank Bn
- 702nd Ord Maint Co

3rd Infantry Division
- 7th Inf Regt
- 15th Inf Regt
- 65th Inf Regt
- 64th Hy Tank Bn
- 703rd Ord Maint Co

4th Infantry Division
- 8th Inf Regt
- 12th Inf Regt
- 22nd Inf Regt
- 40th Med Tank Bn

7th Infantry Division
- 17th Inf Regt
- 31st Inf Regt
- 32nd Inf Regt

8th Infantry Division
- 13th Inf Regt
- 61st Inf Regt

24th Infantry Division
- 5th Inf Regt
- 19th Inf Regt
- 21st Inf Regt

25th Infantry Division

28th Infantry Division
- 109th Inf Regt
- 110th Inf Regt
- 112th Inf Regt
- 728th Ord Maint Co

31st Infantry Division
- 155th Inf Regt
- 167th Inf Regt
- 200th Inf Regt

40th Infantry Division
- 223rd Inf Regt

43rd Infantry Division
- 102nd Inf Regt
- 169th Inf Regt
- 172nd Inf Regt

47th Infantry Division
- 135th Inf Regt
- 136th Inf Regt
- 164th Inf Regt
- 474th Ord Maint Co

82nd Airborne Division
- 782nd Abn Ord Maint Co

1st Cavalry Division
- 7th Cav Regt

- 6th Infantry Regt.
- 29th Infantry Regt.

30th Infantry Regiment	Army Field Forces Board Nr 1
269th Infantry RCT	Army Field Forces Board Nr 2
278th Infantry RCT	Army Field Forces Board Nr 3
351st Infantry Regt	
6th Medium Tank Battalion	The Armored School
70th Medium Tank Battalion	The Ordnance School
73rd Heavy Tank Battalion	The Infantry School
89th Medium Tank Battalion	
550th Medium Tank Company	
714th Medium Tank Battalion	Aberdeen Proving Grounds

PREFACE

The purpose of this study was to collect data relative to the automotive maintenance support of the tank company of the infantry regiment for the purpose of establishing doctrine in its employment and to make certain recommendations for its improvement. The data on which this study is based was obtained from interviews with individuals having knowledge of the subject and its problems and by questionaires sent to every infantry division in the United States Army and other interested agencies.

It must be remembered throughout the report that although the tank company has been an intregral part of the infantry regiment since 1946 only two or three infantry divisions were organized to include the tank company prior to the outbreak of hostilities in Korea. As a result the tank company was never what you might call field tested, or were experience factors developed either to its effectiveness as a unit or to the logistical support so necessary to make it an effective organization.

Units intregrated into the various infantry divisions now possessing tank companies, the majority of which are located in Korea and on which a large portion of this report had to be based, were make-shift organizations. They rang from units activated in combat zones to converted amphibious tractor battalions reorganized and put into battle in a matter of weeks with little or no training. In other cases tank companies were taken from our then existing

armored divisiion and from various separate tank battalions. Some of these completely lacked experience in working with infantry, not only in the differences in the techniques of employment, but in the differences in logistical support. Not only did these units lack training but equipment as well.

All of these problems will become more evident to the reader as he reads this report and many will require additional study since they fall beyond the scope and the capabilities of the writers. It is hoped that this report will bring to attention some of the difficulties encountered, solutions to these difficulties, and a basis for future study into the other problems which directly or indirectly affect findings contained here-in. In addition many of the problems discussed in this report are, by no means of the imagination, limited solely to the tank company of the infantry regiment but apply to the overall maintenance problem regardless of the unit or the equipment found within the unit.

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CHAPTER 1

INTRODUCTION

The purpose of this study was to determine if the maintenance support now being rendered the tank company, infantry regiment under existing Tables of Organization and Equipment is adequate and to make recommendations for its improvement. Although this report deals primarily with the tank company of the infantry regiment many of the problems encountered are applicable to the tank company wherever it is found and to automotive maintenance in general.

HISTORY

Immediately following World War II a series of boards and panels were organized to study policy, procedures, techniques, organizations and tactical doctrine for the purpose of improving our combat arms. As a result of these various boards and panels it was recommended and finally adopted early in 1947 that the infantry division would have organic to it one tank battalion plus one tank company for each of its regiments. This integration of armor into infantry units was based on two generally accepted facts. First, the need for anti-tank protection within the division and, second, on the need of a highly mobile force possessing great fire power and shock action for use in offensive and defenseive operations.

To support this concept was the evidence of the attachment to the majority of our infantry divisions during World War II, of

one separate tank destroyer battalion and one separate tank battalion. These attachments became so continuous that the divisions actually considered these battalions an organic unit. For all practical purposes these units were a part of the division except on paper.

In a further study of these attachments it was found that the majority of the tank destroyer battalions which provided the anti-tank protection were most successfully employed when the unit was broken down with one company attached to each rifle regiment. Next, it was found that in attaching each of the companies to a regiment better teamwork could be developed if the attachment was continuous in nature for the period of an operation. This procedure of attaching the same company to the same regiment materially aided both units in performance of their respective missions. Commanders became familiar with each other, SOP's could be established, and even more important was the development of the spirit of mutual trust in each others' operation so essential to teamwork.

In the case of the separate tank battalion the employment varied. In the majority of the divisions it was found that the unit was held intact and employed as a unit. There were varients of this, however, and occasionally the tactical situation required the attachment of the tank companies to one of the rifle regiments of the division.

Running concurrently with the study of the infantry divisions was another series of studies devoted to the employment of armor. It was in this series of studies that the present concept of armor was

born. It was here that the tank destroyer as such was disolved and the mission of this force was incorporated into that of the heavy tank.

The heavy tank company differs slightly in organization from the medium company in that they consist of four platoons of five tanks while the medium tank company consists of three platoons of five tanks each. In addition each heavy tank platoon has one ¼-ton truck for use of the platoon leader. It is this organization, the heavy tank company and the heavy tank battalion, that was accepted and made part of the infantry division. Unfortunately at the time of the reorganization of the infantry division, to include the assignment of armor as an organic part. The army was engaged in one of its periodic economy programs which prevented this reorganization except on paper. It was not until 1948 that any of the divisions had physically present tank units; and then only three divisions were so equipped. Not until the outbreak of hostilities in Korea did these units come into being on an Army-wide scale.

These facts are mentioned since they have a definite bearing on this report as they present a study based on facts accumulated over a period of time and under varied conditions. Not only was this late adoption of armored units by the infantry divisions an obstacle to this study but also the equipment used coupled with inexperienced and untrained personnel. In fact, this report is a study of a relatively new concept of the employment and support of units whose personnel are untrained and inexperienced using old and obsolete equipment under the most adverse conditions. Therefore, material presented in the

succeding chapters must be weighed, keeping these conditions which have just been descrived in mind. Many problems that will be discussed later, may, in all probability, solve themselves when units become properly equipped and our personnel become more experienced. Others unfortunately, will probably never be solved. Why not? There are still others for which no excuse can be made, and here it is hoped, by pointing them out, that similar problems in the future can be prevented.

TACTICAL EMPLOYMENT

Like all other units of the infantry regiment, the primary job of the regimental tank company is to assist the progress of the rifle elements of the regiment. The tank company assists the rifle elements progress by accomplishing either or both of two assigned missions. The first of these is to close with and destroy the enemy and the second is to provide anti-tank protection for the regiment.[1]

Maintenance of the Infantry Tank

The M-46 or M-47 Medium Tank, now issued to the infantry tank company, presents many old as well as many new maintenance problems. Units in Korea, have experienced many difficulties with this task. The 70th Tank Battalion was issued this tank upon arrival in Korea and kept a record of its operational troubles.[2] The amount of replacement parts for this unit is shown in Table I. Also shown is the labor requirements for these replacements. Note the amount of time required. From these statistics, it was indicated that it

would require 0.8 man-hours of maintenance for each mile of operation. This figure of 0.8 man-hours of maintenance per mile of operation does not include first echelon of maintenance performed by the crew or any period of time that the vehicle might be deadlined while awaiting parts.

This figure appears to be high as far as labor is concerned, however, a test was conducted at Fort Hood, Texas, in July of 1950 under almost optimum conditions which resulted in a figure of .058 man-hours per mile of operation.[3] In this test the figure appeared much lower considering that first echelon maintenance was included, however it must be remembered that this test was conducted under what appears to be excellent conditions. Of the two figures submitted probably the true figure lies somewhere between, say around .12 man-hours per tank per mile of operation.

Table II shows the time and labor required to perform the scheduled maintenance. It should be noted that even these tanks require a vast expenditure of effort and time.

These figures are cited for the purpose of impressing the reader with the difficulty of maintaining this tank. It must be borne in mind that there are 22 of these tanks in the infantry tank company for which the responsibility of their maintenance rests upon the unit commander. You can see the proportions it assumes. Certainly, the need is great to study this problem in detail when you consider it will require, using the middle figure of maintenance of .12 man-hour of maintenance per tank per mile, some 2.64 man-hours

TABLE I

REPLACEMENT OF PARTS OF M46 TANK
(Experience of the 70th Medium Tank Bn Korea)

ITEM		Number of items replaced per 72 tanks per 363 miles per 30 days.	Man-hours per replacement	Echelon Authorized to perform replacement
1.	Tracks	12240 blocks	17:00	2nd
2.	Road Wheels	40	8:30	2nd
3.	Sprockets, hole	30	11:12	2nd
4.	Sprockets, solid	4	11:12	2nd
5.	Sprocket Bolts	200	24:36	2nd
6.	Tank Wedges	200	3:0	2nd
7.	Track Connectors	100	3:0	2nd
8.	Adjust. Idlers	6	18:00	2nd
9.	Comp. Idlers	4	8:00	2nd
10.	Comp. Wheels	6	8:00	2nd
11.	Support Roller Wheels	8	8:00	2nd
12.	Shock Absorbers	30 8 Int	3:15 10:00	2nd
13.	Road Wheel Hubs	6 Front	10:00	2nd
14.	Road Drive Hubs	4	20:00	2nd
15.	Rear Hub Bolts	20	1:00	2nd
16.	Road Wh Spindles	6	42:00	3rd
17.	Transmissions	15	64:30	3rd
18.	Engines	15	74:00	2nd
19.	Spark Plugs	1740	0:50	2nd
20.	Carburetors	10	5:30	2nd
21.	Intake Manifold	6	32:00	2nd
22.	Fan Towers	10	16:00	2nd

TABLE I (CONT)

ITEM		Number of items replaced per 72 tanks per 363 miles per 30 days	Man-hours per replacement	Echelon authorized to perform replacement
23.	Fan Drive Brgs	10	16:00	3rd
24.	Fan Drive Seals	20	16:00	3rd
25.	Fan Drive Clutches	10	16:00	3rd
26.	Oil Cooler Coils	60	32:00	2nd
27.	Oil Cooler Brushes	100	32:00	3rd
28.	Fan Drive Assy	4	16:00	3rd
29.	Aux. Engine	16	14:00	2nd
30.	Exhaust Manifold Clps	30	1:00	2nd
31.	Gen Dr Gr Bearings	20	1:30	2nd
32.	Magnitos	20	38:00	2nd
33.	Aux Eng Plugs	150	1:30	2nd
34.	Aux Eng Carburetors	4	17:00	2nd
35.	Batteries	10	1:00	2nd
36.	Master Jct Box	20	8:00	2nd
37.	Speedometers	14	1:30	2nd
38.	Tachometers	10	4:00	2nd
39.	Fuel Cutoffs	4	2:00	2nd
40.	Circuit Breakers	4	2:00	2nd
41.	Trans Low Prs Sw	16	1:00	2nd
42.	Trans Lub Sw	30	1:00	2nd
43.	Trans Hi Prs Sw	30	1:00	2nd
44.	Road Wheel Caps	4	0:30	2nd
45.	Pillow Blocks	4	70:00	3rd
46.	Univ Jts from Trans to Final Drive	2	19:00	2nd

TABLE II

PREVENTIVE MAINTENANCE TIMES

	FUNCTION OR OPERATION	CREW	TIME (Hrs)	MAN-HOURS
1.	Before operation Service	5	0.67	3.3
2.	At Halt Service	5	0.16	0.8
3.	After Operation Service	5	2.75	13.8
4.	Weekly Inspection and Service	6	5.5	33.0
5.	Replace Tracks	-	---	15.0
6.	Monthly Inspection and Service	2 Mech	18.0	36.0
7.	Remove: top deck armor grille, center batteries and battery box, exhaust pipes, housing, and door supports.	2M & WO	0.9	2.7
8.	To Replace items in (7)	"2 "	1.7	5.1
9.	To remove power pack	" "	.9	2.7
10.	To replace power pack	" "	2.3	6.9
11.	To remove front road wheel arm and shackle	2M	2.1	4.2
12.	To reinstall (11)	"	2.4	4.8
13.	To remove final drive and sprocket assembly	2M & WO	3.1	9.3
14.	To reinstall (13)	" "	4.8	14.4

of maintenance to move the company one mile. Those who do not consider these factors as effecting the tactical employment of this unit are only fooling themselves.

APPROACH TO THE PROBLEM

It is only after an understanding of the employment of the tank company in the infantry regiment that a true picture of the problems of maintaining this unit can be painted. In making this study the problem was attacked from several directions. First, was an analysis of what equipment had to be maintained and special problems incountered in maintaining this equipment. Once this was determined our next step was to determine who we had to do the job and what equipment was needed. Following these steps a study was made of how the personnel and equipment available could best be employed to accomplish the job. All of these steps were reviewed in light of past experience, the present situation, and the future.

In order to gather data upon which to work the committee encountered its first obstacle. First, the organization is relatively new. Second, established experience factors do not as yet exist and those that do were found to be either erroneous or not applicable. To overcome this obstacle a conserted effort was made to establish certain facts upon which to work. This was accomplished to some extent by sending out questionaires to every infantry division in the United States Army, every separate infantry regiment, interested service schools, and other agencies asking that they be completed by

personnel having experience with this unit and returned to the committee.

In all some 1,000 questionaires were sent into the field. Of these, only 300 were returned. Many units and agencies replied that they had neither the personnel who were qualified to answer the questions nor the equipment on which to base any answers. Of the 300 that were completed, we were again confronted in analysing the answers by the wide variance in equipment and the questionable experience of the individuals making the reply. (See Appendix I)

It was found in examining the equipment that tank companies of the infantry regiment in Germany were equipped with the M-26 Medium Tank; units in Panama, Porta Rico, and Alaska with the M-24 Light Tank and the M4A3 Medium Tank; in Guam the M4A3E8; and in Korea with the M4A3, M4A3E8, M-26, and M-46. Even regiments in the same division had different equipment. Not only was this wide latitude of equipment a problem but the unit organization as well. Some companies had but three platoons where others had four and in the extreme case some divisions in the United States had only sufficient tanks for orientation purposes.

Next a field trip was taken to the Office of the Chief of Ordnance for the Army and to the headquarters of Army Field Forces to discuss our findings and also to determine if information which we previously had been unable to obtain was available at either of these two headquarters.

In the Office of the Chief of Ordnance there existed a very

limited knowledge of the problems now existing. Not only was there a limited knowledge but also a lack of interest almost to the extent of indifference. Their primary interest was only in satisfying the desires of Field Forces which is as it should be, if it is in spirit as well as in fact. A perfect example is the development of the tank recovery vehicle so desperately needed by our units in the Field. Here, Field Forces had given specifications for the development of a vehicle which prevents transporting this vehicle by normal rail. Ordnance fully aware of these deficiencies in design are now in the middle of a $1,500,000 project constructing a test model. This vehicle they know full well when completed will not in all probabilities be able to be moved out of the Detroit Arsonel. When questioned concerning this project the answer was, "If that is what Field Forces wants we will build it and let them figure out what to do with it." Fortunately Field Forces is aware of these deficiencies in design and are attempting to redesign the vehicle. In the mean time, however, construction continues at the Detroit Arsonel on a $1,500,000 project that is already condemned in design by the agency which voices the power of acceptance or rejection.

At Army Field Forces it was found that the conslusions reached by this committee and their solutions had already been considered and approved. The same problems which we discuss in detail later in this report were also uncovered by members of Field Forces while observing operations in Korea. It is also recognized, that although steps are being taken to correct problems now existing that a final solution

will never be reached until certain factors have been established.

ORGANIZATION AND PRINCIPLES OF MAINTENANCE

Maintenance, we defined as the care taken and work done to keep any item of equipment in good condition. To accomplish this mission, maintenance is divided into three categories and five echelons:

Organizational maintenance (first and second echelon) is the responsibility of the unit commander to which the equipment belongs. In the case of the tank company first echelon is that work which is done by the tank or vehicle crew. Second echelon then is that work which is accomplished by the company maintenance section and tank maintenance section of the service platoon of the regimental service company. The maintenance performed in these two echelons include preventive maintenance and repair performed by specially trained personnel of the regiment. (See chapters 2 and 3)

Field maintenance (third and fourth echelons) normally is the responsibility of the field commanders. It is performed by either organic or attached maintenance units of the division or field maintenance units of the field army. Following the system through for the tank company we find that third echelon is performed by the ordnance company organic to the division and fourth echelon is that support which is furnished by the field army. In the case of the infantry division it is normal for one ordnance maintenance company belonging to the field army to be placed in direct support when the div-

ision is engaged in other than minimum activities. Field maintenance includes any repair work which the unit or shop is capable of performing, provided it is not specifically prohibited. (See Chapter 4)

Depot
Base maintenance (fifth echelon) is performed by technical service installations in fixed or semifixed installations under the theater commander or in fixed installations of the chiefs of technical services in the zone of the interior. It consists of repair and rebuild of equipment, assemblies, subassemblies and component parts for return to depot stock. This phase of maintenance will not be discussed in this report.

In maintenance there has been established certain principles of employment which when followed will provide field units with the desired type of support. Unfortunately in many cases these principles are not adheared too and our field maintenance is suffering as a result. Extracted are the more important of these, however, if the reader desires a more complete definition than given here he will find them discussed in FM 100-10 Field Service Regulations Administration.

(1) The commander of a unit is responsible for the maintenance of his equipment. Organizational maintenance is his direct responsibility. He must call on field and base maintenance organizations for other maintenance.

(2) Repairs to equipment are performed as far forward as is consistent with the tactical situation, time available, capabilities of personnel, and availability of spare parts and tools. This saves transportation and puts equipment back into operation in the quickest

possible time. No echelon, however, performs the work of a higher echelon to the neglect of its properly assigned functions.

(3) It often is more desirable to move maintenance personnel to equipment than to move equipment to the personnel. For this purpose, contact repair service is established, providing mobile repair parties consisting of mechanics with spare parts and special equipment.

(4) An adequate supply of spare parts, assemblies and tools must be available for maintenance units to operate at maximum efficiency.

(5) Maintenance units are disposed laterally and in depth to offer the best possible service to equipment being maintained. Maintenance units remain sufficiently close to units being served to give close support.

(6) In emergencies, the nearest facilities are utilized, regardless of the normal responsibility for maintenance.

(7) Each combat unit effects the recovery of material in its area so far as practicable without diversion of essential strength from its primary mission.

The material presented in this chapter was written to provide the reader with the necessary background for the subsequent chapters of this report. For ease in understanding, the material has been broken down into four chapters; Tank Company Maintenance, Regimental Maintenance Support, Division Ordnance Support and Conclusions. The last chapter, Conclusions, is a summary of the committee's findings and recommendations.

NOTES FOR CHAPTER 1

[1] FM 7-35 Tank Company Infantry Regiment, (Department of the Army, June 1949) par 2a.

[2] Preparation for Overseas Movement for a Tank Unit, by Colonel W. P. Winters, Armored Officer (Published by Armor Section, Headquarters Eight US Army Korea, 21 December 1950) p ?

[3] Fort Hood Test Project P-1732, (published by AFF Board #2, Fort Knox, Kentucky, July 1950) p ?

CHAPTER 2

TANK COMPANY MAINTENANCE

The addition of a tank company to the infantry regiment increased the maintenance load considerably. This chapter will discuss problems of maintenance, employment of the maintenance section, and personnel problems peculiar to the maintenance section, tank company, infantry regiment.

Lack of Trained Personnel

Individual crew member. The first phase in the Army maintenance program is that of preventive maintenance performed by the tank crew. This phase is the keystone of the whole Army maintenance system, and failure in its performance seriously affects the entire system. The survey indicated that lack of trained personnel was one of the greatest weaknesses of the tank company's maintenance support. This lack of training starts with the individual tank crewman.

The tank crew spends considerable time maintaining the tank. In field operation the time allotted to this task would amount to approximately four to five hours daily, not considering the actual loading of ammunition and fuel (Table Nr 1). Hence it is apparent that a large percentage of the crewman's training must be devoted to maintenance and similar subjects. An examination of ATP 17-600 indicates that 112 hours are devoted to maintenance and similar subjects out of a total of 378 hours in the advanced individual tank crewman course. In addition to this, a recent change to ATP 17-600

by AFF makes it mandatory to conduct a block of four hours per week in maintenance instruction. From this it can be concluded that the maintenance training is sufficient to qualify the trainee to be absorbed into a tank crew with the least amount of prior training by the company. This statement is not meant to imply that the replacement can join a combat tank crew and work efficiently immediately, but rather that the maintenance training accomplished by the replacement system is about optimum as far as time and necessity limitations are concerned.

TABLE NO. 1

TIME FACTORS: MAINTENANCE AND RESUPPLY

M-46 TANK

5-MAN CREW

Before opn check	27 min	
After opn check	76 min	
Daily maintenance	103 min	
Load 70 rounds 90 mm	60 min	
Load 50 cal Amm, 550 rounds	15 min	
Load 30 cal Amm, 5000 rounds	20 min	
Regas by 5 gal cans, 54 cans	35 min	
Resupply	130 min	
Total		3 hrs 43 min

This is with gas and ammo trucks beside tank. Truck driver passing gas cans to crew. Ammunition in crates.

Once the replacement tank crewman has joined his organization, the training problem becomes that of the unit. This initial short period of duty with the company during which the crewman is becom-

ing orientated is a critical one as far as maintenance is concerned. As stated in a 1st Army Ops Report in WWII:[1]

> ...Maintenance: After the replacement of severe personnel battle losses, the standard of maintenance may be expected to deteriorate rapidly. It is essential to the combat efficiency of a mechanized unit that the commanders anticipate this condition and intensify their efforts at this time to preserve their maintenance standards...

This problem is more difficult in the infantry tank company where the tank platoons are attached to rifle battalions and removed from the direct influence of the company headquarters. The load of supervision of the new crewman is thrown upon the tank commander and the tank platoon leader.

This situation is made painful by the fact that the new replacement is separated from "his company." As stated by Col S L A Marshall,[2] the feeling the soldier has for the company is the strongest tie to a unit there is, and if this is not allowed to develop naturally, there is a definite hinderance to morale. It is difficult to determine just how much effect this situation would have on the individual's morale, but it definitely is a hinderance to satisfactory discipline which is a prerequisite to satisfactory maintenance.

The Tank Commander. The next level in the personnel problem is that of the tank commander. In order than maintenance be performed in a satisfactory and efficient manner it is necessary that the tank crew work as a team. The tank commander is the one individual who can make or break this team spirit. The quality of the maintenance of the tank is in direct proportion to the ability of the tank

commander.

As far as maintenance is concerned, the tank commander must have a deep desire to keep his tank in operation a maximum amount of time. If the tank commander has this devotion, maintenance problems will be considerably reduced. The tank commander also must be a forceful leader. The ability required of this NCO to get the tedious and unpleasant task of maintenance performed seldom is found in the young and immature NCO's of today's Army.

The tank commander must have a great deal of initiative and some mechanical ability. If he performs his job correctly, his crew will assist to the utmost the company maintenance section when they are working on his tank. In the field, while awaiting the arrival of the maintenance section to make a repair, the tank crew will be doing all in their power to have the tank prepared for the mechanics so they can start work immediately.

The tank commander should have some limited mechanic's training. This will assist him in locating minor troubles and keeping the tank in operation. It also will help in anticipating what work should be done by the maintenance section and making the necessary preparations before they start their work.

There is a study being conducted at present to determine the practicability of the four-man tank crew. This may have sound arguments from the personnel point of view; however, it must be borne in mind that with a four-man tank crew the maintenance work load on the individual crew members increases by 20 per cent. This will mean

perhaps as much as a 20-per-cent increase in the time required to perform the crew maintenance. This increase actually may amount to one hour daily. If this elimination of one crew member is adopted, it may be necessary to add personnel to the maintenance section of the company headquarters. This last may have some good points, for it may be necessary to add only three or four mechanics to take the place of the twenty-two crewmen eliminated in each company. This change in the company organization may be a solution to the company's maintenance problems. It is well worth investigation from this point of view.

Company maintenance section. The mission of the infantry tank company maintenance section is to augment the crew maintenance when necessary and to perform as much second echelon maintenance as possible. This section also is responsible for the recovery of wheeled and tracked vehicles of the company.

There are many complaints about the number of mechanics in the maintenance section. Examination of the infantry tank company T/O&E will show a ratio of 10.2 vehicle equivalents per mechanic. This same ratio for the medium tank company of the armored division is 8.9 vehicle equavalents per mechanic.[3] The tank battalion of the armored division requires a higher degree of mobility than the tank unit of the infantry division. As a result of this the armored division's tanks should be subject to more mileage per unit of time than the infantry divisions. This would result in a more demanding maintenance problem; however, in the infantry tank unit, the tanks

are employed over a larger area in supporting the rifle battalions. This decentralization of the tanks increases the mileage per tank as compared with a more or less centralized company.

Weighing each point above, the committee feels the infantry tank company maintenance section is somewhat weaker than its counterpart in the armored division. The addition of two mechanics to the section would decrease the ratio of the vehicle equivalents to mechanics to 8.4, a figure more in keeping with the medium tank company.

Another problem that seems to cause trouble in some units[4] was that the mechanics in the maintenance section of the company were of the grade E-4 while the tank drivers in the platoons were of the grade E-3. This caused some friction when the mechanics were directing the tank drivers in the weekly maintenance work and in other maintenance tasks. If such situations arise in units, the fault would seem to lie with the company commander and the motor officer.

There is a lack of incentive for the company mechanics because of the fact that there is more opportunity for advancement in the tank platoons. It must be borne in mind that the mechanic has, as a rule, attended a maintenance school. With this schooling and some service in the tank company, he may have up to two years' military service. With such short service it is hard to justify a higher rank for the mechanic through T/O position alone. The tank driver probably holds a rank that is too high for his responsibilities and duties. It might be wise to reduce the rank of tank drivers to E-4. An alternate plan would establish the duty of driver as a

step in the tank mechanic career field. This would insure a higher degree of driver training and having a mechanic present all the time in the tank crew. It also would put the driver one grade below the gunner, now an E-5, who normally replaces the tank commander. There are many advantages to this system, and it bears more study.

Company motor officers. Another problem that has been raised is that of untrained company motor officers. At present there seems to be no solution to this, as all armored officers should be qualified to perform this duty. The unit itself can do a lot to improve this situation by running unit schools for company motor officers. This would be accomplished best in conjunction with the division tank battalion. Certainly the company motor officer should be an armored officer and not an infantry officer.

Any unit in the military service whose sole reason for existence is the support of combat elements must have the attitude that they are the servants to the combat elements. This applies to the maintenance section of the infantry tank company. These mechanics and their leaders must be devoted to their duty and tireless in the performance of this duty. This attitude can and must be developed by the company motor officer. Only when this feeling permeates each individual will the maintenance support be satisfactory.

Lack of Spare Parts

Many answers to the questionnaires indicated that maintenance at company level was seriously hampered by a lack of spare parts authorized by ORD 7 SNL, Organizational Maintenance Allowances for

medium tanks. Conversation with officers in the Office of the Chief of Ordnance indicated that this situation existed only at the outbreak of the Korean conflict and now is corrected. The causes of the situation will be discussed in the chapter on the division ordnance company and ordnance support in general.

Many answers to the questionnaires indicated that the spare parts that are authorized are in the wrong quantities and types. The responsibility for the allocation of spare parts to the combat units rests on the Office of the Chief of Army Field Forces. Any changes that are felt necessary should be requested through this office. Little trouble will be encountered in getting the change accomplished if it is warranted. It must be remembered that a change in authorization for spare parts does not mean automatic issue of the part. The part has to be in existence, which in many instances is not the case.

Some units desire that a higher level of suspension spare parts be authorized the company maintenance section. This would speed repair of damaged vehicles due to mine action. The problem of just where to carry these suspension parts arises. A vehicle would have to be added to the maintenance section. More and faster support by the division ordnance company would seem an economical solution to the suspension problem.

Welding Equipment

Many observers feel that welding equipment of some type should be added to the infantry tank company. This idea has much merit. A cutting torch has many uses in the maintenance section of the company.

One of the most important is its use in recovery and field repair and replacement. Breaking a track with a torch is an expeditious means of performing this task. The time saved would well pay for the investment.

There are many types of welding jobs that arise in the company. For example, some units have modified the tank turrets by welding on hand grips for the infantry personnel that may have to be transported on the tank. Equipment racks on the outside of the hull also have been made by some units. Temporary repairs to the tank as a whole can be made in an emergency.

This section was designed to introduce the problems of the tank company. The remainder of the chapter discusses them in some detail.

Employment of the Tank Company Maintenance Section

The regimental tank company operating as a company does not present any maintenance problems peculiar to it alone. The tactical employment of the company maintenance section is essentially the same whether the company is in an infantry regiment or a tank battalion. The tank companies of the infantry regiment, tank battalion, infantry division, heavy tank battalion, armored division, and heavy tank battalion, corps armored cavalry group are all the same.[5]

Recovery of disabled vehicles does, however, present an exception. In the armored division, tanks which the tank companies cannot repair are towed either to a battalion vehicle collecting point or to the battalion axis of advance. The battalion maintenance pla-

toon then takes over the disabled tank. If they cannot repair it, they tow it to the axis of advance of the supporting ordnance or to a division vehicle collecting point.[6]

If an attempt is made to apply this system to the regimental tank company, trouble is encountered at the regimental level. The tank maintenance section, service company, has no recovery vehicle, and thus it cannot play the part played by the battalion maintenance platoon of a tank battalion.

FM 7-35 states that tank company maintenance section should tow tanks it cannot repair to:

1. Division vehicle collecting point.
2. The regimental tank maintenance section, or
3. The axis of supply and evacuation or to defilade.

If the third alternative is chosen, the company must notify the regimental motor officer of type of vehicle, exact location, extent of damage, and the tactical situation.[7]

If the company tows a disabled tank to a division vehicle collecting point, the distance is apt to be excessive. Division ordnance isn't likely to have a collecting point forward of the regimental train bivouac, and the train bivouac normally will be out of hostile artillery fire. Here is a conflict in doctrine, because FM 7-35 also states that company recovery trips should be limited to short hauls.[8]

Hauling the disabled tank to the regimental tank maintenance section is not going to be very profitable unless regimental main-

tenance can repair the tank. If they cannot, the tank will sit there until a division ordnance recovery vehicle comes forward to get the tank or the tank company's recovery vehicle tows it back to ordnance. The division ordnance company has only two tank recovery vehicles to service the entire division.[9] A disabled tank, therefore, might have a long wait before division ordnance can get up to it.

If the tank is towed to an axis of supply and evacuation or to a defiladed position, it will have a long wait for the same reason. In addition it must be remembered that infantry divisions normally do not move as fast as armored divisions.

From the above you can see that recovery is more of a problem to regimental tank companies than to tank companies of tank battalions.

Another problem in employment of the tank company maintenance section arises when the company is not operating as a company but has its platoons attached to two or more battalions. FM 7-35 states that the company maintenance section follows the company as closely as conditions permit and rejoins it during breaks in the operations.[10] With platoons detached this is not always possible. Different platoons may be operating at some distance from each other, and this requires a decision as to which part or parts of the company the section is going to follow. Joining the company during breaks in operations presents the same problem since the platoons of the tank company do not join together but remain detached with infantry battalions.

Probably the answer to the question depends, like everything else, on the situation.

Captain Jack Elder, formerly with the tank company, 9th Infantry Regiment, recommended giving each detached platoon a mechanic with a hand tool set. Captain Elder proposed that the mechanic ride in the platoon leader's $\frac{1}{4}$-ton truck.

First Lieutenant Charles A Goucher, of tank company, 31st Infantry, in Korea, pointed out that the anticipated time of detachment can be a deciding factor. He favored attaching mechanics only when the platoons would be away from the company for a relatively long period of time.

First Lieutenant John Gregg, a member of the committee who served with tank company, 32nd Infantry, stated that the distance between the detached platoons and the company can be a deciding factor. Lt Gregg believes that mechanics normally should be attached to platoons working more than ten miles from the company but not attached to platoons within six miles. At in-between distances (six to ten miles) Lt Gregg believes the attachment will depend on the terrain, weather, situation, and condition of the tanks.

The committee feels that insufficient experience has been obtained to establish a definite doctrine on support of detached platoons. The regimental tank company maintenance sections must be flexible enough in training and organization to provide maintenance support for detached platoons. It is even more important in regimental tank companies that mechanics be general mechanics rather than specialists in tank companies of tank battalions.

Organization

First echelon maintenance in the regimental tank company is performed by the five-man crew using the tools issued with the vehicle. The tank crew, if trained and allowed sufficient time, is capable of performing the required crew maintenance.

Tank drivers are sometimes trained in their parent company and occasionally in division schools. The only service school course offered for crew members is the tank leaders' course at the Armored School.[11] An M46 tank crew is composed of the following:

One tank commander, sergeant first class

One tank driver, sergeant

One assistant driver and bow gunner, corporal

One gunner, sergeant

One cannoneer, private first class

All of the above personnel carry MOS # 9[illegible] with the exception of the tank commander who is a 1795. As previously stated in this report, first echelon maintenance is a major problem. Late in 1951, after Korean rotation had resulted in practically a 100 per cent turnover in personnel, the 31st Infantry Tank Company was experiencing so many tank breakdowns resulting from poor crew maintenance that they accepted only replacements with tank training. Many other units also complained of the poor maintenance background of armored replacements.

The time required to perform maintenance in combat presented an annoying problem. Colonel J. B. Lindsey, commanding officer of the

65th Infantry Regiment, states:

> ... The commanders of units with tanks attached, do not have sufficient knowledge of the maintenance of the tanks and oftentimes request missions that interfere with the proper maintenance and operation of the tanks...

Colonel Lindsey's statement is corroborated by many regimental motor officers and tank company officers in Korea and at other overseas stations. One of the chief complaints is that insufficient time is allotted during maneuvers and combat for first echelon and organizational maintenance. Tank crews cannot fight all day, resupply with three tons of gasoline and ammunition, and fight or stand ready to fight all night for a prolonged period of time. Under such circumstances the result is poor first echelon maintenance.

First echelon maintenance has a definite effect on the capabilities of organizational maintenance sections. Mechanics can be kept busy correcting damage resulting from insufficient crew maintenance. The work load may become so great that they will have insufficient time for retrieving and repairing battle casualties, and at the time perform such other organizational maintenance as is required of them.

Second echelon maintenance at the company level is performed by ten men of the maintenance section. These men are generally graduates of the track vehicle mechanics course of the Armored School. This course awards an MOS of 3660 (Track Vehicle Mechanic) to graduates. A similar course conducted at the Artillery School graduates personnel with the same MOS. They are usually assigned to self-propelled artill-

ery and anti-aircraft units.

The personnel assigned to the tank maintenance section are:[12]

1 master sergeant, company motor sergeant

1 sergeant, senior track vehicle mechanic

1 sergeant, senior recovery mechanic (commands tank recovery vehicle)

1 corporal, recovery mechanic (driver, tank recovery vehicle)

4 corporals, track vehicle mechanics

2 privates first class, mechanics helpers.

The above personnel carry an MOS of 3660 with the exception of the motor sergeant who is a 1660.

Approximately three-quarters of the questionnaires returned indicated that the present organization and equipment authorized the maintenance section of the tank company, infantry regiment, is inadequate.[13] On the other hand, a study conducted in April 1951 by the Infantry School concluded that personnel and equipment as authorized by T/O&E 17-37N are sufficient. It must be pointed out that regimental commanders were less convinced of the inadequacies of the section than were regimental motor officers and tank company officers.

It is apparent that many officers who answered the questionnaire considered local shortages of authorized spare parts and T/O&E equipment and tools. Several questionnaires showed that the T/O&E was not consulted, because it was claimed that many items of equipment which are already authorized were needed. The issue is further confused by a significant group which recommends that the service company tank maintenance section be deleted from T/O&E 7-13N and put bodily into the tank company.[14] The committee does not feel

the last point advisable, because it would put an additional responsibility on the already-overburdened company commander. Army Field Forces has recommended to the Assistant Chief of Staff G3 that one track vehicle maintenance officer be added to the regimental maintenance section.[15] This addition will increase the supervision of tank maintenance and probably will result in more efficient use of the tank maintenance section of service company. A warrant officer in this position would add more stability to the section.

The committee feels that the tank maintenance section of the tank company should be changed to the following:

1 master sergeant, Motor Sergeant
1 sergeant first class, Senior Mechanic
1 sergeant first class, Recovery Chief
1 sergeant, Recovery Mechanic and Recovery Vehicle Driver
2 sergeants, Tank Mechanics
4 Corporals, Tank Mechanics
2 Pfc's, Mechanics Helpers

Promotion

See previous page

Table 2 compares the strength of the tank company maintenance section with the formula for authorizing maintenance personnel into tables of organization as set down in SR 310-30-1. The maintenance section includes one more mechanic than is authorized by the SR, but this discrepancy is completely justified in that no additional personnel are provided as drivers for the two track vehicles and the one ¼-ton truck which is organic to the section.

None of the questionnaires recommended deletion of maintenance

personnel from the present company maintenance section, while roughly one-third recommended that anywhere from one to thirteen mechanics be added. Another one-third recommended that a welder be added along with welding equipment.

TABLE NO. 2

INCLUSION OF UNIT ENLISTED MAINTENANCE PERSONNEL IN THE COMPANY HEADQUARTERS TANK COMPANY, INFANTRY REGIMENT

	Auth by SR 310-30-1	Auth by TO&E 17/37N	TO&E Discrepancy
1. Supervisory Personnel			
A. Motor Sgt (SR Par 32b--one per company operating five or more vehicles	1	1	
2. Organizational Mechanics			
A. Organizational Mechanics (SR Par 32b--one per each 12 vehicle equivalents or major fraction	8	7	-1

B. Vehicles of Tank Co Inf Regt (TO&E 17/37N) — Vehicle Equiv (SR Par 33)

Tanks	22	X	3.5	=	77
Trucks ¼-ton	6	X	1	=	6
Trucks 2½-ton	2	X	1	=	2
Veh Tk Recov	1	X	3.5	=	3.5
Veh Armd Util	1	X	3.5	=	3.5
Tlr 1 ton	2	X	.1	=	.2
Tlr 250-gal water	1	X	.1	=	.1
Tlr ½-ton	1	X	.1	=	.1
Total vehicle equivalents					92.4 (8)

C. Breakdown, Organizational Mechanics (TO&E 17/37N)

Senion Track Vehicle Mechanic	1
Track Vehicle Mechanics	4
Mechanics Helpers	2
Total	7 (7)

3. Recovery Mechanics and Recovery Vehicle Crew

Senior Recovery Mechanic	1	
Recovery Mechanic	1	
Total	2	(2)

TABLE NO. 3

COMPARISON OF ENLISTED MAINTENANCE PERSONNEL IN THE TANK COMPANY, (HV) OR (MED), TO&E 17/37N, AND THE MEDIUM TANK COMPANY, TO&E 17/27N, AND AUTHORIZATIONS BY SR 310-30-1

Vehicles	Infantry Division Tank Company TO&E 17/37N		Armored Division Medium Tank Company TO&E 17/27N	
		Veh Equiv		Veh Equiv
Tanks	22	77	17	59.5
Vehicle Tank Recovery	1	3.5	1	3.5
Vehicle Armored Utility	1	3.5	1	3.5
Other Vehicles	12	8.4	8	4.4
Totals	36	92.4	27	70.9

Personnel		Auth by SR		Auth by SR
Motor Sergeant	1	1	1	1
Track Vehicle Mechanics (SR authorizes one mechanic per 12 vehicle equivalents)	7	8	6	6
Recovery Mechanics and Recovery Vehicle Crew	2		2	

The mounting of an oxyacetylene welding set on the new tank recovery vehicle will create a need for a welder, MOS 3526, in the tank company. With the great demand for additional maintenance personnel within the company it is difficult to add welding as an additional duty to one of the present members of the maintenance section. On the other hand, it would be uneconomical to add a welder not also trained as a tank mechanic.

Three questionnaires proposed that mechanics helpers be replaced by mechanics in the tank company. This is not a matter of changing the table of organization, but a degree of training in the same MOS. Conceivably, all the Pfc mechanics helpers in one company could be more highly skilled than the corporal mechanics in a second company. Mechanics training is largely a matter of on-the-job training and experience. The more critical supervision, advice, consultation, instruction, and help given a recent auto or track mechanic school graduate, the sooner he will develop into a good mechanic. Of course, his development will also depend on his incentives, ambition, intelligence, and attitude.

The survey disclosed objections to the inequalities in grade between mechanics and tank crewmen. The tank company maintenance section has a master sergeant as motor sergeant and two sergeants--a recovery chief-vehicle commander, and a senior mechanic. All the other maintenance personnel are corporals and Pfc's. Captain William L Kilby, Jr, regimental motor transportation officer, 18th Infantry, had this to say:

...Lack of trained personnel has been the biggest trouble encountered in both the tank company and in the service company tank maintenance section. I feel that this is largely due to lack of incentive. An intelligent, ambitious man can very easily become a sergeant in a tank crew and has possibilities of going much higher, while a mechanic may get stuck as a corporal indefinitely, not because he is inefficient but because there is no more rank available. It seems to me that a mechanic that supervises and advises a driver should be authorized at least the same grade. Several tank mechanics in the tank company (18th Infantry) have become outstanding tank commanders; with comparable rank they would have remained in the (company) maintenance section...

One of the principles of personnel management is: "Stimulate the individual's desire to produce through adequate incentives."[16] The low ratings of mechanics are in direct opposition to this principle in that there are strong "rating" incentives for mechanics to leave the maintenance section for the greater promotion opportunities of tank crew members. A man with two to four month's schooling in tank maintenance certainly has the inside track in competition with other prospective tank drivers for sergeant's chevrons.

In recommending an upward grade level revision it is realized that an army-wide chain reaction is to be anticipated. The committee is of the unanimous opinion that the grade level of armor and infantry units, and probably the other combat arms, is too high now and would prefer to equalize the maintenance grade level with them by lowering the grade levels of the arms and services. The committee does not consider such a proposal or recommendation within its scope. Equalization is the goal, and raising the grade level is merely an expedient.

The raising of the combat troops grade level is assumed to

have been primarily a measure to get better types of men into the highly technical army of today. Higher grades are prevalent in the rifle and weapons squads and tank crews than in the motor maintenance sections, making the incentives correspondingly greater for a man to want to become a rifleman or tank crewman. When tanks are made as complex as they are today and the cost goes up into six figures for each tank, it seems necessary at least to equalize the incentive for the mechanic who plays a major part in its maintenance.

The committee agrees that the inclusion of a track vehicle maintenance officer in service company of the Infantry Regiment will increase the maintenance supervision and thus improve first echelon maintenance. The adoption of the suggested organization of the company maintenance section will increase the work load capacity by adding two track mechanics. It will also satisfy the need for incentive in that it would authorize two additional sergeants ratings.

Ordnance Equipment, Tank Company (Medium) Infantry Regiment

The purpose of this section is to give the reader of this report an insight into the equipment to be maintained in the tank company, infantry regiment. It also will discuss the maintenance equipment now in the unit and recommend deletions or additions of equipment based upon deficiencies reported from units in the field. The report also will discuss maintenance equipment now under development.

TO&E 17-37N Tank Company Medium, which is the basis of the tank company of the infantry regiment, authorizes the following vehicles:

22 Tanks Medium
1 Vehicle Tank Recovery
1 Vehicle Utility Armored M44
2 Trucks 2½-ton, 6 x 6 cargo
6 Trucks ¼-ton, 4 x 4 Utility, M38

The medium tank is the main item of equipment and as such will require the main maintenance effort of the company maintenance section.

The medium tank M46 is a heavily-armored, full-track-laying, low-silhouetted combat vehicle mounting a 90mm gun. The vehicle contains a crew compartment (driving and fighting) in front, and an engine compartment (engine and transmission) in the rear.[17]

It is powered by a Continental model AV 1790-5, 12 cylinder, V-type, 4-stroke, Otto cycle, air-cooled engine with a single overhead cam shaft for each bank of six cylinders. Power is transmitted to the final drives and track sprockets through a cross-drive transmission which is a combined transmission, differential, and steering unit. The cross-drive transmission incorporates a hydraulic torque converter and a mechanical power path providing split-torque drive; variable steering mechanism; and built-in disc-type brakes. A manual dual control box is installed in the driving compartment and is connected to the cross-drive transmission through mechanical linkage. The driver or assistant driver can control both steering and drive-range shifting by operating his respective manual control lever on the dual control box, The vehicle is equipped with torsion bar type of suspension and individually sprung wheels.

The hull of this vehicle is a completely welded structure, except for portions such as handhole covers and grates which are removable for service and maintenance operations. The hull is divided into two

compartments, the crew compartment at the front and the engine compartment in the rear. These compartments are separated by a bulkhead that extends across the vehicle.

The turret mounts the 90mm gun M3A1 in a combination gun mount. The turret can be traversed 360° in either direction both manually and by means of the hydraulic power turret traversing mechanism.

The tank is equipped with an auxiliary generator and engine to furnish electrical power for the vehicle's electrical equipment, in addition to that supplied by the generator on the main engine. The auxiliary generator and engine can be operated, while the main engine is not running, to recharge the batteries and to provide power for communications and other electrical equipment. Two bilge pumps are installed, one in the engine compartment and one in the crew compartment, for deep-water fording operations. The tank is equipped with radio and interphone communication equipment. A ventilating blower and a heater are installed for comfort of the crew. The vehicle is equipped with a fixed fire extinguisher system which may be operated from the crew compartment or by a remote control from outside the tank. Portable fire extinguisher equipment is also furnished.

Controls and instruments are arranged so that the vehicle can be operated from either the driver's or assistant driver's position. Dual controls are provided for the accelerator linkage, service brakes, and transmission manual controls. All other controls can be reached from either position.

The following data shows the size and weight inherent to the M46.

Weight, fully equipped, including crew	46 tons
Length, over-all (gun in firing position)	26 feet
Width, over-all	11.5 feet
Height, over-all	10.5 feet
Ground clearance	18 3/4 in
Ground pressure	13.3 psi

The foregoing description of and data on the M46 implies that there is a tremendous maintenance load placed upon all echelons of maintenance. This assumption is not necessarily true because of the interchangeability of parts and the now-adopted unit replacement method employed by third and fourth echelons. The most important echelon of maintenance, with this tank in particular, is first echelon, particularly that performed by the crew. Diligence on their part will prevent the majority of breakdowns and effect minor repairs before major damage can occur. The equipment available to the crew for maintenance is listed in DA Supply catalog ORD 7 SNL G-244, Organizational Maintenance Allowances for Tank, Medium, M46, dated November 1950. The maintenance equipment listed therein is adequate, and no recommendations as to additions or deletions will be made in this report.

In the maintenance section of the tank company infantry we find the following tool sets:

Tool set, general mechanics..7..1 per mech (014, 660) (SNL G-27)	
Second echelon, special, set A	1 per each type of vehicle listed herein for which a sp set "A" exists. Tool set should match model Nr of vehicle issued. Not auth if issued under SNL. (see pertinent ORD 7 SNL)

Special, armored force, company set..1..SNL G-27

These sets as issued are sufficient for Company maintenance. This conclusion is based upon the results of Question 11 of questionnaire sent out by this committee. (See appendix)

Units in the field unhesitatingly state that there is a definite need for the addition of welding equipment, either electric or gas, to the maintenance section of the tank company, infantry regiment, This problem has been discussed earlier in this chapter, and the conclusions were that an oxyacetalene would be the most satisfactory solution to this problem. When a new vehicle recovery becomes available for issue to units, a gas welding unit will be part of its equipment. Presently, however, units in the field can take advantage of D/A circular 96-1951 which permits theater and division commanders to authorize additional equipment.

VTR M32 is not capable of retrieving the M46 tank. The reason for this is obvious in that it was designed specifically to furnish recovery support to units equipped with tanks of the M4 series. It is useful in the removal of engines and other units from the M46. The development of and subsequent issue to units of a new vehicle, heavy recovery, will solve the recovery problem on the medium and heavy tanks. For discussion of this vehicle see section on recovery vehicle.

Many officers in the regimental tank company feel that a wrecker 6-ton M1A1 should be included in the maintenance section of the company. The addition of this vehicle to the tank company main-

tenance section cannot be justified, because it would not be used to its fullest capacity. It is recognized that the addition of this vehicle to the maintenance platoon of the service company, infantry regiment, would be of definite advantage (see chapter 3). In combat there is a definite need for additional transportation to carry spare parts. It is the contention of most tank company commanders in Korea that if they had a vehicle, preferably a 2½-ton truck, to carry the spare parts which are authorized, the number of deadline tanks could be kept at a minimum.

Development of Vehicle Recovery Heavy T51

When the T26 tank was introduced into combat in the European Theater of Operations in 1945, it became apparent that a recovery vehicle capable of handling this heavier tank would have to be developed. Shortly thereafter the tank recovery vehicle T12 using the T26E1 chassis was started. This vehicle contained many undesirable features and proved to be inadequate, so in the summer of 1948 this project was terminated. In September of 1950 a list of desirable characteristics for heavy and light revovery vehicles was published in report of project Nr 1386, Army Field Forces Board Nr 2, Military Characteristics for Recovery Vehicle. In February 1951 the subcommittee on automotive equipment from the Office of the Chief of Ordnance approved the characteristics and authorized the development of the recovery vehicle, heavy, T51, and assigned Department of the Army priority 1A to it. At the same time it authorized the development of the recovery vechicle light T50, assigning this project a priority of 1C.

The immediate need for a recovery vehicle was one capable of retrieving the M46 tank. The initial concept design for the T51 was begun in February 1951. In April 1951 Army Field Forces Board Nr 2 approved the design, and construction of two pilot models was begun in the summer of 1951. The first pilot model is expected to be finished in March 1952 and the second pilot model in April of 1952.

"The T51 will be made of welded plates and relatively light in armor protection, but, as has been proven in Korea and Europe im the last war, it is impossible to effect recovery under threat of tank and anti-tank fire. Consequently no provisions are necessary for protection against them. The purpose of the armor is to permit the vehicle to accomplish its principal mission with the same amount of protection afforded the crew as is provided by the armored personnel carrier. As most vehicular battle casualties result from mines, it is necessary that the crew feel relatively immune to casualty from mines and light artillery so that they will be willing to risk exposure to mine damage to effect recovery. "

A complete list of tool requirements cannot be determined until the vehicle has been tested, but it is the intention of the developers that the vehicle not be overloaded with unnecessary tools. The equipment generally will be the same as that presently found on the M32 with the following additions:

50-foot extension for mike and head-set which will permit off-vehicle control of winching and hoisting operations

20-foot slave cable

Two 15-foot towing cables

Two sets of track-connecting and link-pulling fixture

30-ton capacity hydraulic jack 2

Spot light, portable, 24-volt, with stand and 50-foot extension to provide sufficient illumination to aid in repair or recovery where the tactical situation permits.

Oxyacetylene set with 150 feet of hose which will permit welding and cutting operations at a distance from the recovery vehicle.

Characteristics of Recovery Vehicle T-51

General:

Weight (Combat Loaded) 105,000 lbs. Crew 4
Weight (Less Crew Stow. & Fuel) 98,400 lbs.
C. of G. In. Abv. Grnd. In. From
Unit Ground Pressure 10.11 lbs./sq. in.

Armor:

HULL	Above Fender		Below Fender
Front 3/4 in. at.	36 deg.	1½ in. at.	0 deg.
Sides 3/4 in. at.	0 deg.	1 in. at.	0 deg.
Rear 3/4 in. at.	0 deg.	1½ in. at.	0 deg.
Top 3/8	In. Floor	1½ and 1	in.

VISION & SIGHTING EQUIPMENT:

Periscope,	Vision	Type	M17	Quantity	4
	Commanders		M17	Quantity	4
Sight,	Commanders MG	Type	Polaroid	Quantity	1
Other:		Type	M191R	Quantity	1

ARMAMENT:

Type	Location	Traverse	Elevation
Gun Machine Cal. 50 Browning M2HB Flex AA	Cab Roof	360°	80°-10°

Carbine Cal. 30 M2. Gun sub-machine Cal. 45 M3A1.

AMMUNITION:

1500 Rds. Cal. 50
540 Rds. Cal. 30
180 Rds. Cal. 45
Other: Smoke? Hand Grenades?

RUNNING GEAR:

Suspension, Type Torsion Bar
No. of Wheels 14 Dual Wheel Size 26"
Track, Type Steel and Rubber Chevron - Double Pin.
No. Shoes/Track 82 Pitch 6-15/16 Width 28"

ELECTRICAL SYSTEM: NOMINAL VOLTAGE 24

Generator, Main, Amperes 150 Ord. No. 7727461
Generator, Aux, Amperes 400 Ord. No. 7402328
Ignition System (Magneto Scintilla)
Magneto No. 7716553 Booster Coil No. 7725157
and 7716554

COMMUNICATIONS:

Radio Set AN/GRC-3, 4, 7 or 8 Location Cab
Interphone Model AN/UIC-1 & Radio No. of Outlets 4
External Interphone Extension Kit Model AN/VIA-1

FIRE EXTINGUISHER:

Fixed 4 Portable 1

POWER PACKAGE:

ENGINE:

Make Continental Model AVSI-1790-6 Type 12 Cyl 90°V Air Cooled Supercharged

Displacement 1790 Cu. In. Bore 5.75 In. Stroke 5.75 In.
Governed Speed 2800 RPM Compression Ratio 5.6
Fuel Gasoline Rating 80 Octane Capacity 390
Max. Gross Horsepower 1040 @ 2800 RPM*
Max. Net Horsepower 920 @ 2800 RPM*
Max. Gross Torque 1920 lb.-ft. @ 2300 RPM*
Max. Net Torque 1570 lb.-ft. @ 1900 RPM*
Main Cooling System Air Eng. Oil Cap. 64 Qts.
Oil Cooling System Air - Engine cooled. *Estimated

POWER TRAIN

Type X Drive Model XT 1400-1
Hydraulic Converter Single Stage
Polyphase Stall Multiplication 4
Overall Usable Ratio: Low 124/1 Int 58/1 High 27.2/1 Direct 6.8/1 Rev. 1.35/1
Steering Rate 5.6 RPM Turning Radius Variable
Steering Control Manually Controlled Hydraulic valve

Brakes Mechanical Operation Mechanical
Oil Cooling System Unit Cooled - engine driven

PERFORMANCE

Gross Horsepower to Weight Ratio 19.6 HP/Ton
Max. Tractive Effort 155700 lbs. Lb/W 1.55
Max. Speed 35 MPH Light Max. Grade 60%
20 MPH Towing 60-Ton Tank
Max. Trench In. Max. Vertical Wall 37 In.
Cruising Range 130 Miles Max. Ford. Depth 6

FINAL REDUCTION

Type Planetary (in transmission) Ratio 4.63/1 Ft./Rev. 7.52
Sprocket Pitch Diam. 28.802 in. No. of Teeth 13

CRANE

Hoisting Capacity: Up to 30 tons at 4 feet distance from rear hull plate of vehicle to a hook height of 12 ft.

Hoisting Speed. Speed from 6-3/4 fpm to 9½ feet/min.

With Boom Extended:

Hoisting Capacity. Up to 15 tons at 8 feet distance from rear hull plate of vehicle to a hook height of 15 feet.

Traverse. 30° to both Right and Left of longitudinal axis of vehicle.

WINCHES

Main Winch

Barrel diameter 10"
Flange diameter 24"
Barrel length 15-7/8"
Cable capacity 317 feet of 1¼" dia cable.
Line pull and line speeds.

	Bare Drum	Full Drum
Low gear	100,200 lbs @ 27 fpm to	49,700 lbs @ 54.6 fpm
High gear	54,400 lbs @ 49.8 fpm to	26,950 lbs @ 100.7 fpm

Auxiliary Winch

Barrel diameter 6"

Flange diameter 15"
Barrel length 7"

Cable Capacity. 615 ft. of 3/8" dia cable

Line Pull and Speeds:

Bare Drums	52.6 fpm	10,650 lbs.
Full Drums	117.3 fpm	4,780 lbs.

The T51 definitely has the recovery charactoristics by troops in the field. It has sufficient towing power to pull a 60-ton load along at 20 miles an hour. The boom has a capacity of 30 tons at 4 feet distance from the rear hull plate of the vehicle and a capacity of 15 tons when the boom is extended 8 feet from the rear hull plate of the vehicle to a hook height of 15 feet. The boom is capable of traversing 30° right and left of the longitudinal axis of the vehicle. These capacities in conjunction with the welding set and other tools carried on the vehicle answer the recovery needs of units in the field.

The greatest apparent drawback to the T51 is its lack of easy transportability. Paragraph 4c, ltr ~~DA~~, Office of the Chief of Ordnance, 5 February 1951, subject Recovery Vehicle Heavy, T51, states: "The over-all width shall be compatible with other design requirements, but shall be held to the limits which will not require special provisions for road, rail, and sea transport." Unfortunately in the design this characteristic was not strictly adhered to. The result is that the vehicle must be reduced from its over-all width of 146-7/8 inches to 127-3/4 for rail shipment [illegible].

The limitations set on width by American railroads are 10'8" and 11'2". Any width 10'8" or less can be carried on practically any

main route in the United States. When this width is increased to a maximum of 11'2", a special routing is required. At present the problem of reducing the shipping width of the T51 is being worked on at Detroit Arsenal. The approach to the problem is to remove the suspension. A conservative estimate on the time required to prepare the vehicle for shipment is 26-man days.[18] Presumably it would require the same time to unload and prepare this vehicle for field operation. The width of the T51 possibly will make it inoperative in many parts of the European and Asiatic continent because of the narrowness of the roads. Its width will also reduce many two-way roads to one-way traffic while the T51 is operating thereon. Further, the railroads of the European and Asiatic continent probably could not transport the T51. The committee feels that these factors are significant in that it is the avowed policy of our government to contain aggression before it reaches the North American continent.

The T51, although it apparently has the capabilities and characteristics generally desirable for a recovery vehicle, may not be of value to the Army outside of the ZI because of the difficulty in transporting it.

It is not within the scope of this report to investigate or criticize in any manner the research and development facilities of the United States Army, but to the officer in the field there seems to be an apathetic attitude in the pursuance of development. It is realized that no significant research on recovery vehicles was undertaken until after the outbreak of the Korean war which indicates a lack of

foresight for the period 1945 to 1950. We are cognizant of the slimness of the appropriation for research and development, but we submit that the act of design does not necessarily mean that a pilot model would have to be built.

Conclusions

Inadequate first echelon maintenance is often the result of inferior training but in most cases is the result of insufficient supervision and inspection.

Stronger emphasis should be placed on maintenance in all phases of tank crew training. This should include a maintenance training program for new replacements conducted in the receiving unit prior to his assignment to a tank crew.

An investigation should be conducted to determine the effect the proposed reduction of the tank crew to four men will have on maintenance.

Units should be oriented on procedures for making recommendations to the Office of the Chief of Army Field Forces on changes to spare parts authorizations.

Units should establish schools for company maintenance officers.

The tank company maintenance section must be trained and organized to support detached platoons since detachment of platoons is normal.

The doctrine on employment of the tank maintenance section as stated in Par 104-107, FM 7-35 is sound with the following except-

ions:

a. Recovery doctrine in Par 107a FM 7-35 calling for short hauls by the tank company maintenance section presently is impracticable because service company has no recovery vehicle.

b. The doctrine in Par 107b FM 7-35 calling for the tank company maintenance sections to rejoin the company during the breaks in offensive operations is not always possible since elements of the company may be attached to battalions during these breaks.

All company mechanics should be trained in the operation of gas welding equipment so that they become reasonably proficient in welding and cutting. This training should be common to all mechanic MOS's.

Tank commanders should, to a limited extent, be trained in second echelon maintenance.

The tank maintenance section should be increased by the addition of two track mechanics. These mechanics should be in the grade of Sergeant E-5. This increase in the grade structure would act as an incentive to men in the section to remain in mechanics' jobs rather than migrate to tank crews.

Tool sets as authorized the tank company by T/O&E 17-37N are adequate.

The M-32 is no longer an adequate recovery vehicle and should be replaced as soon as possible by an improved recovery vehicle. The committee feels that the T51 will have many shortcomings.

Welding equipment should be authorized the maintenance section,

tank company, infantry regiment. Theater and division commanders should exercise their prerogative under DA Cir 96 1951 to authorize issue of welding equipment to the tank company.

The availability of spare parts to the tank company should be increased by raising the authorized level, and the parts so authorized should be carried in an additional 2½-ton truck to insure that the company will always have the necessary spare parts well forward.

NOTES FOR CHAPTER 2

[1] First Army Operations Report World War II, p 2.

[2] Col S L A Marshall, Men Against Fire, p 78.

[3] SR 310-30-1.

[4] Responses to Questionnaires from 351st Infantry and 112th Infantry Service Company.

[5] All of these tank companies have the same T/O&E, 17-37N.

[6] FM 17-50, Logistics, The Armored Division, par 137b, p 153.

[7] FM 7-35, Tank Company Infantry Regiment, par 107e, p 152.

[8] FM 7-35, par 107a, p 151.

[9] T/O&E 9-8N, Ordnance Maintenance Company, Infantry Division.

[10] FM 7-35, par 107b, p 151.

[11] TM 9-718 T/O&E 17-37N.

[12] T/O&E 17-37N, Tank Company (Medium).

[13] Appendix Analysis of Questionnaire.

[14] Appendix Analysis of Questionnaire.

[15] Ltr OCAFF to Asst C of S, G3, DA, Subj: Machine Revision of T/O&E 7-13N.

[16]FM 101-1, The G-1 Manual, par 208.

[17]TM 9-718, Medium Tank, M46.

[18]Contention of Field Maintenance Section, Office of the Chief of Ordnance.

CHAPTER 3

REGIMENTAL MAINTENANCE SUPPORT

Organization

The regimental level of second echelon maintenance is performed by six men of the tank maintenance section of the service platoon of the service company. These men are usually trained at The Armored School as are the company mechanics. The basis of assignment of this personnel is as follows:[1]

1 Master Sergeant, Regimental Tank Maintenance Sergeant.

1 Sergeant, Senior Track Vehicle Mechanic.

2 Corporals, Track Vehicle Mechanics.

1 Corporal, Welder.

1 Private First Class, Mechanic's Helper.

(2 light truck drivers are also assigned to the section to drive assigned 2½-ton trucks.)

The section performs its mission, which includes the quarterly preventive maintenance, supply of tank parts, welding, road-side repair and assisting in battlefield recovery, utilizing the following equipment:[2]

1 Tool Set, Special Armored Force Separate Battalion.

1 Tool Set, Special Second Echelon Set B, per each type track Vehicle in the regiment.

4 Tool Sets, General Mechanic's.

1 Truck, 3/4 Ton Weapons Carrier, with winch.

2 Trucks, 2½-Ton Cargo, with winch.

2 Trailers, 1-Ton Cargo.

Other equipment is available in the regimental wheeled vehicle maintenance section of service company.[3]

Employment

The regimental tank maintenance section provides the same echelon of service to the regimental tank company that the tank battalion maintenance platoon provides the tank companies of the tank battalion. Specifically, the section performs the quarterly preventive maintenance service on the 24 track vehicles of the regiment. The section is capable of limited repair and can make some unit replacements. If the tank company maintenance section has an overflow of work, the regimental section should assist it. The section also provides spart parts and technical advice.[4]

The tank maintenance section does not have a tank recovery vehicle, nor is there one anyplace else in the regiment except the one that is organic to the tank company.[5] This makes the section incapable of providing the recovery support normally found at this echelon in armor units. A lack of any equipment in service company capable of lifting heavy weights, such as the engine out of an M46 tank, prevents the tank maintenance section from adequately performing its required second echelon maintenance services.

The above deficiencies effect the tactical employment of the section. There is no particular point in establishing a vehicle collecting point since the section can not move disabled tanks from

that point. Repair jobs requiring heavy lifting must be done at the tank company or division ordnance.

Generally speaking, the section performs its work in the regimental trains bivouac during combat. Field Manual 7-30, states that the section may send forward maintenance teams to repair or evacuate disabled tanks. How the section is to evacuate disabled tanks is not explained.[6]

Field Manual 7-35 states that the section operates initially in the regimental train bivouac and then follows the tank elements closely.[7] But, with no recovery equipment in the section, no recovery support can be expected of it. The section will probably continue any work it has on hand and be on call to assist the tank company in any manner within its capabilities. This will usually be to work on tanks with troubles beyond the correction capabilities of the tank company maintenance section, or reinforcing that section when it has more work than it can handle.

On marches, the regimental tank maintenance section follows the tank company on the tank company's route of march, which may or may not be the same as that of the rest of the regiment. It makes hasty, temporary repairs on march casualties. If these repairs are insufficient to get casualties to the march objective, the section reports the location of the disabled vehicle or vehicles to the division ordnance company.[8]

Returned questionnaires indicate a strong preference for the attachment of the regimental tank maintenance section to the tank

company when in the field in all but the most static situations or periods of minimum activity. In this manner the section furnishes the closest support possible, but not always is this the most effective support. Qualified tank maintenance supervisory personnel are more frequently found in the regimental tank companies than in service companies. Hence, both the regimental motor officers and tank company commanders are usually quite amenable to the attachment of the regimental tank maintenance section to the tank company.

The regimental tank maintenance section should be able to best support the tank company from the regimental trains bivouac, where it can work for longer continuous periods without moving than it would be able to if it were operating right with the tank company maintenance section. In the trains area it is closer to ordnance support and spare parts and has available to it certain tool and equipment items kept by the wheeled vehicle maintenance section. However, until adequate supervision of the section is more universally available in service companies, and until a recovery vehicle is assigned to the section, it will probably be more effective when attached to the tank company in most instances.

Equipment

In addition to the tank maintenance section (and other sections) a wheeled vehicle maintenance section is also present in the service platoon of the service company. These two sections frequently work together and their equipment is made mutually available. The following equipment is present in the wheeled vehicle section and

is available to the tank section when operating with or adjacent to the wheeled vehicle section.[9]

1 Drill, Electric, Portable . . .

1 Tool Set 2nd Echelon Ne 2, Common.

1 Set Nr 5, Oxyacetylene.

1 Set Nr 7, Hoisting and Towing.

1 Welder (electric portable).

The greatest equipment shortcoming of the tank maintenance section is the lack of a tank recovery vehicle. Responses to question number 18 of the questionnaire (see Appendix i). "What additional equipment is needed in the (regimental tank maintenance) section and what equipment has been found unnecessary?" , showed a definite need for the following equipment:

1 Tank Recovery Vehicle.

A more applicable and useable tool set than the Special Armored Force Separate Battalion Set.

Other responses to this question and questions nine and ten indicated the need for an M1A1 heavy wrecker, either at the tank company or in service company, primarily for its heavy weight-lifting ability for use in pulling tank engines for scheduled maintenance.

Presently it is necessary for the tank company maintenance section to evacuate disabled tanks to the regimental maintenance area, and frequently, if further evacuation is necessary, the company will have to evacuate on back to division ordnance. This long haul back to ordnance deprived the tank company of its recovery vehicle's ser-

vices for excessively long periods and puts wearing miles on the vehicle. The frequent employment of the tank company's platoons on a wide front, attached to two assault battalions, also complicates the evacuation problem. With two tanks of widely separated platoons being disabled at about the same time, it could very reasonably take all day for the company's one recovery vehicle to recover them. With the addition of a recovery vehicle to the regiment, the speed of evacuation should at least be doubled. Recovery support by the division ordnance company has too many inherent delays and is frequently too far in the rear to render effective support (see Chapter 4). Almost 90 percent of the questionnaire responses were of the opinion that there was insufficient recovery support for the tank company, and 60 percent of that group was in favor of increasing supporting recovery equipment at the regimental level. If for any reason the recovery vehicle of the tank company is inoperable, there is no machinery in the infantry regiment capable of lifting out the engine of the new medium tanks, a necessary operation for the monthly and quarterly preventive maintenance services. In order for the regimental tank maintenance section to perform recovery missions and the required quarterly services on the new tanks, it is mandatory that recovery equipment be assigned to the section.

The only hoisting and towing equipment in the regiment is that provided by the hoisting and towing set, or "A frame", mounted in the back of a 2½-ton truck of the regimental wheeled vehicle maintenance section. It is not capable of lifting power plants and other heavy

parts of the new medium tanks. The M1A1 6-ton heavy wrecker has the capability of lifting practically all assemblies which are peculiar to the new tanks. The committee feels that this vehicle would be a great asset to tank maintenance within the regiment, but that the recovery vehicle, with the same or greater lifting capacities, must be added first. In the event that recovery vehicles are not immediately available the M1A1 wrecker must be assigned to service companies of all regiments operating M46 or M47 tanks. OCAFF has recommended the addition of both of these vehicles to the infantry regiment.[10] This will provide greatly improved wheeled vehicle recovery if approved, as well as adding to the efficiency of both tank recovery and maintenance.

Returned questionnaires indicate that the Special Armored Force Separate Battalion Tool Set contains many tools which are of no use in the maintenance of the new medium tanks. This set has not been revised since World War II, and has been found of little value in the field. It should be overhauled and revised, or replaced as recommended by OCAFF, by Tool Set Second Echelon Nr 2, Supplemental.[11]

Personnel

Turning now to tank maintenance section personnel, SR 310-30-1 allows one mechanic per 30 motor vehicle equivalents or major fraction thereof. Track vehicles of the regiment comprise 84 vehicle equivalents authorizing three track vehicle mechanics. Inasmuch as the section now has three mechanics and one mechanic's helper, the committee cannot sympathize with approximately one-fourth of the

questionnaire responses which recommended additional mechanics be added to the section, except as recovery mechanics who operate the recovery vehicle. Nor is it felt that any personnel can be deleted in the face of this demand for more personnel and the failure of any responses to recommend deletions.

The addition of a tank recovery vehicle to the tank maintenance section of service company has been recommended by OCAFF as stated previously. OCAFF also recommended that the personnel of the tank maintenance section be augmented by two recovery mechanics who will be the driver and the vehicle commander of the added recovery vehicle.[12] This recommendation is in conformance with recommendations of The Infantry School made in April 1951.[13]

A recovery vehicle in the service company will be engaged in almost continuous service when in the field. This is readily apparent from the following list of some of its uses and missions:

Reinforce tank company in battlefield recovery, repair of disabled tanks, and in pulling tank engines in the scheduled monthly preventive maintenance service.

Evacuate tanks from tank company maintenance area to the regimental maintenance area.

Evacuate tanks from the regimental maintenance area to the division ordnance company.

Reinforce the six ton wrecker recommended for the regimental wheeled maintenance section.

Perform heavier wheeled vehicle recovery.

Lift heavy tank parts with its crane in parts replacement work on tanks.

Lift engine and power train assemblies out of tanks in the performance of quarterly organizational maintenance.

Perform welding operations with oxyacetylene welding equipment mounted on the vehicle.

From these and other duties that will be assigned the recovery vehicle and crew, it is considered evident that the added recovery personnel will have little or no time in which to perform duties now performed by personnel of the tank maintenance section. Also, on many of the above missions one or two mechanics of the section will have to accompany the recovery vehicle and crew. A three man crew is usually considered necessary for recovery operations. Thus, this personnel addition, if approved, will give the tank maintenance section the capability of performing recovery support missions, rather than merely reinforcing the existing maintenance personnel. With this in view the committee does not look favorably on the elimination of any mechanics or the mechanic's helper now in the section.

Eleven out of 27 questionnaires returned by regimental motor officers, 41 percent, recommended the addition of an ordnance parts clerk to either the tank company or the service company tank maintenance section. The parts clerk presently in the wheeled vehicle maintenance section should be able to take care of the needs of the tank maintenance section when that section is operating with the wheeled section. However, when the tank maintenance section is working

in the tank company maintenance area, which is frequently normal in the field, the section will take its parts along with it, but will concurrently lose the services of the parts clerk. The driver of the parts truck, the motor sergeant, and perhaps the senior mechanic, should be capable of filling in for the parts clerk during the short periods of time the section should be separated from service company and the parts clerk. The addition of a tank maintenance officer to the section (discussed later in this chapter) and/or the revision of the division ordnance company T/O&E along lines anticipated (see Chapter 4) might also help to alleviate the frequent need for this parts clerk.

The committee assumes that the two light truck drivers in the tank maintenance section are not also mechanic's helpers because they may frequently be expected to unload the maintenance equipment and spare parts from their trucks to haul gasoline, ammunition or troops. However, one of the trucks usually becomes a fixture in the section with built-in work benches and with anvils and vices fixed semi-permanently to the front bumper, etc. It takes man-hours to unload and strip this truck for cargo or troop hauling, and its absence deprives maintenance personnel of a suitable place to do some types of necessary work. For these reasons, it is one of the last very few vehicles in the regiment to go on a hauling mission in an emergency.

Since one of the trucks is practically always, and the other frequently, parked with the tank maintenance section, it appears uneconomical not to assign an additional MOS to one if not both of

these drivers. A considerable amount of their time could be more effectively utilized if they were trained mechanics helpers, or if one was a helper and the other a parts clerk. Since an electric welder on a one-ton trailer is frequently towed by one of the trucks, the welder in the section might even be assigned as driver. Only in the event that both of these light truck drivers are assigned additional MOS's, could the committee consider deletion of a mechanic's helper, and then only with the provision that he is utilized as one of the recommended additional mechanics in the tank company.

The last question of the questionnaire asked, "Briefly, what is your opinion of the weakest link in the maintenance support of the tank company, Infantry Regiment?". One of the four significant responses to the question indicated that the weakest link was the tank maintenance section of service company. Lt Col Glen A Nelson of the 7th Division's 32nd Infantry (commanding or exec, not known) says in reference to the regimental tank maintenance section, "In this (Korea) operation, wheeled vehicle maintenance requires the use of all authorized equipment". A regimental commander in the Third Division agrees.[14] Lt Col Nelson goes on to say:

> It is my belief that the three regimental tank companies of the infantry division should be organized into a tank battalion with a headquarters and service company in order to provide adequate tactical and maintenance officers, tank mechanics, and heavy retriever operators . . . The skilled men they (regimental tank companies) have should be pooled.
>
> The tank company commander in a regimental company has a tremendous responsibility for maintenance of vehicles and communication equipment. Some of this should be borne by a battalion echelon, leaving the company commander free to concentrate more on his tactical mission.

This is not an uncommon opinion.[15]

Complaints from tank company officers are numerous, and most of them point to the regimental motor officer -- "he must be trained in tank maintenance", "Very few infantry motor officers know anything about tanks", were typical remarks. These inferred, and other stated more specifically, that there was no cooperation or coordination by the motor officer with the tank company. Lack of adequate supervision of tank maintenance by the regimental motor officer was another complaint.

Recommendations of various field commanders in Korea that the tank maintenance section of the service company be transferred to the tank company were transmitted to a G-3, OCAFF, conference on maintenance support of armored elements of the infantry division, in April, 1951, by Col N M Lynde, Jr, Ordnance Corps, OCAFF.[16] About 15 percent of the questionnaire responses including two commanders of infantry regiments in Korea and the 7th Division Ordnance Officer made the same recommendation.

Even the regimental motor officers who returned questionnaires were in favor of passing the responsibility for tank maintenance to the tank company commander. Six of the 27 even wanted their tank maintenance sections to be organic to the tank company, and only three wanted the sections normally under regimental control.

Material presented in the preceding three paragraphs and the prevailing responses to the questionnaire indicate that the regimental motor officers generally have a bigger job than they can do, or

know how to do, and the recommended solution is almost universally to concentrate the responsibility for tank maintenance in the tank company. This includes the company officers and company commanders.

The Infantry School does not want to transfer the tank maintenance section from the service company for the following reasons:[17]

> The Regimental commander, through his motor officer, can maintain closer contact and control over the tank company maintenance.
>
> The entire burden for maintenance should not be imposed upon the tank company commander.
>
> Under the current organization, the service company tank maintenance section can be attached to the tank company if the regimental commander so desires.
>
> There is a possibility that future development will provide other track vehicles, such as flame throwers, vehicular mounted recoilless weapons, etc., in the infantry regiment but not necessarily in the tank company.

Only six officers recommended in their questionnaires that an officer or warrant officer be added to the tank maintenance section. A few more recommended an additional officer at the tank company with no duties except those of motor officer (present tank company executive officer is also motor officer).

An assigned tank maintenance warrant officer in the regimental tank maintenance section should be able to effect coordination and cooperation with the tank company maintenance elements and take a large part of the burden and responsibility for tank maintenance from the shoulders of both the regimental motor officer and the tank company commander. He should be able to place the proper emphasis on tank maintenance in the tank company as well as at regiment, and

make liaison between tank company and ordnance more effective, as well as provide the needed supervision for the tank maintenance section. In short, the addition of a tank maintenance warrant officer in the service company would go a long way toward alleviating the need for trained supervisory maintenance personnel in the regiment.

Conclusions

1. If effectively supervised and equipped, the regimental tank maintenance section would normally most effectively support the tank company by remaining in the regimental trains bivouac when in combat.

2. The absence of a tank recovery vehicle renders the tank maintenance section incapable of performing its assigned mission of regimental level organizational maintenance and recovery.

3. The addition of an M1A1 wrecker to the regimental service platoon would greatly increase the efficiency of the regimental tank maintenance platoon.

4. The Special Armored Force Separate Battalion Tool Set organic to the regimental tank maintenance section is inadequate and burdensome to the section.

5. If a tank recovery vehicle is added to the regimental tank maintenance section a two man crew for it must also be added.

6. The two light truck drivers of the regimental tank maintenance section should be awarded additional MOS's in order that they may be more economically employed.

7. A tank maintenance warrant officer is necessary to the regimental tank maintenance section in order to provide adequate supervision of the section, and tank maintenance in general.

Recommendations

1. That T/O&E 7-13N be augmented by the addition of a tank recovery vehicle to the tank maintenance section.

2. That the Special Armored Force Separate Battalion Tool Set be reviewed and revised to eliminate unnecessary tools and provide adequate tools for tank maintenance; or that this set be replaced by Second Echelon Tool Set Nr 2, Supplemental.

3. That T/O&E 7-13N be augmented by the addition of two Recovery Mechanics, MOS 3660.

4. That all infantry regiments presently equipped with M46 or M47 tanks be authorized and issued an M1A1 wrecker.

5. That additional MOS's of Mechanic's Helper, 3660, be assigned light truck drivers of the regimental tank maintenance section.

6. That T/O&E 7-13N be augmented by the addition of one warrant officer, MOS 0606, Track Vehicle Motor Officer, to the tank maintenance section.

Notes For Chapter 4

[1]T/O&E 7-13N,C2, Department of the Army, (15 November 1950), p 4.

[2]T/O&E 7-13N, (9 April 1948), pp 11 & 12.

[3]T/O&E 7-13N, (9 April 1948), pp 9-16 and T/O&E 7-13N,C1, (18 September 1950).

[4]FM 7-30, Service and Medical Companies Infantry Regiment, Department of the Army (Washington:Government Printing Office, 1949), p 52,par 39e.

[5]T/O&E 7-13N and C1.

[6]FM 7-30, p 54, par 44e.

[7]FM 7-35, Tank Company Infantry Regiment, Department of the Army (Washington; Government Printing Office, 1949), p 153, par 109b.

[8]FM 7-30, p 53, par 43.

[9]T/O&E 7-13N, pp 9-12.

[10]Letter, ATTNG/75/332 320.3, SUBJECT:Machine Revision of T/O&E 7-13N(Service Company, Infantry Reft.), TO:Assistant Chief of Staff, G-3, Department of the Army, Washington D.C., (OCAFF, Fort Monroe, Va February 1952) par 4 and 5.

[11]Ibid; par 4 and 5.

[12]Ibid, par 3.

[13]Letter, GNKEAD-R320.3, SUBJECT: Tank Maintenance Organization within the Infantry Regiment, TO: Chief, Army Field Forces, School, Fort Benning, Ga, 5 April 1951), par 2c.

[14]Col J. B. Lindsey, C.O. 65th Inf. 3d Inf Div, Korea.

[15]Captain Robert E. Drake "The Infantry Regiment's Tank Company" Armor, LX, No.5 (September-October, 1951), p 14; and Lt Col George B. Pickett, Jr., "Tanks in Korea: 1950-1951", Armor, LX, No.6 (November-December 1951), p 14.

[16]"Minutes of Conferences on Maintenance of Armored Elements of the Infantry Division Held by G3, 24-25 April 1951, Fort Monroe, Va", (OCAFF), p 2.

[17]Ibid; p 2.

CHAPTER 4

THE DIVISION ORDNANCE COMPANY

The phase of maintenance that has recieved the most adverse criticism as far as tank maintenance support is concerned is that involving the ordnance company of the infantry division. This might be expected as most of the questionaires were completed by line officers and comparitivly few by ordnance officers. It being natural to feel that one's own unit is operating efficiently and that the weak points in any system lie elsewhere, it therefore resulted in the division ordnance being subject to much censure. In this chapter we will discuss the infantry division's ordnance support. During this discussion these comments will be analysized and their valadility determined. Finally we will attempt to draw conslusions and to make recommendations to improve the role of the ordnance company in the maintenance support of the infantry tank company.

Organization of the Division Ordnance Company

In critically discussing any type of military organization, it is well to keep the purpose or mission of that organization foremost in mind. The mission of the infantry division's ordnance company is as follows:

> To furnish storage and issue of ordnance supplies, ordnance field maintenance support for all elements of the division, technical inspection of ordnance material, and administrative control of ammun-

ition supply to the division and attached units.

Under conditions of minimum activity, it is capable of furnishing support for all elements organic to the division. Under other operational conditions, assistance from other ordnance troops will be required to perform the full support mission.[1]

When the organization of this unit was concieved, certain limitations as to its capabilities were placed upon it. These limitations as stated by several different publications always seem to be at variance with each other. However in conference with various people in the Office of the Chief of Ordnance, it was learned that the capabilities of the infantry division ordnance company have been modified to this extent. Under conditions of minimum activity, the company can render support for only 60% of all elements organic to the division. The reason for this lessening of capabilities arises from the addition of more track vehicles to the division and from the experience gained in Korea.

From the above, it can be seen that the infantry division is not self-supporting so far as its organic ordnance is concerned. To make the division 100% self-supporting, it is standard policy to attach additional ordnance units to the division from field army level. This plan is not a temporary stop-gap device to make up for the inability of the division's organic ordnance, but is in direct conformation with the Army system of maintenance.[2] This plan is based on the tactical employment of tactical units. The army commander attaches to the division as much additional ordnance support as the tactical situation

requires. This will include forward direct support ordnance battalions.

The above practice gives the field army commander direct control over much of his ordnance support. By attaching it as he sees fit, he accomplishes efficient utilization of his ordnance support at such times and places where the need is critical. The system is flexible and thru it more responsibility is placed directly upon the field army commander. This follows the spirit of the Army system of maintenance right down the line.

To bring the infantry division up to being 100% self-supporting in ordnance, the standard practice is to attach an Ordnance Medium Maintenance Company to the division.[4] In addition to this, there is in each direct support ordnance battalion, one Ordnance Recovery Company.[5] This is the support that can be expected by the infantry division when tactically engaged in normal field operations.[6]

Employment of the division ordnance company. The ordnance company renders field maintenance support of the infantry tank units at the third echelon level. This is performed by two identical automotive sections, one in each of two maintenance platoons. Table III shows the present organization of these sections. This automotive section has two different type tasks to perform; that of maintenance on both track and wheeled vehicles. Upon examing Table III it will be found that this section is capable of being divided into two teams or sub-sections. One team will be devoted to wheeled vehicles and the other will be devoted to trafked vehicles. Table IV shows a probable break down into

these two teams. It must be remembered that this organization into teams will be governed by the situation and the facilities available. Normally this will be a semi-mobile or shop type installation.

At times when the lower echelons are overloaded in their preventive maintenance, it is the function of the ordnance company to absorbe this overflow of work. This is dome by actually going to the tactical units and assisting in the maintenance. This is in direct agreement with the Army principles of maintenance.[7]

Personnel of the ordnance company have the duty of inspecting ordnance equipment and rendering technical advice to the users of that equipment. This is done by frequent visits to the tactical units. It will result in cordial relations all the way around.

The doctrine of employment of the infantry division ordnance company and attachments appears to have many weaknesses. The ARMOR SECTION, US I CORPS, has made the following observations:

> (1) The Ordnance Maintenance Battalion of the Infantry Division is not sufficient maintenance support for the Infantry Division which has its full complement of Armor vehicles. The Heavy Tank Battalion alone can utilize the full capabilities of an Ordnance Medium Maintenance Company. With the advent of the M46 tank and the inability of the M32 VTR to recover crippled M46 tanks adequately, it is necessary to have a recovery unit with division ordnance which is capable of recovering these tanks. Ordnance maintenance units should be so organized and disposed as to lend closer support to units. Without this support, unnecessary wear and tear is put on the gear trains of the towed vehicles, consumption of gas is high, and valuable time is lost by tank battalion and tank company maintenance units. Due to the type of terrain and road conditions in Korea, the need for "close-in" type Ordnance maintenance support cannot be over-emphasized. Replacement parts, stocked on a 30-day supply level, should be maintained in Division Ordnance. With regard to vehicle replacements, there have been times in the Korean Campaign when units have had to travel as far as one

> hundred miles to draw replacement vehicles and drive them back to their respective organizations. In most instances the vehicles were returned to Division Ordnance immediately for repairs or processing. An immediate check and processing point should be set up between the recieving organization and the supply point from which the vehicles are issued. Such a procedure would insure reciept of "combat ready" vehicles. It is recommended that a complete study of Ordnance supply within the Infantry Division be made by the Office of the Chief of Ordnance with the above recommendations in mind.[9]

This general comment follows fairly closely the consensus of most line officers as indicated by the questionnaires. The outstanding point is that the support renendered up to this time has been too far to the rear. (This is not in accord with the principles of maintenance.) One must remember that the closer a soldier, whose duty is that of support, is to the battlefield, the more he feels that he is a member of the fighting team. As a result of this, there is an increase in his desire to do his job efficiently and promptly.

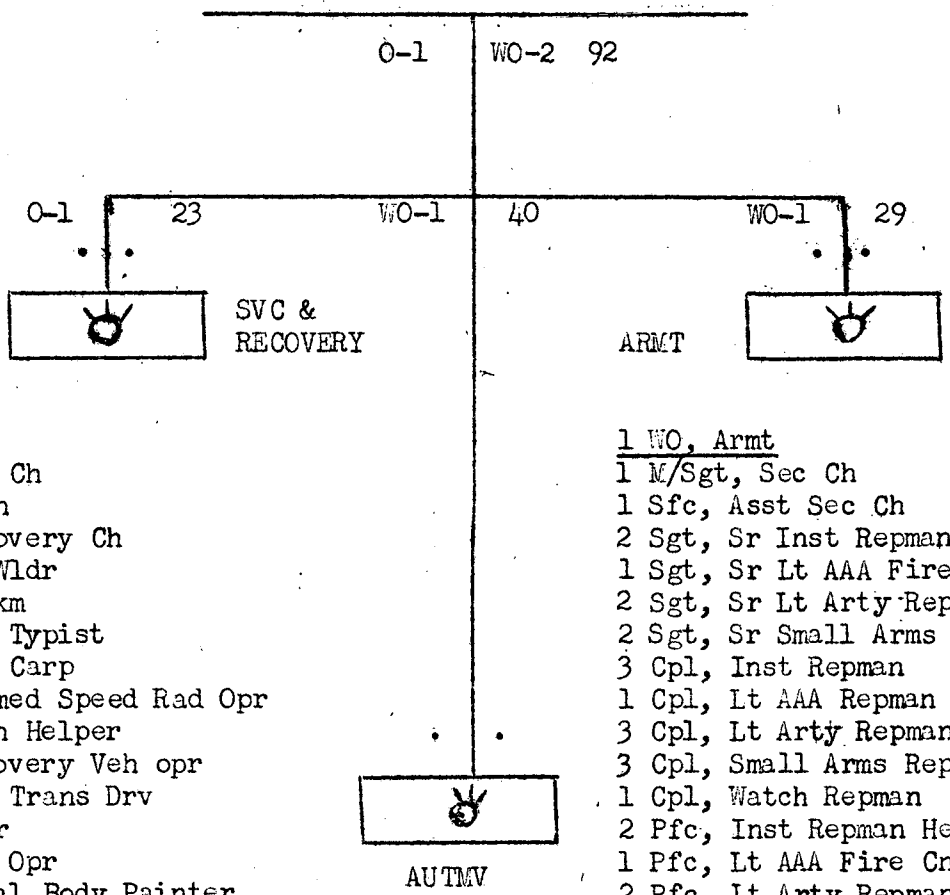
At a conference in the Office of the Chief of Army Field Forces, Brigader General Neblo, former United States Eight Army Ordnance Officer, stated that divisions in Korea which kept their ordnance units well forward were the most successful. He added that divisions that kept their ordnance units to the rear failed to provide adequate ordnance support. This was because the former had a better understanding of the tactical situation and the maintenance problems confronting the supported units. As a result liason was easier to perform and this resulted in better coordination and cooperation between the units.[9]

One must also consider, however, the point that some types of maintenance installations require some shelter and have to be more or

TABLE III

MAINTENANCE PLATOON

ORDNANCE COMPANY INFANTRY DIVISION



1 Lt, Svc
1 SFC, Sec Ch
3 Sgt, Mach
1 Sgt, Recovery Ch
1 Sgt, Sr Wldr
1 Cpl, Blskm
1 Cpl, Clk Typist
1 Cpl, Gen Carp
1 Cpl, Intmed Speed Rad Opr
1 Cpl, Mach Helper
1 Cpl, Recovery Veh opr
1 Cpl, Trk Trans Drv
2 Cpl, Wldr
4 Cpl, Wkr Opr
1 Pfc, Metal Body Painter
1 Pfc, Wldr Helper
2 Pvt, Lt Trk Drv

1 WO, Armt
1 M/Sgt, Sec Ch
1 Sfc, Asst Sec Ch
2 Sgt, Sr Inst Repman
1 Sgt, Sr Lt AAA Fire Cntl Repman
2 Sgt, Sr Lt Arty Repman
2 Sgt, Sr Small Arms Repman
3 Cpl, Inst Repman
1 Cpl, Lt AAA Repman (Fire Cntl)
3 Cpl, Lt Arty Repman
3 Cpl, Small Arms Repman
1 Cpl, Watch Repman
2 Pfc, Inst Repman Helper
1 Pfc, Lt AAA Fire Cntl Repman
2 Pfc, Lt Arty Repman Helper
3 Pfc, Small Arms Repman Helper
1 Pfc, Watch Repman Helper

1 WO,Autmv
1 M/Sgt, Sec Ch
1 Sfc, Asst Sec Ch
1 Sgt, Sr Autmv Fld and Elec Repman
2 Sgt, Sr trac Veh Repman
3 Sgt, Wh Veh Repman
7 Cpl, Autmv Fld and Elec Repman
1 Cpl, Metal Body Repman
6 Cpl, Trac Veh Repman
1 Cpl, Turret Arty Repman
8 Cpl, Wh Veh Repman
1 Pfc, Canvas Lthr Repman
1 Pfc, Metal Body Repman Helper
1 Pfc, Toolroom Keeper
2 Pfc, Trac Veh Repman Helper
1 Pfc, Turret Arty Repman
3 Pfc, Wh Veh Repman Helper

TABLE IV

PROBABLE BREAKDOWN
OF

AUTOMOTIVE PLATOON

TANK TEAM	WHEELED VEHICLE TEAM
1 Sfc, Asst Sec ch (Ch,Tlmt Sec)	M/Sgt, Sec ch
1 Sgt, Sv Autmv Flc Elrc Repman	3 Sgt, Wh Veh Repman
2 Sgt, Sv Tvac Veh Repman	5 Cpl, Autmv Fld & Elec Repman
2 Cpl, Autmv Fla Elec Repman	1 Cpl, Metal Body Repman
6 Cpl, Tvac Veh Repman	8 Cpl, Wh Veh Repman
1 Cpl, Turret Arty Mech	1 Pfc, Canvas Chav Repman
2 Pfc, Trac Veh Repman Helper	1 Pfc, Metal Body Repman
1 Pfc, Turret Arty Repman	1 Pfc, Tool-room Keeper
	3 Pfc, Wh Veh Repman

less permenent for most efficiency. Also logistical units of any type can not be so far forward as to get in the way of the combat elements.

Considering all of this, it is believed that the most workable solution is the formation of mobile ordnance teams. These teams would work out of a rear installation. They would support the tactical situations as directed by the division commander upon the advice of the division ordnance officer. This type of support would be similar to that of the armored division where an ordnance company is normal to have two regimental combat teams in the line, two ordnance teams could support these units in a simular manner. To do this, flexibility in the organization must be the key-note.

Tank recovery by Division Ordnance. The ordnance company as presently organized has a Service and Recovery Section in each maintenance platoon. (See Table III) Each section is equipped with one M32, Vehicle Tank Recovery. Tank recovery by this unit is performed at present as follows: Vehicle collecting points are established in the rear of the regimental combat team areas. Tactical units evacuate their tanks to these points. If the ordnance units are unable to repair these tanks on the spot within practicle time limits, the ordnance company evacuates the tanks to the rear to higher echelon installations. This may normally be the 4th echelon shops of the direct support ordnance battalion. The recovery section may also be used in a reinforcing role as far down as the tank company.

It should be noted here that the recovery section is equiped

with only one M32, Vehicle Tank Recovery. As has been mentioned before in this report, the M32 is entirely inadequate to evacuate the M46, Medium Tank or anything heaver. This problem should be solved by the adoption of the T51, Recovery Vehicle. This vehicle was discussed in Chapter I.

As mentioned earlier in this chapter, an ordnance medium maintenance company will normally be attached to the infantry division during operations. This unit has three recovery vehicles. In addition to this, an ordnance recocery company will be in direct support of every three infantry and one armored divisions. With the number of recovery vehicles available at division level, the recovery problem should be fairly simple, if an adequate vehicle was in the hands of these units.

It is necessary to emphasis at this point the desirability of getting recovery support as far forward as possible. Due to the inadequate M32, it requires another M46 Tank (and sometimes two) to evacuate a disabled M46 tank. This is a significant loss to the tank platoon that has to effect immediate evacuation. The service company at present does not have a recovery vehicle. Hense it falls upon the ordnance to get recovery support as far forward as possible.

To accomplish efficient recovery support, requires satisfactory liason with the combat elements. The recovery teams must be aggressive and must cooperate completely with the combat units. Although the ordnance company received much criticism concerning its tank recovery, it is believed this was warrented. Much of the trouble

lies in the inadequate recovery vehicle.

An Ordnance Battalion for the Infantry Division. The latest contemplated change in the organization of the ordnance support of the infantry division is that of reorganizing the ordnance company into an ordnance battalion. (See Appen. II for the proposed organization.) This reorganization involves no change in the actual number of personnel. It substitutes a battalion of one rear company and one forward company for the present organization. The forward company would be so organized that a ordnance maintenance platoon could be dispatched to and operated in each regimental combat team area. The rear company would be commanded by the division ordnance officer. This organization was originated in Korea where it is at present being tested by the United States Third Infantry Division. It has been approved by the Office of the Chief of Army Field Forces and by the Chief of Ordnance.

This battalion organization may appear at first to be a solution to the ordnance support problem. However one must keep in mind that there is no increase in the man power available to accomplish the maintenance work. The advantage, to this proposed organization, is that flexibility is increased, allowing closer support. This is in direct accordance with the principle of maintenance which state that it is more desirable to move the maintenance personnel to the equipment rather than to move the equipment to the personnel. Also it must be noted there is an increase in the number of track vehicle mechanics. This will be a definite advantage in the support of the infantry tank units.

One must remember also that the rear company of this battalion organization will be performing shop type third echelon maintenance some what to the rear. This requires a sheltered semi-perment installation. Because of this, time will still be consumed in moving vehicles back from the forward company. In spite of this, however, time saving and the availability of support should increase as far as the tank units are concerned.

The Supply of Ordnance Spare Parts

As noted in the first part of this chapter, the mission of the ordnance company is in part as follows:

To furnish storage and issue of ordnance supplies,***[11]

It does not appear that this mission has been carried out ot much success. There has been considerable comment on the supply of spare parts for tanks. Most of the comments were concerned with the actual handling and procuring of tank spare parts by the ordnance company supply personnel. This was brought out in statements similar to that of Capt Charles A Goucher, Jr, formally of the 31st Inf Regt, 7th Div, who stated the following:

> The division ordnance maintenance and supply officers usually do not have a well rounded knowledge of tank maintenance and spare parts supply. These people must be trained because for the majority of these people, it is their first experience with tanks. I can not stress this point enough---it is most important.

Again as stated by CWO William C Kinard formally of the Service Co of the 5th RCT (Korea):

Unit (Tank Company) should be able to get replacement tanks for combat losses within 48 hours at the least. The parts situation is pretty bad, therefore tanks are on deadline that should be in use (Fan belts, sprocket wheels, road wheels, track clamps, bolts and nuts).

These statements fairly reflect the majority of the opinions expressed in the questionnaires. It appears that the supply personnel of the ordnance company are generally unfamiliar with tanks and tank spare parts. This indicates lack of training of those individuals. Some line officers have stated that they have had to personnally visit the ordnance supply points and show the operating personnel exactly which parts they, the line officer, required. This is purely a problem of training and the Ordnance Corps is responsible for their own training.

Another exists in that spare parts are not available due to the inability of the ordnance company to predict future needs. It does not appear that ordnance personnel are noting the speed with which certain tank spare parts are being consumed, and requisitioning accordingly. At a conference at the Office of the Chief of Army Field Forces, Grigadier General Neblo (former ordnance officer for the 8th Army in Korea) stated that many ordnance officers were not familiar with stock records and supply procedures. In addition, there was a lack of knowledge concerning the items themselves. Ordnance personnel or the majority of ordnance personnel do not know those items which makes the difference of the vehicle running or remaining on dead line. The general noted this to be a weakness of ordnance in Korea.

There is not much to be said concerning this problem. It is one of the functions of the ordnance supporting company to make all

authorized spare parts available to the tactical units. To waste as little time as possible, this availability must be constant at the front-line. This is one of the main facets of good ordnance support.

The only solution to this spare parts problem is a through technical supply training. Indicating by a code letter or number suffixed to the stock number of part those items which will prevent a vehicle from running or a gun from firing. This has to be accompanied by aggressive leadership to cause the system to function.

Equipment of the Division Ordnance

Most people with experience consider that the maintenance equipment of the division ordnance company is adequate to accomplish its mission. Some questionnaires indicate a few desired changes but since these are in the small minority and all are different from each other in their recommendations, they will not be considered.

An important point was introduced by General Neblo in conference with the committee members.[12] The general noted that there is no suitable portable shelter in which units could perform tank maintenance in sub-freezing temperatures. A comparitively simple task like weekly lubrication assumed gigantic proportions at such temperatures. Grease fittings become caked with solid ice and mud. This is particularily true with tanks. General Neblo stated further that it is entirely illogical to hold the unit commander responsible for this type of maintenance when conditions make it impossible to perform.

Since the tank commander has many other problems to solve, it is the duty of the supporting maintenance units to lend assistance with this problem. The only workable solution to this cold weather difficulty appears to be a portable heated shelter. This shelter would have many requirements and the design would be no easy task. No attempt will be made here to point out a solution. It is mentioned purely to emphasis the need for this type of equipment.

Personnel of the Ordnance Company

Much comment was recieved concerning the training of personnel in the infantry division ordnance company. From the questionaires it appears that the lack of trained personnel in the unit was a decisive factor in its ability to support the tank units of the division. Let us consider the two types of personnel in the ordnance company, the enlisted technicians and the supervising officers.

The enlisted technicians. Lack of proper and adequate training was the greatest critism of the mechanics and various specialists in the ordnance company. As stated by Lt Col Ambrose F Johnson, 747th Ordnance Maintenance Company, 47th Division:

> Mechanics are proficient in repair of older type tanks, M24 and M4 series, but have had schooling on newer type cross-drives, etc, but had no practical application.

Again as stated by Major Jack D Daugherty, formally of the 73rd Heavy Tank Battalion (Korea):

> In my opinion, the most outstanding deficiency in the Ind Div Ordnance Company was the complete lack of experience and training in tank repair and maintenance.

These two statements are typical of the comments recieved from both line and ordnance officers.

After questioning of training officers in the Office of the Chief of Ordnance, it was learned that there are two predominent reasons for this lack of trained personnel. A big item (particularly in Korea) is the fact that a member of a combat unit has a much shorter tour of service before rotation than does the soldier in the ordnance company. Hence combat units have a need for trained mechanic replacements more often than the ordnance unit. As a result, when ordnance-trained replacements arrive in the theater of operations, they are used to fill mechanic vacancies in the combat units. This is to say the combat units have a priority for these people. The final result is that when ordnance units require replacements, their ordnance-trained replacements have been siphoned off into the combat units and the ordnance unit receives what is left. This may be anything so far as technical training is concerned. It is farily easy to see that it is uneconomical to have a highly trained ordnance mechanic at company level and to have a semi-skilled mechanic in the ordnance shops. This is a problem of the personnel assignment sections of the theater of operations.

Another factor that seems to have some bearing on the availability of ordnance personnel is the size of the Ordnance Corps. It is an Army policy to allot only a fixed percentage of the total Army strength to the Ordnance Corps. In effect the number of ordnance mechanics trained is proportional to total Army strength. Hense, the more

technical and complex ordnance equipment becomes, the number of mechanics available still remains the same so long as the total strength remains the same. This accounts in some degree for the shortage of trained ordnance technicians. Perhaps this is not too significient. However, it does point out that there has been no provision made for the increasing complexity of military equipment. See Table I for the man-hours required to service and maintain the M46 tank.

No study has been made by this committee of the mechanic training at the Ordnance School. This may be worth investigating as the training program may be inadequate and not fulfilling requirements.

It must be also considered that there were only limited amounts of M46 tanks prior to the Korean operation. As a result of this, ordnance units were greatly handicapped as to training with this vehicle. As a result there was a lack of M46 ordnance mechanics. This is partially borne out by the fact that less criticism of the ordnance company that were supporting tactical units that were equipped with the old M4 tanks.

Supervisory Officer Personnel. It was apparent, from the questionaire that the ordnance officer receives considerable unfavorable criticism concerning his qualifications. A comment by Capt James L. Harrington, formally of the 70th Tank Battalion (Korea), was as follows:

> The organization of the ordnance company is quite adequate if it is properly employed. However in my experience the ordnance supervisiory personnel are not acquainted with the maintenance problems attendant to armored vehicles. All too often, rather than learn of or correct inadequacies, nothing or very little is done to keep vehicles running and in fighting condition.

Another comment along the same lines was made by 1st Lt Egbert B. Clark III, formally with the 6th Tank Battalion (Korea). His statement was in answer to the following question:

> Question: Briefly what is your opinion of the weakest link in the maintenance support of the Tank Company of the Infantry Regiment?
>
> It Clark's answer: Horrible Ordnance support; parts not available, excessive time required for major repairs by ordnance, indications of poorly trained or at least poorly supervised ordnance work.

These statements serve to indicate that there is a decided weakness in the officer personnel in ordnance units.

It is extremely difficult to determine the cause of this weakness. Also it is beyond the mission of this report to find fault with personnalities at any level. However, an attempt will be made to make a few general comments on the situation.

There are only two types of military units; those that fight and those that support the fighting units. A supporting unit of any type has the sole mission of assisting or serving. Every member of that unit must be thoroughly indoctrinated with this idea of assisting or serving. It should be their creed of military life. Once the idea of serving is imbued in this supporting unit, it will automatically accomplish its support mission provided it has adequate

training and equipment. No more will the remark be heard that rear supporting units are only working eight-hour days while combat is in progress elsewhere.

To develop this spirit within units requires that unit officers have this feeling of being servants deep within themselves. This is a "must" for any officer of the services. Far too often the feeling prevails that the technical services are of a higher value or on a higher plane than the combat elements. This leads to poor support which results in noneffective combat operations.

When this desire to be the servant to the combat elements exists, cooperation and coordination result. The service renders its technical advise in an effective manner and it is gratefully recieved. The technical service inspections that are performed become of great value to the combat elements. Logistical support reaches an optimum level.

All of these remarks could apply to the officers of the division ordnance company. Many are perhaps putting it all to profitable practice. These are the characteristics of a good ordnance officer. Since many ordnance units seem to render little effective support, it may be summerized that many of the ordnance officers do not have this outlook.

Cordial relations with the unit that is being supported can not be overstressed. The so-called inspector-instructor service embodies this idea completely. (Appendix III) As stated in these proposed special regulations:

All instructor-inspectors must be fully impressed with the sound customer-dealer relationship in order to develop a high degree of cooperation between the using organization and supporting ordnance units.

A point along these same general lines is that ordnance officers must want, above all other duties, that duty of operation in the field. It has been stated that field duty is considered by most ordnance officers to be highly undesirable and unpleasant. It like "death-and-taxes" is considered inevitable but nevertheless disagreeable. As a result many of the best ordnance officers attempt to avoid being assigned to field ordnance units. They instead attempt to draw more desirable assignments such as those with civilian industry and in ordnance headquarters. The more or less unwanted officers often command the ordnance field units. It is needless to say that this situation must be corrected to improve ordnance support of tactical units.

Conclusions and Recommendations

Conclusions. 1. The ordnance company of the infantry division has been too far to the rear to adequately support the tank units of the infantry division, especially the tank companies of the infantry regiment.

2. The ordnance company as strength is concerned is adequate but requires more flexibility in its employment.

3. If an adequate recovery vehicle were available, the recovery support rendered by the company would be ample for the tanks of the infantry division.

4. Ordnance company supply personnel need more training in supply and in technical maintenance.

5. Ordnance supply has not maintained an adequate supply of tank spare parts and have not made these spare parts available to the forward echelons.

6. There is a need for a suitable shelter in which to perform tank maintenance in sub-freezing weather.

7. The assignments of ordnance replacements in combat have not been made so the personnel are assigned to the duties for which they have been trained.

8. There is not a great enough percentage of Army personnel assigned to the Ordnance Corps to meet present maintenance commitments. Or of those assigned, full utilization is not being obtained.

9. The supervisory officer personnel of the ordnance company are not well trained and do not understand the problems of the tank units. There is insufficient liason between the ordnance and the tactical units.

Recommendations. 1. The adoption of the ordnance battalion organization for the infantry division in place of the ordnance company, as recommended by Army Field Forces.

2. A more intense and up to date training program be initiated for ordnance supply personnel.

3. A study be made of the advisability of suffixing stock numbers of parts for identification of those items which will if not available prevent a vehicle from running and a gun from firing.

4. Every effort be made to have spare parts for tanks available as far forward as possible.

5. A program be initiated to develope a suitable shelter for sub-freezing maintenance.

6. A study be made of the assignment and procurement of ordnance personnel with an eye to its fitting present maintenance requirements.

7. An orientation program for ordnance officers be instituted so as to better acquaint them with their duties and missions in ordnance supporting units in the field. This program might possibly be conducted by the service schools of the combat arms.

NOTES FOR CHAPTER 4

[1] Ordnance Units, Special Test No 9-168, prepared by the Ordnance School (Aberdeen Proving Ground, Maryland June 1951), p 7.

[2] Field Service Regulations, Administration, FM 100-10, prepared by the Department of the Army (Washington, DC, Government Printing Office, September 1946) par 243 and 244.

[3] Ordnance Field Maintenance Organizations, FM 9-10, prepared by the Department of the Army (Washington, DC, Government Printing Office, August 1951) par 70.

[4] Tables of Organization and Equipment 9-7, Ordnance Medium Maintenance Company, with Change 1, 15 September 1950 and Change 2, 15 November 1950, prepared by the Department of the Army (Washington, DC, Government Printing Office, 5 May 1948).

[5] Tables of Organization and Equipment 9-187, Ordnance Recovery Company, with Change 1, 15 September 1950 and Change 2, 12 December 1950, prepared by the Department of the Army (Washington, DC, Government Printing Office, 17 November 1949).

[6]Same as note 3.

[7]Same as note 2.

[8]Armor Combat Lessons Bulletin Number 17, published by the Armor Section, Headquarters US I Corps (APO 258 dated 7 April 1951).

[9]Conference Headquarters Army Field Forces, Brig Gen Neblo, Captain Reed A. Thursby, and Captain Leverett N. Jenks, February 1952.

[10]

[11]Same as note 2.

[12]Same as note 9.

CHAPTER 5

CONCLUSIONS

It is the purpose of this chapter to tie up in one package all the conclusions and recommendations of the previous chapters. It is felt by consolidating these findings that a better picture of the problem in its entirety will be presented to the reader. It is felt that the conclusions reached in this report are sound and will, if adopted, improve the maintenance support available to the tank company of the infantry regiment and in many cases maintenance in general.

Training

In Chapter 2 the following points were brought out:

1. Inadequate first echelon maintenance is often the result of inferior training, but in most cases it is the result of insufficient supervision and inspection.

2. Stronger emphasis should be placed on maintenance in all phases of tank crew training.

3. Units should be oriented on procedures for making recommendations to the Office of the Chief of Army Field Forces on changes to spare parts authorization.

4. Units should establish schools for company maintenance officers.

5. The tank company maintenance section must be trained and organized to support detached platoons since detachment of platoons

is normal.

6. All company mechanics should be trained in the operation of gas welding equipment so that they become reasonably proficient in welding and cutting.

7. Tank commanders should, to a limited extent, be trained in second echelon maintenance.

In Chapter 3 the following points were made:

A tank maintenance warrent officer is necessary to the regimental tank maintenance section in order to provide adequate supervision of the section and tank maintenance in general.

In Chapter 4 the following was recommended:

1. The ordnance company of the infantry division has been too far to the rear to adequately support the tank units of the infantry division, especially the tank companies of the infantry regiment.

2. The ordnance company as far as strength is concerned is adequate but requires more flexibility in its employment.

3. Ordnance company supply personnel need more training in supply and in technical maintenance.

4. The supervisory officer personnel of the ordnance company are not well trained and do not understand the problems of the tank units.

Take all of these factors which have just been brought out and when added together they spell, "Failure to properly train". It is the recommendation of this committee that:

1. A study be made of the training of all personnel involved directly or indirectly with maintenance. That this study be all inclusive in nature to insure that not only our mechanics are receiving the proper training but also the individuals who must exercise supervision over these mechanics and the commanders who exercise command over the supervisors. This study must be made from the lowest level to the highest to insure not only proper instruction but coordinated instruction.

2. One agency be charged with the responsibility of supervision of maintenance and maintenance training to insure coordination.

Personnel Requirements

It is extremely difficult to make recommendations for changes in personnel and equipment when there appears to be a questionable yardstick insofar as the ability of our existing personnel is concerned. It can easily be said, "How can you recommend increases in personnel for the accomplishment of a job when it is recognized that those which you now base your recommendation upon are not accomplishing their mission due to inadequate training?" In the recommendations which follow we have taken into consideration this problems of lack of training and have attempted to justify ourselves on known and proven yardsticks. Our personnel increases are based on work load factors. We have attempted to first analyze what must be done and how long this takes to accomplish. From these two factors, we determine what we assumed to be needed. It is therefore recommended that:

1. That tank maintenance section of the tank company infantry regiment be increased by the addition of two track mechanics. These mechanics should be in the grade of Sergeant E-5.

2. That infantry regimental service company be augmented by the addition of two recovery mechanics, MOS 3660, and one warrant officer, MOS 0606.

Equipment

Not only are adequately trained personnel necessary to successful maintenance, but these same personnel must be properly equipped in order to accomplish what is desired. It is therefore recommended that:

1. Welding equipment be authorized the maintenance section of the tank company of the infantry regiment. This equipment would be used primarily for cutting purposes and would greatly assist in recovery work.

2. That the regimental service company be authorized one tank recovery vehicle to assist the tank company in evacuation.

3. That the Special Armored Force Separate Battalion Tools Set be reviewed and revised to eliminate unnecessary tools and provide adequate tools for tank maintenance.

4. That all infantry regiments presently equipped with M-46 or M-47 tanks be authorized and issued an M1A1 wrecker. It is recommended that this wrecker be placed in the regimental service company.

5. That the spare parts stock level at all echelons be thoroughly studied and that new authorizations be made based upon

consumption rates.

6. That a suitable shelter be designed for tank maintenance in during sub-freezing weather.

7. That a tank recovery vehicle capable of battlefield evacuation of the M-46 and M-47 be developed with the least possible delay.

8. That the entire research and development program of armored equipment be thoroughly investigated. It is the opinion of this committee that neither coordination or cooperation is being obtained under the present system between the various agencies involved. It is not only felt that coordination and cooperation is missing but also an understanding of what is needed.

Organization and Employment

We can have fully trained personnel and all of the necessary equipment to accomplish a job but if improperly organized and employed, it is doubtful if the job will ever be effectively done. In studying the organization and the employment it is the opinion of this committee that:

1. The tank maintenance sections of tank company and regimental service company are properly organized to accomplish their mission, except for shortages in personnel, which has already been discussed. It is felt however that the organization of the ordnance company of the infantry division is incapable of furnishing the necessary support and the recommendations of the Army Field Forces should be adopted. This organization is shown in Appendix ____

2. The principles of maintenance as outlined in Field Service Regulations Administration are sound in principle and if followed, successful maintenance will be obtained. It is recommended that these principles be thoroughly covered in all courses of instruction at our various service schools, and that they be brought to the attention of all personnel with the least possible delay.

3. That emphasis should be placed by all commanders on the provisions of the proposed SR, attached as Appendix III, which provides for the Ordnance Instructor - Inspector Service.

In closing it is the hope of the committee that the material which we have uncovered during the course of this study will in some small way improve out present maintenance problem not only within the tank company of the infantry regiment but wherever maintenance is performed. If we leave only this one thought, the time and effort spent in collecting the material which you have just read will have been justified.

"The degree of success we achieve in maintenance is dependent entirely upon adequately trained personnel, properly equipped and organized, and effectively supervised."

APPENDIX I

RESEARCH AND EVALUATION DIVISION
THE ARMORED SCHOOL
Fort Knox, Kentucky

QUESTIONNAIRE

Please answer the following questionas in the space provided or on additional paper if more space is needed. Answers should be based on your personal experience; and where possible, attach any data available as inclosures to support your statements.

1. Name.

2. Rank.

3. Organization.

4. Type of tanks unit is equipped with and actual number_____

_____.

5. On what experience are you basing your answers? (Check one or more of the following.)

		Unit	Period of Time
_____	a. Combat.	_____	_____
_____	b. Maneuvers.	_____	_____
_____	c. Garrison.	_____	_____

The following questions pertain to the maintenance section of the Tank company, infantry regiment:

6. Do you consider the present organization and equipment authorized the maintenance section of the tank company, infantry regiment, adequate? (Answer "yes" or "no").

7. If you do not consider the personnel and equipment adequate to perform its mission, number the following causes beginning with number 1 as the most important factor contributing to its inadequacy.

_____ Lack of trained personnel.
_____ Mechanically unreliable tanks resulting from poor engineering.
_____ Improper or poor first echelon maintenance performed by the vehicular crew.
_____ Inadequate tools and maintenance equipment.
_____ Insufficient personnel.
_____ Tactical employment of the company.
_____ The Army system of maintenance

_____Lack of adequate third echelon support.
_____Other (Specify)

8. How do you recommend the Maintenance Section of the Tank Company Infantry Regiment be employed when the platoons of the company operate separately?

9. How do you receommend the Maintenance Section be employed when the company operates as a company?

10. Do you feel there exists a need for additional recovery support? If so, what is your recommendation for a practical and economical solution?

11. What additional equipment is needed in the Maintenance Section and of that presently authorized what could be eliminated?

12. What additional personnel is needed in the Maintenance Section and of those presently authorized which could be eliminated?

The following questions pertain to the Tank Maintenance Section of Service Company of the Infantry Regiment:

13. Do you consider the present organization and equipment authorized the Tank Maintenance Section of Service Company, Infantry Regiment adequate? (Answer "yes" or "no")_____

14. If you do not consider the personnel and equipment adequate, number the following causes beginning with 1 as the most important factor contributing to its inadequacy.

_____ Lack of trained personnel.
_____ Mechanically unreliable tanks, resulting from poor engineering.
_____ Poor company maintenance

_____Inadequate tools and equipment.
_____Insufficient personnel.
_____Inadequate third echelon support.
_____The Army system of maintenance
_____Other (Specify)

15. How do you recommend the Tank Maintenance Section of Service Company be employed? (Check one of the following).

_____Attached to the Tank Company except when in a static position or when the situation permits easy evacuation from the Tank Company to the regiment.
_____Normally under the control of the Regimental Maintenance Officer.
_____Normally attached to the Tank Company.
_____Other (Specify).

16. Do you feel there exists a need for additional recovery equipment?___ (if yes check one of the following).

_____at the company
_____at the regiment
_____at the Ordnance Company.

17. What additional personnel do you feel is needed in the Tank Maintenance Section of Service Company, or what personnel do you feel can be eliminated?

18. What additional equipment is needed in this section and what equipment has been found unnecessary?

The following questions apply to the Ordnance Company organic to the Infantry Division?

19. Is the Tank Maintenance Section of the Ordnance Company sufficient in both personnel and equipment to properly support the tank units of the division. (Answer yes or no). _____

20. Is the Ordnance Company sufficient to support the Infantry Division as presently equipped? (Answer yes or no). _____

21. If you feel the Ordnance Company is not sufficient to support the Infantry Division for limited periods of time under combat conditions what is your recommendation for a practical and economical solution?

21. Cont

The following questions are of a general nature:

22. What percentage of your tanks over the past two months have you been able to keep combat operational each day._____

23. List four mechanical failures which most frequently occur in your unit.
(Be specific, such as: generator failure, gas pump failure, etc.)

1._____
2._____
3._____
4._____

24. Of these failures indicate the percentages you feel are a result of faculty engineering and the percentage resulting from lack of improper maintenance.

25. Briefly, what is your opinion of the weakest link in the maintenance support of the Tank Company of the Infantry Regiment

25. Cont

26. Remarks,

26. Remarks (cont)

Question 6

Is the TO&E of the Maintenance Section, Regimental Tank Company adequate

	Number Answering	Yes	No
Tk Company Commanders in Korea	22	9%	91%
Tk Company Commanders in ZI	16	50%	50%
Tk Company Commanders overseas	7	0%	100%
Regimental Motor Officers in Korea	9	11%	89%
Regimental Motor Officers in ZI	10	40%	60%
Regimental Motor Officers Overseas	6	0%	100%
Regimental Commanders in Korea	18	33%	67%
Regimental Commanders in ZI	9	33%	67%
Regimental Commanders overseas	4	25%	75%
Div. Ordnance Officers in Korea	0		
Div. Ordnance Officers in ZI	5	20%	80%
Div. Ordnance Officers overseas	0		
Officers with Tk Battalions, Korea	16	50%	50%
Total	122	28%	72%
Recapitulation by position			
Tk Company Commanders	45	22%	78%
Regimental Motor Officers	25	20%	80%
Regimental Commanders	31	32%	68%
Division Ordnance Officers	5	20%	80%
Officers with Tk Battalions Korea	16	50%	50%
Total	122	28%	72%
Recapitulation by Location			
Korea	65	26%	74%
ZI	30	43%	57%
Overseas	27	15%	85%
Total	122	28%	72%

Question 7.

Eight factors contributing to the inadequacy of the Tank Company Maintenance Section in order of their importance based on opinions of 88 officers:

1. Inadequate tools and equipment.
2. Lack of trained personnel.
3. Insufficient personnel.
4. Improper or poor first echelon maintenance.
5. Lack of adequate third echelon support.
6. Tactical employment of the company.
7. Mechanically unreliable tanks resulting from poor engineering.
8. The Army system of maintenance.

Question 8

How should Tank Company Maintenance Section be employed when the platoons operate seperately?

	Number Answering	Kept Intact	Attached To Platoons
Tk Company Commanders in Korea	22	50%	50%
Tk Company Commanders in ZI	16	69%	31%
Tk Company Commanders Overseas	5	60%	40%
Regimental Motor Officers in Korea	12	92%	8%
Regimental Motor Officers in ZI	8	100%	0%
Regimental Motor Officers Overseas	3	67%	33%
Regimental Commanders in Korea	6	100%	0%
Regimental Commanders in ZI	9	78%	22%
Regimental Commanders Overseas	9	78%	22%
Div. Ordnance Officers in Korea	1	100%	0%
Div. Ordnance Officers in ZI	3	33%	67%
Div. Ordnance Officers Overseas	2	50%	50%
Tank Battalion, Korea	10	60%	40%
Total	106	71%	29%
Recapitulation by Position			
Tk Company Commanders	43	58%	42%
Regimental Motor Officers	23	91%	9%
Regimental Commanders	24	83%	17%
Division Ordnance Officers	6	50%	50%
Tank Battalion Officers	10	60%	40%
Total	106	71%	29%
Recapitulation by Position			
Korea	51	69%	21%
ZI	36	75%	25%
Overseas	19	68%	32%
Total	106	71%	29%

Question 10

Recommendations for Recovery Equipment in Tank Company Maintenance Section.

	None	Add 1 VTR	Improved VTR	10 Ton Wrecker
Tank Company Commanders, Korea	0	5	7	3
Tank Company Commanders, ZI	7	1	2	0
Tank Company Commanders, Overseas	2	2	0	1
Regimental Motor Officers, Korea	2	0	0	4
Regimental Motor Officers, ZI	5	4	0	1
Regimental Motor Officers, Overseas	1	0	2	1
Regimental Commanders, Korea	4	2	3	2
Regimental Commanders, ZI	3	3	0	0
Regimental Commanders, Overseas	1	3	0	1
Div. Ordnance Officers, Korea	0	0	1	0
Div. Ordnance Officers, ZI	0	2	2	0
Div. Ordnance Officers, Overseas	0	2	0	0
Tk Battalion Officers, Korea	4	0	0	0
Total	29	32	17	13

Recapitulation by Position

Tank Company Commanders	9	8	9	4
Regimental Motor Officers	8	4	2	6
Regimental Commanders	8	8	3	3
Div. Ordnance Officers	0	4	3	0
Tank Battalion Officers	4	8	0	0
Total	29	32	17	13

Recapitulation by Area

Korea	10	15	11	9
ZI	15	10	4	1
Overseas	4	7	2	3
Total	29	32	17	13

Question 11

Recommendations on additions to equipment of Tank Company Maintenance Section

	None	2½ ton Tr w/A Frame	¼ Ton Truck	Tow Bar M46	Arc Welder	Cutting Torch	Btry Charger	Increase Spare Parts level	Transportation for Spare parts
Tk Company Commander, Korea	7	0	0	0	9	2	0	2	13
Tk Company Comdr, ZI	0	0	0	0	0	2	0	0	0
Tk Company Comdr, Overseas	0	1	0	0	2	3	1	0	0
Regt. Mtr Officers, Korea	0	0	0	0	4	0	0	0	0
Regt. Mtr Officers, ZI	5	0	0	0	0	2	0	0	0
Regt. Motor Officers, Overseas	0	0	1	0	1	0	0	0	1
Regt. Comdr, Korea	0	3	0	0	3	0	0	0	0
Regt. Comdr., ZI	4	0	0	0	0	1	0	0	0
Regt. Comdr., Overseas	4	0	0	0	1	4	0	0	0
Div. Ord. Officer, Korea	0	0	0	0	1	0	0	0	0
Div. Ord. Officer, ZI	0	1	1	0	0	0	0	0	0
Div. Ord. Officer, Overseas	0	0	0	0	0	0	0	0	0
Tk Battalion Officers, Korea	7	2	0	5	0	1	0	1	0
Total	27	7	2	5	21	15	1	3	14
Recapitulation by Position									
Tk Company Commanders	7	1	0	0	11	7	1	2	13
Regt. Motor Officers	5	0	1	0	5	2	0	0	1
Regimental Commanders	8	3	0	0	4	5	0	0	0
Div. Ordnance Officers	0	1	1	0	1	0	0	0	0
Tank Battalion Officers	7	2	0	5	0	1	0	1	0
Total	27	7	2	5	21	15	1	3	14
Recapitulation by Area									
Korea	14	5	0	5	17	3	0	3	13
ZI	9	1	1	0	0	5	0	0	0
Overseas	4	1	1	0	4	7	1	0	1
Total	27	7	2	5	21	15	1	3	14

Question 12

Recommendation on additional personnel in Tank Company Maintenance Section.

	1 Tank Mech	2 or more Tank Mech	Parts Clerk	Welder	Radio Repairmen
Tk Co. Comdr., Korea	8	0	0	9	2
Tk Co. Comdr., ZI	1	0	3	0	3
Tk Co. Comdr., Overseas	2	2	3	0	2
Regt. Motor Officer, Korea	2	0	0	3	0
Regt. Motor Officer, ZI	1	2	0	0	2
Regt. Motor Officer, Overseas	0	0	1	1	0
Regt. Comdr., Korea	2	0	2	3	0
Regt. Comdr., ZI	2	0	0	1	2
Regt. Comdrs., Overseas	3	0	2	4	0
Div. Ord. Officer, Korea	0	0	0	0	0
Div. Ord. Officer, ZI	1	0	0	0	0
Div. Ord. Officer, Overseas	0	0	0	0	0
Tank Battalion Officer, Korea	2	0	1	0	2
Total	24	4	12	21	13
Recapitulation by Position					
Tank Company Commander	11	2	6	9	7
Regt. Motor Officers	3	2	1	4	2
Regt. Commanders	7	0	4	8	2
Div. Ordnance Officers	1	0	0	0	0
Tank Battalion Officers	2	0	1	0	2
Total	24	4	12	21	13
Recapitulation by Area					
Korea	14	0	3	15	4
ZI	5	2	3	1	7
Overseas	5	2	6	5	2
Total	24	4	12	21	13

Question 13

Is the TO&E of the Regimental Tank Maintenance Section adequate?

	Number Answering	Yes	No
Tank Company Commanders, Korea	21	19%	81%
Tank Company Commanders, ZI	13	31%	69%
Tank Company Commanders, Overseas	4	25%	75%
Regt. Motor Officers, Korea	10	10%	90%
Regt. Motor Officers, ZI	12	17%	83%
Regt. Motor Officers, Overseas	3	0%	100%
Regt. Commanders, Korea	6	33%	67%
Regt. Commanders, ZI	10	30%	70%
Regt. Commanders, Overseas	6	17%	83%
Div. Ordnance Officers, Korea	1	0%	100%
Div. Ordnance Officers, ZI	4	50%	50%
Div, Ordnance Officers, Overseas	0		
Tank Battalion Officers, Korea	11	36%	64%
Total	101	24%	76%

Recapitulation by Position

Company Commanders	38	24%	76%
Regt. Motor Officers	25	12%	88%
Regt. Commanders	22	27%	73%
Div. Ordnance Officers	5	40%	60%
Tank Battalion Officers	11	36%	64%
Total	101	24%	76%

Recapitulation by Area

Korea	49	22%	78%
ZI	39	28%	72%
Overseas	13	15%	85%
Total	101	24%	76%

Question 14.

Seven factors contributing to the inadequacy of Regimental Tank Maintenance Section according to their importance based on the opinions of 74 officers:

1. Lack of trained personnel
2. Inadequate tools and equipment
3. Insufficient personnel
4. Inadequate third echelon support
5. Poor company maintenance
6. Mechanically unreliable ranks resulting from poor engineering
7. The Army system of maintenance

Question 15

Employment of Regimental Tank Maintenance Section

	Number Answering	Attached to Tk Co except under Static Cond	Normally under Regt. Control	Normally attached to Tk Co	Transferred Section to Tk Co.
Tk Co. Comdr., Korea	22	14%	9%	50%	27%
Tk Co. Comdr., ZI	13	54%	15%	23%	8%
Tk Co. Comdr., Overseas	6	0%	0%	33%	67%
Regt Motor Officer, Korea	10	10%	30%	30%	30%
Regt Motor Officer, ZI	12	33%	25%	33%	9%
Regt Motor Officer, Overseas	5	20%	20%	20%	40%
Regt Comdr, Korea	6	33%	17%	17%	33%
Regt Comdr, ZI	9	67%	11%	22%	0%
Regt Comdr, Overseas	4	0%	75%	25%	0%
Div Ord Officer, Korea	1	0%	0%	100%	0%
Div Ord Officer, ZI	4	25%	50%	25%	0%
Div Ord Officer, Overseas	1	0%	0%	0%	100%
Tk Bn Officers, Korea	13	15%	39%	46%	0%
Total	106	25%	22%	34%	19%
Recapitulation by Position					
Tk Co Comdr	41	25%	10%	39%	27%
Regt Motor Officers	27	22%	26%	30%	22%
Regt Comdrs	19	42%	26%	21%	11%
Div Ord Officers	6	17%	33%	33%	17%
Tk Bn Officers	13	15%	39%	46%	0%
Total	106	25%	22%	34%	19%
Recapitulation by Area					
Korea	52	16%	21%	42%	21%
ZI	38	48%	21%	26%	5%
Overseas	16	44%	25%	25%	6%
Total	106	25%	22%	34%	19%

Question 16

Recommendations on echelon at which Recovery equipment should be added.

	Number Answering	None	Co	Regt	Div.
Tk Company Commander, Korea	16	0%	25%	56%	19%
Tk Company Commander, ZI	12	8 1/3%	8 1/3%	75%	8 1/3%
Tk Company Commander, Overseas	6	33%	50%	17%	0%
Regt. Motor Officer, Korea	13	15%	15%	55%	15%
Regt. Motor Officer, ZI	12	0%	0%	100%	0%
Regt. Motor Officer, Overseas	3	33 1/3%	0%	33 1/3%	33 1/3%
Regt. Commander, Korea	6	17%	33%	33%	17%
Regt. Commander, ZI	7	14%	0%	72%	14%
Regt. Commander, Overseas	5	20%	0%	40%	40%
Div. Ordnance Officer, Korea	1	100%	0%	0%	0%
Div. Ordnance Officer, ZI	8	12½%	25%	50%	12½%
Div. Ordnance Officer, Overseas	1	0%	100%	0%	0%
Tk Battalion Officers, Korea	17	6%	18%	29%	47%
Total	107	11%	16%	54%	19%
Recapitulation by Position					
Tank Company Commanders	34	9%	23%	56%	12%
Regimental Motor Officers	28	11%	7%	71%	11%
Regimental Commanders	18	17%	11%	50%	22%
Div. Ordnance Officers	10	20%	30%	40%	10%
Tank Battalion Officers	17	6%	18%	29%	47%
Total	107	11%	16%	54%	19%
Recapitulation by Area					
Korea	53	9%	21%	43%	27%
ZI	39	8%	8%	76%	8%
Overseas	15	27%	27%	27%	19%
Total	107	11%	16%	54%	19%

Question 17

Recommendation on changes to personnel authorized Regimental Tank Maintenance Section.

	No Change	Delete one Mech	Add one Mech	Add Maint Officer	Add Parts Clerk	Add Turret Mech.
Tk Company Commander, Korea	7	1	0	0	1	0
Tk Company Commander, ZI	7	0	1	2	0	1
Tk Company Commander, Oversea	0	0	2	0	0	0
Regt. Motor Officer, Korea	3	0	2	0	0	0
Regt. Motor Officer, ZI	2	0	7	2	1	0
Regt. Motor Officer, Oversea	1	0	1	0	1	0
Regt. Commander, Korea	1	0	3	1	1	0
Regt. Commander, ZI	2	0	2	1	0	0
Regt. Commander, Overseas	0	0	0	0	0	0
Div. Ordnance Officer, Korea	1	0	0	0	0	0
Div. Ordnance Officer, ZI	1	0	0	0	0	0
Div. Ordnance Officer, Over seas	0	0	0	0	0	0
Tk, Battalion Officer, Korea	1	0	1	0	0	0
Total	26	1	19	6	4	1

Recapitulation by Position

Tk Company Commanders	14	1	3	2	1	1
Regt. Motor Officers	6	0	10	2	2	0
Regt. Commanders	3	0	5	2	1	0
Div. Ordnance Officers	2	0	0	0	0	0
Tk. Battalion Officers	1	0	1	0	0	0
Total	26	1	19	6	4	1

Recapitulation by Area

Korea	13	1	6	1	2	0
ZI	12	0	10	5	1	1
Overseas	1	0	3	0	1	0
Total	26	1	19	6	4	1

Question 18

Recommendations on additional equipment for Regimental Tank Maintenance Section.

	No Ch	Add VTR	Add 10T Wrecker	Add 2d Ech Tools	Add 2½ T Truck w/A Frame	Add Spare Parts	Add Acety Welding	Add Elec Welding
Tk Co. Commander, Korea	1	9	1	0	1	0	3	2
Tk Co. Commander, ZI	1	2	3	0	1	0	0	0
Tk Co. Commander, Overseas	1	1	0	0	0	0	0	0
Regt. Motor Off., Korea	1	5	4	1	1	0	0	0
Regt. Motor Off., ZI	1	3	0	5	0	0	0	0
Regt. Motor Off., Overseas	1	0	0	1	0	0	0	0
Regt. Comdr. Korea	0	2	0	0	0	0	0	0
Regt. Comdr, ZI	0	2	1	0	0	0	0	0
Regt. Comdr, Overseas	0	2	0	0	0	0	0	0
Div. Ord. Officer, Korea	1	0	0	0	0	0	0	0
Div. Ord. Officer, ZI	0	1	1	0	0	0	0	0
Div. Ord. Off., Overseas	0	0	0	0	0	0	0	0
Tk Battalion Off., Korea	1	1	0	3	0	0	0	0
Total	8	28	10	10	3	0	3	2
Recapitulation by Position								
Tk Co. Commanders	3	12	4	0	2	0	3	2
Regt. Motor Officers	3	8	4	7	1	0	0	0
Regt. Commanders	0	6	1	0	0	0	0	0
Div. Ord. Officers	1	1	1	0	0	0	0	0
Tk. Battalion Off., Korea	1	1	0	3	0	0	0	0
Total	8	28	10	10	3	0	3	2
Reca;itulation by Area								
Korea	4	17	5	4	2	0	3	2
ZI	2	8	5	5	1	0	0	0
Overseas	2	3	0	1	0	0	0	0
Total	8	28	10	10	3	0	3	2

Question 20.

Is the Infantry Division Ordnance Maintenance Company sufficient to support the Infantry Division as it is now equipped.

	Number Answering	Yes	No
Tk Company Commander, Korea	17	59%	41%
Tk Company Commander, ZI	8	25%	75%
Tk Company Commander, Overseas	0		
Regt. Motor Officer, Korea	0		
Regt. Motor Officer, ZI	2	0%	100%
Regt. Motor Officer, Overseas	2	0%	100%
Regt. Commander, Korea	2	50%	50%
Regt. Commander, ZI	5	40%	60%
Regt. Commander, Overseas	2	100%	0%
Div. Ordnance Officer, Korea	0		
Div. Ordnance Officer, ZI	9	78%	22%
Div. Ordnance Officer, Overseas	2	50%	50%
Tank Battalion Officer, Korea	0		
Total	49	51%	49%
Recapitulation by Position			
Tank Company Commanders	25	48%	52%
Regt. Motor Officers	4	0%	100%
Regt. Commanders	9	56%	44%
Div. Ordnance Officers	11	73%	27%
Total	49	51%	49%
Recapitulation by Area			
Korea	19	58%	42%
ZI	24	46%	54%
Overseas	6	50%	50%
Total	49	51%	49%

Question 21.

Recommendations for changes in organization of Division Ordnance Company

	Tk Co Comdr.	Regt. Mtr. Off	Regt. Comdr.	Div Ord. Off.	Tank Bn. Off.	Total
No Change	2	1	2	1	0	6
Increase to Battalion	3	0	1	1	1	6
Increase Parts Allowance	0	1	0	1	2	4
Increase Recovery Equip	3	1	0	2	2	8
Add 1 MAM Co. Per Rct	3	1	0	2	0	6
Improve Recovery Equip	0	0	1	1	0	2
Increase Tk Sec to Plats	4	0	0	1	4	9
Add Army Support	3	0	0	0	1	4

Question 25.

What is the weakest link in the chain of maintenance support of the Tank Company, Infantry Regiment?

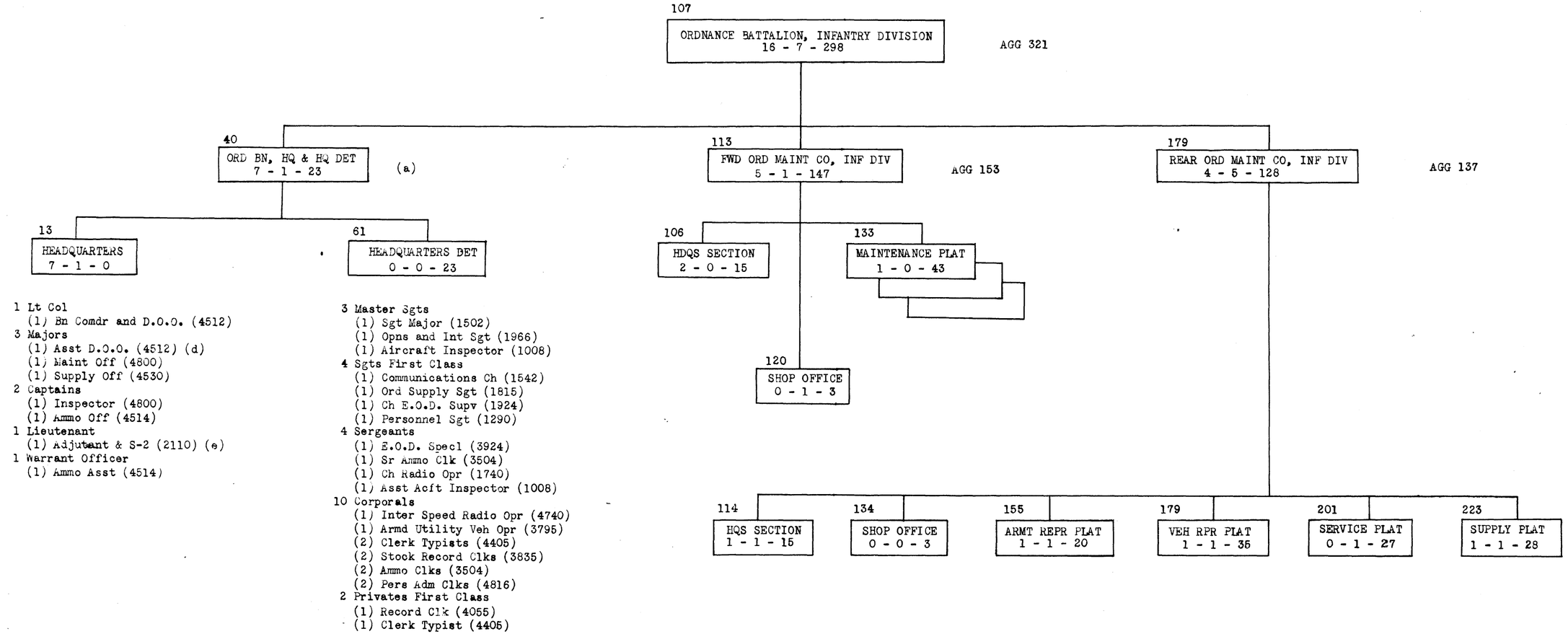
Opinions of 132 Officers

Weakest Link	Number	Percentage
1. Parts Supply	44	33.3%
2. Division Ordnance	31	23.5%
3. Lack of trained personnel	20	15.2%
4. Regt. Maintenance	14	10.6%
5. Recovery & Evacuation	6	4.5%
6. Lack of tools	5	3.8%
7. Poor coordination	4	3.0%
8. Tank Company	3	2.3%
9. Infantry Regimental Staff	3	2.3%
10. Lack of Time	2	1.5%

Recapitulation by Echelon

Ordnance (Items 1, 2 & 6)	80	61%
Regiment (Items 4 & 9)	17	13%
Company (Item 8)	3	2%
General (Items 3,5,7 & 10)	32	24%
Total	132	100%

APPENDIX II



1 Lt Col
(1) Bn Comdr and D.O.O. (4512)
3 Majors
(1) Asst D.O.O. (4512) (d)
(1) Maint Off (4800)
(1) Supply Off (4530)
2 Captains
(1) Inspector (4800)
(1) Ammo Off (4514)
1 Lieutenant
(1) Adjutant & S-2 (2110) (e)
1 Warrant Officer
(1) Ammo Asst (4514)

3 Master Sgts
(1) Sgt Major (1502)
(1) Opns and Int Sgt (1966)
(1) Aircraft Inspector (1008)
4 Sgts First Class
(1) Communications Ch (1542)
(1) Ord Supply Sgt (1815)
(1) Ch E.O.D. Supv (1924)
(1) Personnel Sgt (1290)
4 Sergeants
(1) E.O.D. Specl (3924)
(1) Sr Ammo Clk (3504)
(1) Ch Radio Opr (1740)
(1) Asst Acft Inspector (1008)
10 Corporals
(1) Inter Speed Radio Opr (4740)
(1) Armd Utility Veh Opr (3795)
(2) Clerk Typists (4405)
(2) Stock Record Clks (3835)
(2) Ammo Clks (3504)
(2) Pers Adm Clks (4816)
2 Privates First Class
(1) Record Clk (4055)
(1) Clerk Typist (4405)

NOTES:

(a) Personnel of this detachment are assigned to Rear Company for administration and supply.

(b) Driver as additional duty.

(c) Included in reduced strength column.

(d) Also Battalion Executive Officer and S-3.

(e) Also commands Headquarters Detachment.

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FORWARD ORDNANCE MAINTENANCE COMPANY INFANTRY DIVISION 5 - 1 - 147

AGGREGATE 153

7 HEADQUARTERS SECTION 2 - 0 - 15

1 Captain
  (1) Company Commander (4801)
1 Lieutenant
  (1) Executive (4805)
1 Master Sergeant
  (1) First Sergeant (1585)
2 Sergeants First Class
  (1) Supply Sgt (1821)
  (1) Mess Steward (1824)
2 Sergeants
  (2) Cooks (3060)
5 Corporals
  (1) Company Clk (3290)
  (2) Cooks (3060)
  (1) Inter Speed Radio Opr (4740)
  (1) Field Wireman (4641)
2 Privates First Class
  (1) Cook Helper (3060)
  (1) Inter Speed Radio Opr (4740)
3 Privates
  (3) Filler Personnel (3966)

50 SHOP OFFICE 0 - 1 - 3

1 Warrant Officer
  (1) Inspector (4805)
1 Master Sergeant
  (1) Repair Cont Supv (1966)
2 Corporals
  (2) Shop Clerks (4055)

146 MAINTENANCE PLATOON 1 - 0 - 43

61 HEADQUARTERS SECTION 1 - 0 - 3

1 Lieutenant
  (1) Platoon Leader (4805)
1 Master Sergeant
  (1) Repair Cont Supv (1966)
2 Corporals
  (1) Shop Clerk (4055)
  (1) Inter Speed Radio Opr (4740)

101 SUPPLY SECTION 0 - 0 - 4

1 Sergeant
  (1) Supply Clerk (3815)
3 Corporals
  (3) Supply Specl (3815)

133 VEHICLE REPAIR SECTION 0 - 0 - 26

1 Sergeant First Class
  (1) Section Chief (1966)
6 Sergeants
  (1) Sr Trk Veh Rprm (3966)
  (2) Sr Whl Veh Rprm (3965)
  (2) Recovery Clerk (3966)
  (1) Welder (3256)
12 Corporals
  (3) Trk Veh Rprm (3966)
  (5) Whl Veh Rprm (3965)
  (2) Recovery Veh Opr (3966)
  (1) Wrecker Opr (3966)
  (1) Welder (3256)
7 Privates First Class
  (2) Trk Veh Rpr Hlprs (3966)
  (2) Whl Veh Rpr Hlprs (3965)
  (2) Recovery Crewmen (3966)
  (1) Wrecker Crewman (3966)

171 ARMAMENT & FC REPAIR SEC 0 - 0 - 10

1 Sergeant First Class
  (1) Section Chief (1973)
3 Sergeants
  (1) Sr Arty Rprm (3913)
  (1) Sr Small Arms Rprm (3903)
  (1) Sr Instrument Rprm (3922)
4 Corporals
  (1) Turret Arty Rprm (3907)
  (1) Arty Rprm (3913)
  (1) Small Arms Rprm (3903)
  (1) Instrument Rprm (3922)
2 Privates First Class
  (1) Arty Repairman Hlpr (3913)
  (1) Small Arms Rprm Hlpr (3903)

indicate existing T/O&E ORD Co.
indicate proposed ORD Bn

PROPOSED ORD Bn
INFANTRY DIVISION

			TOTAL EM	E7	E6	E5	E4	E3	E2								
													INCREASE IN ADM OVERHEAD				
1	AA ARTY SUP	1008	2	1		1						LINE No	3	1	PERS SPEC		
2	MM VEH	1014	1		1							"	8	1	1ST SGT		
3	PERSONNEL	1290	1		1							"	13	1	MESS STEW.		
4	METAL WORKER	1302	2		2							"	25	1	PERS SPEC		
5	ADM SPEC	1502	1	1		1						"	42	6	SHOP CLERKS		
6	AMMO SUP	1505	2	1	1							"	50	1	PERS SPEC		
7	COMM CHIEF	1542	1		1	1								11			
8	1ST SGT	1585	2	1													
9	RADIO OP	1740	1			1							DECREASE IN ADM OVERHEAD				
~~10~~	~~INFANTRY CLK~~	~~1812~~										LINE No	22	3	CLERKS		
11	ORD SUP	1815	4	1	3							"	43	4	CT TRK DRIVERS		
12	UNIT SUP	1812	2		2		1					"	44	1	CLERK TYPIST		
13	MESS STEW	1824	2		2							"	47	1	F/D WHEEMAN		
14	FIRE CONT REP	1899	1		1							"	48	4	SIG MESS CLKS.		
15	EOD SUPR	1924	1		1									13			
16	WH VEH SUP	1965	2	1		2											
17	TRACK VEH SUP	1966	9	8	6 3	3	5										
18	ARTY S/A SUP	1973	4	5	2	4	3										
19	BLACKSMITH	3024	1	2				1	2								
20	BODY REP	3040	3	6		1		1	2	1	4						
21	CARPENTER	3050		2					2								
22	COOK	3060	10	13		4	16	4	4	2	2	1					
23	MACHINIST	3114	3	8		2	6	1	2								
24	WELDER	3256	9	8		4	2	4	4	1	2						
25	PERSONNEL SPEC	3290	2	1				2	1								
26	WATCH REP	3381		4					2	2							
27	AMMO RECORD	3504	3	3		1	1	2	2								
28	TRACTOR CREW	3796	1					1									
29	ORD SUP	3815	26	12		7	4	19	8								
30				2													
31	SUP REC SP	3835	5	13		1	1	4	3	7	2						
32	S/A REPR	3903	12	17		4	4	4	6	4	7						
33	TURRET REPR	3907	4	4				4	2	2							
34	ELEC & FUEL REP	3912	5	16		1	2	4	14								
35	ARTY RPR	3913	14	15		4	5	5	6	5	4						
36	~~FUEL FIRE CONT~~	~~3916~~															
37	AA ARTY REPR.	3918	4	6		2	2	2	2	2							
38	INST RPR	3922	9	14		4	4	5	6	4							
39	EOD SPEC	3924	1	1		1	1										
40	WH VEH RPR	3965	43	35		10	7	23	16	10	6	6					
41	TRACK VEH RPR	3966	74	53		13	7	29	22	27	7	5 17					
42	CLERK, GEN	4055	8	2				6	1	2	1						
43	L. TRK DR.	4345	3	7					1	3	6						
44	CLK. TYPIST	4405	5	6				3	5	2	1						
45	AMMO SUP	4505		2							2						

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		TOTAL EM	E7	E6	E5	E4	E3	E2								
46	CANVAS - LTR #609	2 / 2				1	1 / 2									
47	FLD WIREMAN 4641	2 / 3				2 / 1		2								
48	SIG MSSG CLK 4667	4				1		2 / 1								
49	RAD OPR 4740	8 / 4				6 / 4	2									
50	PER. ADM 4816	2 / 1				2 / 1										
51	SPEC CARGO VEH DR. 4532	2 / 2				2 / 2										
53	SUP HANDLER 5832	4 / 6					2 / 3	2 / 3								
		278	11 / 9	20 / 19	61 / 55	137 / 123	62 / 66	7 / 32	278							

		LT COL	MAJ	CAPT	LT	WO										
2110	1 / 0				1											
4512	2 / 2	1 / 1	1 / 1													
4514	1 / 1			1 / 1												
4530	3 / 3		1 / 1	1 / 1	1 / 1	1										
4800	2 / 2		1 / 1	1 / 1												
4801	2 / 1			2 / 1												
4813	0 / 2				2											
2600	1 / 1					1 / 1										
4000	1 / 1					1										
4514	1 / 1					1 / 1										
4805	7 / 2				5	2 / 2										
4808	2 / 2				1	1 / 2										
4813	1 / 1					1 / 1										
	22 / 19	1 / 1	3 / 3	4 / 4	8 / 3	7 / 8	22 / 19									

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APPENDIX III

SR_____

SPECIAL REGULATIONS) DEPARTMENT OF THE ARMY

NO.) Washington 25, D. C., _____

MAINTENANCE OF SUPPLIES AND EQUIPMENT

	Paragraph
Purpose	1
Responsibility	2
Scope	3
Oversea Command	4
General	5
Spot Check Instructor-Inspector Service	6
Technical Instructor-Inspector Service	7
Contact Party Instructor-Inspector Service	8
Command Inspections	9
Personnel	10
Condemned Ordnance Material	11
Forms	12
Reports	13
Follow-Up Instructor-Inspector	14

1. PURPOSE: These regulations establish an ordnance field maintenance and supply instructor-inspector service for the control over and technical supervision of organizational maintenance and supply of ordnance material as required by AR 750-5.

2. RESPONSIBILITY: All commanders in all echelons of command having responsibility for ordnance field maintenance and supply service will be responsible for the establishment and operation of an adequate instructor-inspector service in direct support of using units.

3. SCOPE: These regulations apply to all equipment and supplies in the hands of troops for which the Ordnance Corps has been assigned technical supervision in the 700-51-100 series of special regulations and SR 750-50-10.

4. OVERSEA COMMAND: The provision of these regulations are applicable to oversea commands.

5. GENERAL:

a. An instructor-inspector service is necessary to the establishment of effective supervision of organizational maintenance and supply within all echelons of command. This service establishes a cooperative and efficient customer-dealer relationship between using units and direct support ordnance units. Instructor-inspectors insure the correct interpretation of procedures, insure uniformity in their application, and obtain information which is used to improve organizational maintenance and supply and field maintenance and supply service to the using units. It assures supply economy and conservation of ordnance equipment and supplies.

b. Contact parties and working parties from direct support ordnance units and liaison and staff visits of higher headquarters to using units are all part of an effective instructor-inspector service.

c. The principles and procedures for grading and rating organizations will be similar to those contained in FM 9-10.

d. Specific information regarding the instructor-inspector service for the maintenance of various types of ordnance material is contained in TM 9-1100 and TM 9-2810.

e. Detailed technical information pertaining to the organizational maintenance to be given a particular ordnance item other than aircraft is contained in technical manuals of the 9-100 series. Similar information pertaining to army aircraft is contained in the Department of the Air Force "01" series Technical Orders and Technical Order 00-20A-1.

f. Until such time as specific instructions are available, instructor-inspectors will check organizational supply procedures and facilities for adequate stock records, proper stock level, care and preservation of parts, catalogs available, requisitioning procedure, and critical parts required for equipment presently out of action.

6. SPOT CHECK INSTRUCTOR-INSPECTOR SERVICE.

a. The frequency of spot check instruction-inspection service and the percentage of ordnance equipment to be inspected will be determined by the commander having field maintenance and supply responsibility. As a minimum, all organizational maintenance and supply

facilities, and ten percent (10%) of each type of equipment in each organization will be inspected at least twice annually.

b. When instructor-inspector service discloses that due to weather conditions, tactical situation, or under other adverse conditions, organization commanders are unable to perform the required preventive maintenance service, the commander having responsibility for field maintenance and supply will provide assistance necessary to the using unit to assure that preventive maintenance is accomplished.

7. TECHNICAL INSTRUCTOR-INSPECTOR SERVICE.

a. In the Continental United States direct support ordnance units or installations will perform a complete technical inspection of all equipment in the hands of troops and assist the using organization to effect needed repairs before and after extensive field exercises. As a minimum, equipment will be given a complete technical inspection at least once annually to ascertain serviceability and maintenance requirements. (Refer to TM 9-1100 and TM 9-2810.)

b. In a combat zone, direct support ordnance units will perform a complete technical inspection of equipment and assist the using organization to effect needed repairs before and after operation or as required.

8. CONTACT PARTY INSTRUCTOR-INSPECTOR SERVICE: The use of contact parties and/or working parties are an important part of an effective instructor-inspector service and are fully described in paragraph 108 of FM 9-10.

9. COMMAND INSPECTIONS: Commanders will not construe the

instructor-inspector service provided in this regulation to be a substitute for command inspections. Command inspections are made by commanders in all echelons of command to personally evaluate condition and completeness of equipment, state of training, and effectiveness of organizational maintenance and supply. Instructor-inspector service rendered by ordnance personnel cannot be used to execute this command responsibility.

10. PERSONNEL.

a. All instructor-inspector service will be under the supervision of a qualified commissioned officer. Instructor-inspectors will be thoroughly familiar with prescribed preventive maintenance and supply procedures and practices governing organizational maintenance and supply of ordnance material. Nothing is intended in this publication that precludes the Army Commanders' right to participate in the instructor-inspector services. Instructor-inspectors will be maintenance and supply personnel assigned or attached to the unit or installation providing field maintenance and supply support to the using organization.

c. All instructor-inspectors must be fully impressed with the importance of a sound customer-dealer relationship in order to develop a high degree of cooperation between the using organization and supporting ordnance units. The importance of organizational maintenance and supply economy must be instilled in all instructor-inspectors.

11. CONDEMNED ORDNANCE MATERIAL. The officer in charge of the

instructor-inspector team is required to condemn and direct repair or evacuation and replacement of ordnance equipment that is unsafe to use or operate or thru continued use would cause additional damage.

12. FORMS:

a. The forms prescribed in TM 9-1100 will be used forthe inspection of small arms, artillery, and fire control material; local reproduction is authorized.

b. The forms prescribed in TM 9-2810 will be used forthe inspection of motor vehicles.

c. Applicable intermediate inspection work sheets will be used for inspection of army aircraft.

d. AGO Form ____, Ordnance Organizational Supply Inspection (Figure 1) will be used to inspect supply procedures.

e. Other forms in conflict with those referenced above will not be used.

13. REPORTS:

a. All Spot Check and/or Technical Inspection forms as prescribed in paragraph 12 above will be completed in duplicate by the instructor-inspector. One copy will be furnished the commander of the using organization. The original will be furnished the commander of the ordnance field maintenance unit or facility providing direct support to the using unit. These forms will be retained by each of the above until after the next similar inspection.

b. WD AGO Form No. ___, Recapitulation, Instructor-Inspector Service (Figure 2) will be completed by the instructor-inspector in the

required number of copies. The original and two (2) copies will be furnished to the unit commander inspected. He will state by indorsement thereon what remedial action has been taken to correct any irregularity or deficiency reported therein and will forward the original and one (1) copy through command channels to the headquarters responsible for ordnance field maintenance and supply. One copy will be furnished to the commander of the ordnance unit or facility providing direct field maintenance and supply support to the using unit. All reports will be retained until after the next similar inspection.

c. The reports of ordnance instructor-inspector service will be analyzed by all commanders of all echelons of command to determine the corrective action to be taken or the additional training necessary for organizational maintenance and supply personnel in order to eliminate recurrence of the deficiencies found.

14. FOLLOW-UP INSTRUCTOR-INSPECTOR: In all cases where any phase of organizational maintenance or supply procedure is found to be unsatisfactory, follow-up instructor-inspector will be made to insure that ordnance equipment is receiving the prescribed maintenance services.

ORDNANCE

ORGANIZATIONAL SUPPLY

INSPECTION

1. UNIT: 2. DATE:

3. LOCATION:

4. INSTRUCTOR-INSPECTOR:

5. Senior Organization Member Present:

6. Stock Records:

		From Stock Record			
a.	Item	Authorized	On Hand	On Req.	Actually In Stock

b. Number of items of a above for which location was inaccurate: ____.

7. Publications:

	Authorized	On Hand
ORD 7 SNL _____		
ORD 7 SNL _____		
ORD 7 SNL _____		

8. Adequacy of parts storage:

9. Requisitioning procedure deficiencies:

10. Parts required for equipment presently out of action:

Stock Number	Nomenclature	Quantity Required	Date Requisitioned

11. Training Required:

12. Assistance Rendered:

_____

INSTRUCTOR-INSPECTOR

Fig. 1
WD AGO FORM _____

RECAPITULATION

INSTRUCTOR-INSPECTOR SERVICE
FOR ORGANIZATIONAL MAINTENANCE AND
SUPPLY OF ORDNANCE EQUIPMENT

UNIT: DATE:

Location: Commanding Officer:

Senior Officer of Unit Present:

I AUTOMOTIVE

1. Condition

a. Summary

	Authorized	On Hand	Inspected	Av. Def. Per Veh.	Rating
(1) Wheel Veh					
(2) Track Veh					
(3) Trailers					

b. Most Common Deficiencies Found: No. Vehicles on Which Found:

2. Maintenance Training:

a. Summary

	No. Tested or interviewed	Rating
(1) Motor Officer		
(2) Motor Sergeant		
(3) Mechanics		
(4) Drivers		

b. Training Required:

3. Administration and Shop Operation:

a. Summary

	Rating
(1) Maintenance Administration	
(2) Records	
(3) Shop Operation	

b. Deficiencies Found:

4. Adequacy of Tools:

5. Status of Modification Work Orders:

6. Conduct of Motor Stables:

7. Assistance Rendered Organization:

FIG. 2

II ARMAMENT

1. Condition

a. Summary

	Authorized	On Hand	Inspected	Av. Def. Per Item	Rating
(1) Artillery					
(2) Small Arms					
(3) Instruments					

b. Most Common Deficiencies Found: No Items on Which Found:

(1) Artillery
(2) Small Arms
(3) Instruments

2. Maintenance Training:

a. Summary

	No. Tested or interviewed	Rating
(1) Gun Section		
(2) Using Individuals		
(3) Armorer		
(4) Artillery Mechanic		

b. Training Required:

3. Administration and Shop Operations:

a. Summary

(1) Administration
(2) Records
(3) Shop Operation

b. Deficiencies Found:

4. Adequacy of Tools:

5. Status of Modification Work Orders:

6. Preventative Maintenance:

a. Artillery

b. Small Arms

c. Instruments

7. Assistance Rendered Organization:

III ARMY AIRCRAFT

1. Condition of Aircraft:

a. Summary

	Authorized	On Hand	Inspected	Av. Def. Per Item	Rating
(1) Fixed Wing					
(2) Rotary Wing					

b. Most Common Deficiencies Found: No. Aircraft on Which Found:

(1) Fixed Wing
(2) Rotary Wing

2. Maintenance Training:

a. Summary

	No. Tested or Interviewed	Rating
(1) Supervisors		
(2) Mechanics		
(3) Pilots		

b. Training required:

3. Administration and Shop Operation:

a. Summary

	Rating
(1) Maintenance Administration	
(2) Records	
(3) Shop Operation	

b. Deficiencies Found:

4. Adequacy of Tools:

5. Status of Modification Work Orders:

6. Assistance Rendered Organization:

IV SUPPLY

1. Stock Records:

	No. Items Checked	Rating
a. Group SNL		
b. Group SNL		
c. Group SNL		
d. Group SNL		

2. Storage and Location:

3. Status of Publications:

4. Training:

	No. Tested or interviewed	Rating
a. Summary		
(1) Supervisors		
(2) Clerks		

b. Training Required:

5. Requisitioning Procedure:

6. Parts Required for Immediate Consumption Not on Hand:

7. Assistance Rendered Organization:

V AMMUNITION

1. Records:

2. Storage and Location:

3. Training:

	No. Tested or interviewed	Rating
a. Summary:		
(1) Supervisors		
(2) Ammunition Personnel		

4. Requisitioning Procedure:

5. Assistance Rendered Organization:

VI GENERAL REMARKS AND RECOMMENDATIONS

INSTRUCTOR-INSPECTOR

DA AGO FORM NO._____