

REPORT BY THE U.S.

General Accounting Office

The Key To Improving Maintenance Of Army Equipment: Commanders Must Motivate Their Personnel

The Army's highest priority is to support and operationally ready force that can perform its combat missions effectively. However, Army units are having difficulty in maintaining their equipment because deficiencies are undetected or unreported. Personnel lack motivation to care properly for their equipment.

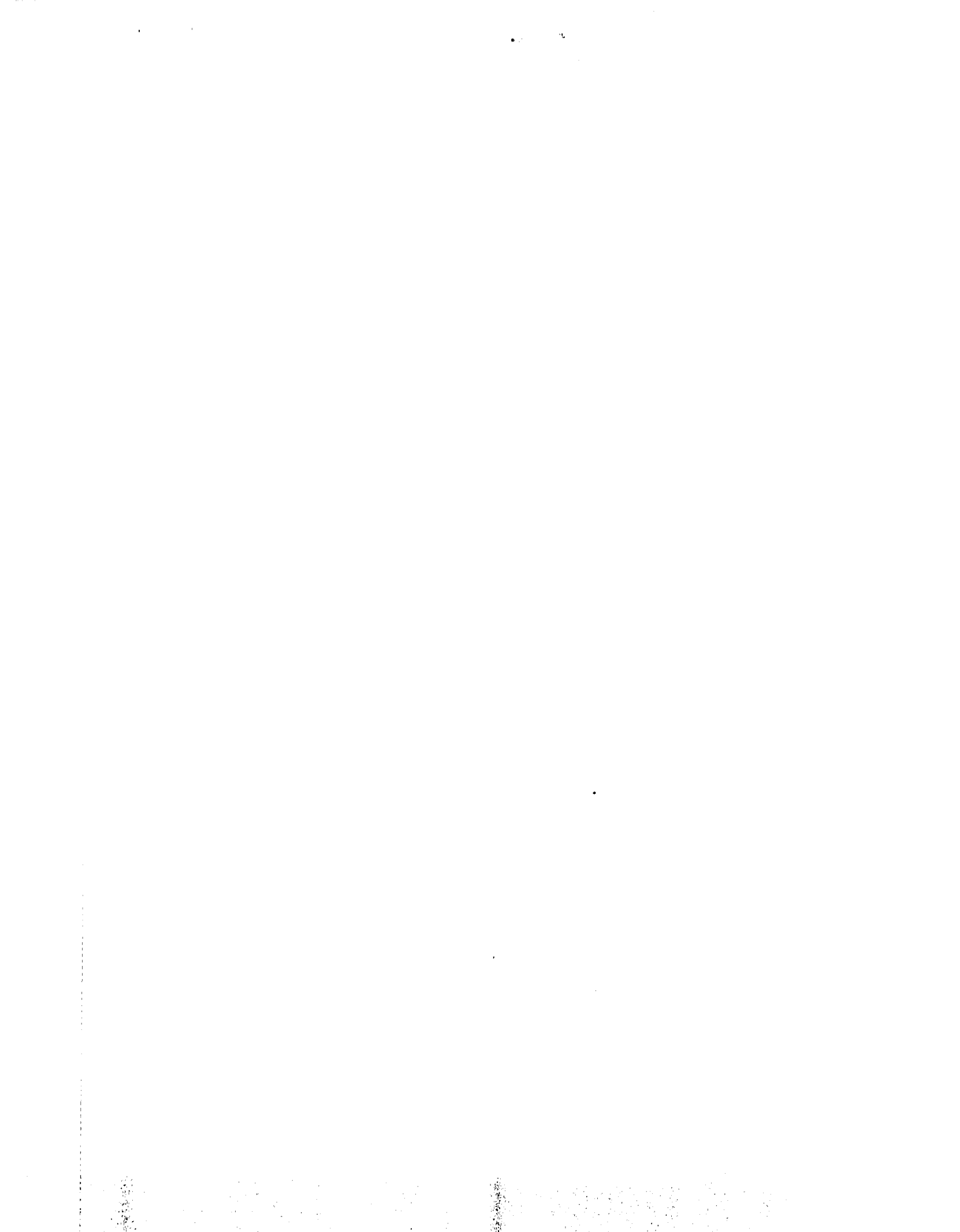
Managers at all levels need to stress the importance of proper use and maintenance of equipment and provide incentives for effective work if the unit missions are to be carried out successfully during emergencies.



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UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

LOGISTICS AND COMMUNICATIONS
DIVISION

B-146896

The Honorable Clifford L. Alexander, Jr.
The Secretary of the Army

Dear Mr. Secretary:

This report discusses the Department of the Army's unit-level maintenance program and suggests ways of improving the program's effectiveness. We discussed the report with the Department of the Army personnel and have considered their comments in the preparation of this report.

This report contains recommendations to you. As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the House Committee on Government Operations and the Senate Committee on Governmental Affairs not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the Secretary of Defense; the Director, Office of Management and Budget; and the Chairmen, House Committee on Government Operations, Senate Committee on Governmental Affairs, and the House and Senate Committees on Appropriations and Armed Services.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "R. W. Gutmann".

R. W. Gutmann
Director



GENERAL ACCOUNTING OFFICE
REPORT TO THE SECRETARY
OF THE ARMY

THE KEY TO IMPROVING
MAINTENANCE OF ARMY
EQUIPMENT: COMMANDERS
MUST MOTIVATE THEIR
PERSONNEL

D I G E S T

The Army has not provided for sufficient quality controls to make sure that unit personnel do maintenance work properly and report the condition of their equipment accurately. Until improvements are made, units will continue to have difficulty in properly maintaining equipment necessary for rapid transition to wartime operations.

The key to reenforcing the importance of unit maintenance is the unit commander and his emphasis on maintenance. To improve the accuracy of information needed to manage operations properly, an interest in all aspects of maintenance and logistical support must be shown.

The least complex maintenance tasks are done at the unit level by equipment operators and mechanics. These tasks include inspecting, lubricating, and cleaning equipment; making minor repairs; and reporting on equipment deficiencies. Although unit commanders are responsible for managing these operations, command emphasis on maintaining equipment has been lacking. As a result:

- Equipment deficiencies have not been properly recognized, corrected, and reported. (See pp. 10 to 12.)
- Maintenance has not been done properly. (See pp. 15 to 17.)
- Planned on-the-job training programs have not been developed. (See pp. 13 to 15.)
- Repair parts have not always been available when needed and sometimes have not been correctly ordered. (See pp. 21 to 24.)

In assessing the effectiveness of maintenance at five units, GAO, with the help of highly qualified Army inspectors, found almost 800 deficiencies needing immediate correction. Most of these defects were on M60A1 tanks. Half of the defects on several pieces of equipment had not been recognized and reported. (See pp. 18 to 21.)

But even when equipment deficiencies were recognized, they were not always reported. Because of this, daily equipment condition reports provided unit commanders with invalid information that was of little use in effectively planning maintenance workloads and setting unit priorities. (See pp. 19 to 20.)

Unit commanders also do not receive enough information from support maintenance levels. Although they are required to provide information on how effectively units care for their equipment, they generally inform the unit mechanic--not the commanders. This information would be useful to commanders in assessing and correcting problems. (See p. 12.)

With increased motivation for maintaining equipment, many of the current problems could be corrected and conditions could be improved. The Army needs an education program that concentrates on developing good maintenance practices as part of unit routine and stresses the importance of reporting actual equipment conditions. Unannounced independent inspections of equipment conditions could help measure the program's effectiveness. (See pp. 28 and 30.)

Once unit personnel are motivated to do a good job, equipment conditions could be further improved by reassigning simple maintenance tasks, such as repairing air cleaners and replacing water pumps, to the unit level. Unit personnel identified over 100 tasks currently assigned to support maintenance levels that they believed were within their capabilities. (See pp. 24 to 27.)

The Secretary of the Army should:

--Institute a maintenance education program that stresses command emphasis and incentives and motivates people to do maintenance and supply duties properly, including the reporting of

actual equipment conditions. Unannounced independent inspections of equipment conditions should be used to help measure program effectiveness.

- Make sure that unit commanders and supervisors are sufficiently involved in maintenance operations so that their knowledge is transferred to equipment operators and unit mechanics.
- Require units to establish approved, planned on-the-job training programs designed to develop the necessary maintenance skills, knowledge, and abilities.
- Evaluate the effectiveness of unit training programs during periodic unit inspections.
- Make sure that support maintenance levels routinely provide unit commanders with available information on maintenance effectiveness.
- Periodically reevaluate maintenance task assignments using feedback information from various maintenance levels, and as appropriate, reassign the tasks to the lowest level possible. (See pp. 28 to 30 .)

This report has been discussed with Army officials at the various levels. These officials generally agreed with the problems identified in maintaining unit equipment. They pointed out that action has been started to provide better maintenance discipline. These actions are to provide sustained improvements to Army unit maintenance efforts by

- stimulating command emphasis,
- strengthening the equipment inspection and maintenance training programs,
- improving the management of maintenance personnel,
- upgrading maintenance management procedures, and
- improving repair part support.

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ABBREVIATION

GAO General Accounting Office



CHAPTER 1

INTRODUCTION

The Army's highest priority peacetime function is to support an operationally ready force that can perform necessary combat missions. Operational readiness is highly dependent on the quality and timeliness of maintenance, which includes inspecting, servicing, repairing, overhauling, rebuilding, modifying, and calibrating equipment. The scope of maintenance ranges from limited preventive maintenance services done by equipment operators to complex operations done by highly skilled technicians.

SUPPORTING ARMY EQUIPMENT

Army maintenance is to be done at the lowest level possible which is compatible with combat situations and the availability of skills, tools, test equipment, time, and repair parts. The maintenance levels, in descending order of complexity, have been categorized as:

- The depot level, which extends the life of equipment through restorative maintenance.
- The general support level, which repairs components primarily for support of the supply system and does heavy body repairs to major equipment.
- The direct support level, which involves diagnosis and isolation of equipment malfunctions, and replaces or repairs defective components.
- The organizational level, which includes minor repairs and preventive maintenance done by unit mechanics and equipment operators.

The Army estimates that about 25 percent of its total annual budget is spent on maintenance. Based on this estimate, over \$7 billion was spent on maintenance in fiscal year 1978. Approximately \$0.9 billion was spent for depot-level maintenance, and about \$6.1 billion was spent for all other maintenance--such as facilities and installation maintenance as well as below-depot-level maintenance.

MAINTENANCE AT THE UNIT LEVEL

The Army estimates that more than 200,000 unit mechanics and equipment operators, involving 245 job specialities, have specific unit-level maintenance responsibilities. Unit main-

tenance encompasses inspecting, lubricating, cleaning, and preserving equipment; making minor adjustments; and replacing easily accessible parts. Through frequent preventive maintenance checks, equipment operators are expected to detect early signs of equipment failures and to ensure that the problems are corrected before more expensive and time-consuming repairs are needed. These checks, which are to be made each time equipment is operated, include:

- Before-operation services: determine whether (1) the equipment is ready for operation and (2) the conditions affecting the equipment's readiness have changed since the last after-operation check.
- During-operating services: detect unsatisfactory equipment performance. Operators are to be alert for any unusual odors, abnormal instrument readings, and irregularities or malfunction of any part of the equipment.
- After-operation services: correct, insofar as possible, any operating deficiencies so that the equipment is ready for future operation on a moment's notice.

Unit mechanics, assisted by equipment operators, make preventive maintenance checks on a quarterly, semiannual, and/or annual basis. These checks are to provide systematic care, inspection, and servicing of equipment to (1) prevent breakdown, (2) detect faults and failures, and (3) maintain needed equipment conditions. In addition, unit mechanics make certain repairs, adjustments, and replacements when the need is reported by equipment operators.

Under the current maintenance information system, equipment operators are to record only those deficiencies that they cannot correct or that need repair part replacement. Unit mechanics are to record all deficiencies they note, whether the deficiencies can be corrected or must be referred to a support maintenance level. When, because of deficiencies, the equipment should not be used for daily operations, the defects should be promptly reported to the unit commander so that he is constantly aware of the equipment's condition.

SCOPE OF REVIEW

In reviewing the effectiveness of unit maintenance operations, we concentrated on the following pieces of equipment that the Army considers important to unit readiness. (See photographs on pages 4 to 8.)

- The M60A1 combat full tracked tank.
- The M109 and M109A1 medium self-propelled howitzer.
- The M167 towed antiaircraft artillery gun (Vulcan gun) and its prime mover, the M561 1-1/4-ton cargo truck (Gama Goat).

The work was done primarily between February and June 1978 at five Army units. These units were assigned to the 82nd Airborne Division, Fort Bragg, North Carolina; the 4th Infantry Division (Mechanized), Fort Carson, Colorado; and the 2nd Armor Division, Fort Hood, Texas. In addition, we obtained information from the

- Department of the Army, Washington, D.C.;
- U.S. Army Forces Command, Fort McPherson, Georgia;
- U.S. Army Training and Doctrine Command, Fort Monroe, Virginia;
- U.S. Army Tank-Automotive Materiel Readiness Command, Warren, Michigan; and
- U.S. Army Armament Materiel Readiness Command, Rock Island, Illinois.

We reviewed Department of Defense and Army instructions, regulations, and directives; Army technical and field manuals; Army inspection reports; related management documents; and unit practices and procedures for managing maintenance resources.

This report has been discussed with Army officials at the various levels. These officials generally agreed with the problems identified in maintaining unit equipment. They pointed out that action has been started to provide better maintenance discipline. These actions are to provide sustained improvements to Army unit maintenance efforts by

- stimulating command emphasis,
- strengthening the equipment inspection and maintenance training programs,
- improving the management of maintenance personnel,
- upgrading maintenance management procedures, and
- improving repair part support.



M60A1 -- COMBAT FULL TRACK TANK

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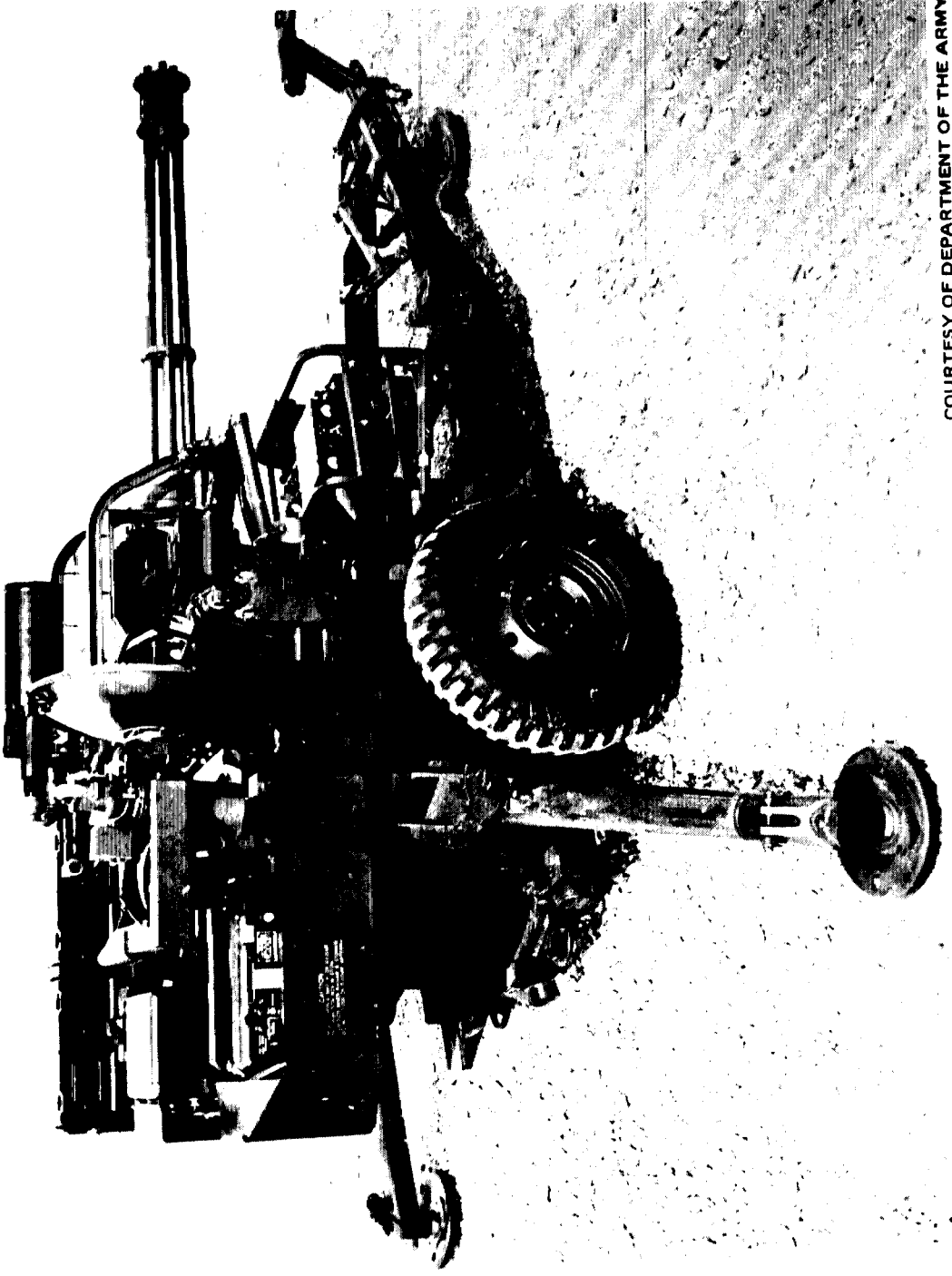
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M109 -- MEDIUM SELF-PROPELLED HOWITZER



COURTESY OF DEPARTMENT OF THE ARMY

M109A1 -- MEDIUM SELF-PROPELLED HOWITZER



COURTESY OF DEPARTMENT OF THE ARMY

M167--TOWED ANTI-AIRCRAFT ARTILLERY GUN



COURTESY OF DEPARTMENT OF THE ARMY

M561--1-1/4 - TON CARGO TRUCK (GAMA GOAT)

CHAPTER 2

THE ELEMENTS OF EFFECTIVE UNIT MAINTENANCE

In December 1977, the Army's "Direction for Army Logistics" stated that, to be logistically ready, units must be prepared for rapid transition to wartime operations and fully capable of performing combat missions with onhand equipment that is well maintained and supportable. The importance of unit-level maintenance to overall readiness therefore cannot be overestimated.

The Army measures the effectiveness of maintenance in terms of the percentage of equipment that is reported to be fully operational and available for use. In units' attempts to keep this percentage high, many factors come into play. The units must, for example, have the necessary facilities, test equipment, and tools to inspect and repair their equipment. Unit personnel must also have the time to do these tasks. But most importantly, effective unit maintenance depends on:

- Command emphasis and incentives to provide the necessary motivation.
- Accurate information on the condition of equipment.
- Adequately trained equipment operators and mechanics to carry out maintenance work.
- Quality control to ensure that maintenance is done properly.
- Readily available repair parts.

Some of our past reports, as well as Army reports, have pointed out deficiencies in these elements and the resulting problems in sustaining equipment readiness. The Army is attempting to correct these problems by improving logistic standards and equipment distribution, developing more realistic readiness reporting standards, and correcting logistic imbalances. Other Army actions specifically intended to improve unit maintenance capabilities include

- developing a program for training and assigning equipment-oriented mechanics who will be better able to diagnose malfunctions, train subordinates, and influence the quality of unit maintenance work;
- developing simplified test equipment;

- developing improved technical manuals; and
- reevaluating the maintenance tasks required of unit personnel.

Much more emphasis is needed, however, to ensure that unit maintenance work is properly identified, reported, and controlled.

COMMAND EMPHASIS

The single most important ingredient in effective unit maintenance is, in our opinion, command emphasis. Unit commanders must provide equipment operators and their supervisors with the motivation to consistently support needed equipment conditions.

An Army commanders' guide states that the most important incentive to an effective unit maintenance program is the commander's personal demonstration of maintenance consciousness. A display of knowledge and enthusiasm concerning equipment and its use, personal inspection, and interest in maintenance and equipment conditions, have a far-reaching effect, according to the guide. Although commanders' inspections are not necessarily technical, they are to be in sufficient detail to determine the adequacy of maintenance and related supply management procedures, and the need for training. To help commanders motivate subordinates, the guide suggests selling preventive maintenance with

- press releases that praise individual and unit maintenance accomplishments,
- a system of competition that recognizes outstanding performance or ranks performance, and/or
- awards, such as pennants, plaques, scrolls, and extra time off.

Other ways of providing incentives are by using (1) efficiency ratings to reflect attitudes toward maintenance and the ability to instill maintenance consciousness in subordinates and (2) penalties for failing to attain required standards or for damaging equipment through negligence or willful action.

Although Army policies emphasize the importance of providing motivation and incentives, our assessments, as well as the Army's, indicate such motivation has not been sufficient. An April 1978 internal audit report at one of the installations visited during this review stated that 45 of 47 vehicles inspected had deficiencies that should

have been corrected or reported. The report said unit commanders knew equipment operators were not making the required inspections; however, they did not know how to get the operators to do so. The report concluded "the basic problem appears to be one of leadership on the part of personnel in command." The lack of command emphasis has also contributed to unit supply problems, according to an October 6, 1977, Army Inspector General report. The report stated that "most commanders, as well as their staff officers, did not understand supply management problems and had not devoted sufficient effort to correcting faulty management practices." In addition, this report noted that "the attitudes of commanders permeated the organization and frequently resulted in the lack of involvement by middle managers."

During this review, we were told that some unit commanders and supervisors know equipment operators are not receiving the emphasis necessary for ensuring that required maintenance is properly done. In addition, some of these officials told us that other needed unit activities, such as physical training, guard duty, and parades, sometimes take priority over maintenance. And as indicated by our inspection results as discussed on pages 18 to 21 equipment deficiencies are often not recognized and not reported.

Rather than providing an incentive for good maintenance practices, the Army's maintenance system provides a disincentive. Operators are expected to correct those equipment deficiencies within their capabilities. Therefore, as they recognize and correct deficiencies, they increase their workload. Unless unit personnel have the incentive to do a good job, they may decide not to "recognize" certain equipment defects.

At one unit we visited, the emphasis necessary for ensuring that required maintenance is properly done was clearly provided and evident in the unit's equipment. We found that the lead maintenance supervisor worked along-side unit personnel and used his experience to supplement the abilities of lesser skilled people in not only recognizing and reporting equipment deficiencies, but also getting the necessary maintenance work done. It appears that this type of supervision provides the incentive, leadership, and control necessary to inspire unit personnel, even when personnel shortages existed and extra work hours were necessary. Further,

during the inspection of this unit's equipment only one important equipment deficiency 1/ was noted that had not been previously recognized and reported.

ACCURATE INFORMATION

To properly carry out maintenance responsibilities, management needs certain information for assessing workload requirements, assembling necessary resources, setting workload priorities, and reporting equipment conditions. This information must represent actual conditions if decisions are to be appropriately made.

Inaccurate reporting of the condition of Army equipment has been a problem for some time. A 1976 U.S. Army Audit Agency report disclosed that:

- Unit maintenance programs were not adequate to ensure that maintenance personnel identified and corrected equipment deficiencies.
- Many items of equipment had important deficiencies not previously identified by the units.
- The condition of mission-essential equipment was not always reported accurately to higher commands on readiness reports.

In 1972 and 1977, we also reported 2/ that unit readiness reports did not always accurately reflect equipment conditions.

It appears that the situation has not changed much today. As discussed in chapter 3, inspections made by Army personnel assisting us showed that many of the inspected items had important deficiencies which had not been identified. As a result, the information unit commanders had on equipment conditions was inaccurate. Such invalid information can be of little use to commanders in managing their maintenance work or setting unit operational priorities.

1/Important equipment deficiency as used in this report means the equipment is unable to perform its primary mission immediately or possess an unacceptable reliability level.

2/"Need for Improvement in Readiness of Strategic Army Forces" (B-146896, May 8, 1972), and "Another Look at the Readiness of Strategic Army Forces" (LCD-76-457, June 9, 1977). (Classified reports.)

Unit commanders also receive inadequate information from support maintenance levels. Army regulation requires that support maintenance levels instruct unit personnel in the proper methods of performing unit maintenance and related support tasks and provide information on how effectively the units care for their equipment. However, this information is generally provided only to the unit mechanics or to their immediate supervisors and not to the unit commanders who are responsible for maintenance operations. An Assistant Division Commander for Support told us that unit commanders do not receive as much information from support maintenance activities as he would like; he said it would be helpful to know the cause of maintenance problems.

We believe the expertise of support maintenance levels should be systematically tapped. If support maintenance levels follow Army regulations and routinely advised unit commanders about equipment maintenance, the commander would be better informed and able to correct problems.

TRAINED PERSONNEL

To prepare both equipment operators and unit mechanics for carrying out their maintenance responsibilities, the Army provides some formal classroom training and expects it to be supplemented with on-the-job training. Such training is essential to understanding how to operate equipment and how to identify and correct defects.

In the past few years, the Army's formal training has been reduced. For example, the length of the basic mechanics automotive repair course has been reduced from over 13 weeks to less than 10 weeks and the class size for hands-on learning in this course has been increased from 4 to 10 members. Currently, the Army's formal training is limited to those critical tasks which (1) cannot be effectively taught elsewhere, (2) are necessary for personal safety, and (3) avoid equipment damage. However, maintenance officials and personnel at all units we visited said classroom training is not adequate. At one unit, the unit mechanics' supervisors said the mechanics' classroom training is inadequate because it teaches trainees to pass tests rather than to solve maintenance problems and does little more than familiarize them with equipment. Also, equipment operators said the course for antiaircraft gunners is inadequate to teach them how to operate the gun, do necessary maintenance, or identify maintenance problems.

Recognizing that classroom training does not make individuals proficient in all the needed skills, the Army's

"Commander's Manual" for military occupational specialties identifies the critical tasks that the soldier must be able to perform and provides information on where task training should be provided. Unit commanders are reminded that they are responsible for providing the time and resources needed by individuals to achieve and maintain proficiency in the tasks for which they are responsible.

At the units visited, however, we found no planned on-the-job training programs and no command emphasis on the importance of such programs. Instead, individuals were to acquire skill proficiencies mostly through on-the-job experiences while working with more experienced personnel or through their own initiatives during off-duty time. At one unit, even though 35 percent of the equipment operators (59 of 163) recently failed to pass a test on their ability to do required maintenance tasks, the unit's training officer told us no special time is being scheduled to train these personnel.

Unit and division officials said units do not have enough time or qualified supervisors to provide formal on-the-job training. Supervisors at one unit said other duties take precedence over on-the-job training because the Army does not evaluate unit training programs. In addition, a May 1978 Army study 1/ said the effort expended on on-the-job training depends on the unit commanders. On August 25, 1978, the Commanding General United States Forces Command told his commanders they "... must think of maintenance as training ...". He said, "To insure a successful program, the junior officers and noncommissioned officers must become involved with the impetus coming from all levels of command."

To assist in learning critical maintenance tasks, the Army has spent millions of dollars to develop material for on-the-job and individual training, such as audio/video cassettes, home study courses, and manuals. Although the Army does not keep records on the use of these training aids, maintenance

1/ Logistics Management Institute's report on Effectiveness of Army Direct and General Support Maintenance Units--Working Paper No. 2 Training of Military Mechanics.

supervisors said unit personnel make little use of them because time is not allotted during normal duty time for self-study. Instead, it is generally left up to the individuals to use the aids on off-duty time.

In our 1972 and 1977 reports on Strategic Army Forces (see p. 12), we stated that equipment operators were having problems in recognizing equipment deficiencies because they lacked experience and knowledge and that unit training and supervision were inadequate to compensate for this shortcoming.

QUALITY CONTROL

Once commanders have provided unit personnel with the motivation and training to do a good job, they must establish some sort of quality control to be certain that maintenance is done properly. The major types of controls used are (1) supervisors who observe and direct the work of equipment operators and (2) periodic inspections to assess the quality of unit maintenance and equipment condition.

An Army field manual states that equipment operators maintenance is to be directed by supervisors totally familiar with preventive maintenance checks, troubleshooting techniques, and reporting procedures. Moreover, supervisors are to continually observe the unit's mission-critical equipment for any signs of failure or misuse. Supervisors should also be sufficiently involved to recognize when equipment operators need training and should then insure that the training is provided.

In the past, the Army provided for quality control through periodic Command Maintenance Management Inspections of equipment, facilities, and records. The results of the inspections were provided to not only unit commanders, but also higher level commands. Although the Army believed the inspections were achieving their objective of quality assurance, it suspended the inspections in December 1970.

The Army believed that these inspections had caused excessive and costly preparatory work. And because the units knew when they were to be inspected, the Army believed they had unnecessarily consumed parts in an attempt to achieve maintenance perfection without any appreciable increase in equipment readiness. Further, unrealistic work requirements and pressures were thought to have been imposed on unit personnel. Although the inspections had shortcomings, we believe they encouraged units to periodically strive for maximum equipment readiness and provided some assurance of the quality of unit maintenance to the various command levels. If these inspections had been unannounced, they could have

helped develop good maintenance practices as part of daily routine.

The Command Maintenance Management Inspections were replaced in 1970 by the Maintenance Assistance and Instruction Team Program. Through this program, units were to be provided with assistance, instruction and technical expertise so that they could better meet their maintenance responsibilities. However, the success of the program depends on the unit commanders because the assistance is provided only at their request.

The number of requests for assistance at the units we visited varied significantly. For example, at one unit, two assistance visits had been made within 4 months of our inspection. At another unit, the last visit had been almost 8 months before our inspection. Two other units had been assisted on at least 25 occasions from February 1977 through July 1978. We were, however, unable to determine any relationship to the condition of units' equipments and the number of Maintenance Assistance and Instruction Team visits. We can conclude, however, that based on our inspections (see chapter 3), whatever benefits the Teams are providing are not sufficient for sustaining acceptable equipment conditions.

Other Army programs aimed at providing quality control are described below.

--Annual General Inspections, the most formal inspections of units, cover all aspects of unit operations, including maintenance. Readiness reporting, training, supply support, and equipment inspections are some of the elements evaluated to determine how each unit does its assigned mission.

--The Command Logistic Review Team was established by each major Army command to identify logistic problems that adversely affect readiness so that timely corrective actions can be taken. When the Department of the Army provides assistance to the major commands, the team is called Command Logistic Review Team Expanded. The team reviews such areas as backlogs, Maintenance Assistance and Instruction Team usage, authorized repair parts list, and loads, and calibration of equipment. The team tries to solve logistic problems through bottom-to-top analyses.

Although the Army has attempted to provide quality control through unit supervisors and various inspection

programs, such control has not been adequate to compensate for shortcomings in unit maintenance. As will be seen in chapter 3, there is little to prevent equipment deficiencies from remaining unrecognized and unreported.

SUPPLY SUPPORT

Effective supply support, a must for any maintenance operation, means that parts are either on hand or readily available to repair faulty equipment. The effectiveness of such support depends on both the units themselves and their support activities.

It is up to the units to identify their repair part needs based on past usage, to stock the parts accordingly, and to order replacement parts as needed. And it is up to the support activities to be responsive to unit maintenance needs; that is, they must promptly fill the units' requests for parts in the correct quantities. If this system is to work effectively, the personnel involved must be trained, good records must be kept, and the system must be monitored by qualified supervisors.

Army unit supply support problems have been discussed in prior reports. In our 1972 and 1977 reports on Strategic Army Forces (see p. 12), we stated that Army units did not requisition enough repair parts; consequently, unit stocks had high zero balances. One reason for these repair part shortages was the high turnover among supply personnel and their supervisors. We reported that, by the time the personnel had learned to effectively follow supply system procedures, they had usually completed their tour of duty. Problems with both unit and support activity procedures were found during this review, as discussed in chapter 3.

CHAPTER 3

NEED TO IMPROVE MAINTENANCE OPERATIONS

Unit maintenance efforts are not effectively sustaining needed equipment conditions. Important equipment deficiencies are not always being recognized and/or reported so corrective actions can be taken and unit commanders can be informed of actual equipment conditions. Even when important deficiencies are reported, timely corrective action is not always possible because needed repair parts are not as readily available as they should be and unit personnel are not authorized to make the necessary repairs that are within their capability.

EQUIPMENT CONDITION

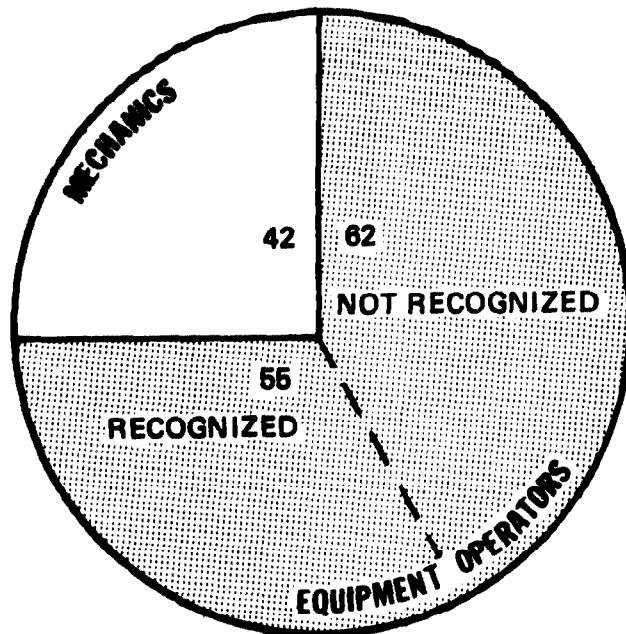
At the five units visited, we randomly selected 70 items for inspection. We asked highly qualified and experienced Army inspectors to assist us in evaluating the equipments' condition. This evaluation compared the equipments' actual condition to the technical standards used by the units' mechanics in their daily maintenance work and equipment serviceability criteria used by equipment operators in evaluating the equipments' capability to satisfactorily perform their primary mission with normal maintenance support.

The inspectors identified almost 800 deficiencies that they thought should be corrected immediately as shown in the following table.

<u>Equipment inspected</u>	<u>Number inspected</u>	<u>Number of deficiencies needing immediate attention</u>
Tanks	37	679
Howitzers	13	99
Vulcan Guns	10	1
Gama Goats	<u>10</u>	<u>11</u>
	<u>70</u>	<u>790</u>

Analyses of these deficiencies, with assistance from Army personnel, revealed that a majority of the equipment had important deficiencies. Also, we found many of these deficiencies should have been recognized by equipment operators and/or their supervisors and were not.

At two units visited, 37 of 108 M60A1 tanks were inspected. The Army inspectors found over 675 of their 800 deficiencies on these tanks. Of the 675 deficiencies, 159 were on seven tanks. Maintenance responsibility for recognizing these deficiencies are shown on the following page.



Equipment operators should have recognized 117 of these 159 deficiencies during their performance of preventive maintenance checks and services (discussed in chapter 1). Unit mechanics should have recognized the others; however, we could not determine if these deficiencies existed when the mechanic last inspected the equipment. Some of the reasons given by equipment operators and supervisors for not recognizing deficiencies were

- oversight by the crew due to lack of personnel and time, thus not all of the preventive checks and services were performed;
- the crew had not noted a problem; and
- the crew was not trained or did not have enough experience to identify the problem.

If these deficiencies had been recognized, some of them should have caused the equipment to be reported to unit commanders, on daily equipment reports, as not being available for daily operations.

Even when important deficiencies were recognized, we found they were not always reported. For example, at two units, the equipment operators had recognized deficiencies which should have been reported to their unit commanders for 23 of 37 tanks. But, deficiencies had only been reported on two tanks. Some of the important deficiencies that should have been brought to unit commanders' attention, but were not, are included in the following table.

<u>Important deficiency</u>	<u>Number a/ of tanks with unreported deficiency</u>
Air cleaner gaskets, seals, bolts, inserts, or hoses were missing or unserviceable	20
More than two roadwheels were unserviceable	14
Roadwheel arm(s) were bent or broken	6
Others, such as the driver's intercom system was not working and the main gun's firing mechanism was missing	4

a/ Including four tanks with important deficiencies that had not been recognized.

Among the reasons given for not reporting these deficiencies were (1) replacement parts were not available, (2) the maintenance officer did not believe a replacement was needed, and (3) the condition was not as bad as portrayed by the inspectors. Although disagreements did exist among unit personnel and the inspectors, corrective action was taken subsequent to our inspection on almost all of the disputed deficiencies.

Several maintenance officials and Army inspectors said that the results of our inspection represent the general condition of the selected equipment. On August 15, 1978, a Division Commander reported to his Commanding General that

"Three additional battalions were inspected utilizing the same inspectors with identical criteria. The results of these inspections have been analyzed and are as follows:

- a. The deficiencies identified are generally similar to those found in the GAO survey.

- b. The inability of personnel to recognize deficiencies is similar to that previously identified.
- c. Readiness reporting was somewhat improved."

However, an Assistant Division Commander for Support, in commenting on our inspection results, said "It is inconceivable to expect lesser qualified and experienced operators and crew members, utilizing equipment serviceability criteria, to recognize the same quantity of deficiencies." Further, he stated "This command feels that ..., the problem of detection is at the driver and 1st line supervisor level within the inspected battalion."

We agree that qualified and experienced inspectors should find more deficiencies than newly trained or untrained operators, but with adequate supervision, the number of unidentified deficiencies, in our opinion, should be considerably less than noted during our inspections. This opinion is based on the fact that at one unit where we found supervisors actively involved, the inspectors only found one important deficiency that had not been recognized and properly reported. (See p.11.)

BETTER SUPPLY SUPPORT NEEDED

Because Army units are to be mobile, Army regulation permits them to stock enough repair parts to maintain their equipment for 15 days in combat. Although such repair parts were intended to be available when and where they were needed, units often ordered them in insufficient quantities and with improper priorities. In addition, when units did order repair parts, their supply support activities sometimes had difficulty responding promptly.

Unit supply practices

The repair parts authorized to be stocked by units are based on historical usage patterns and are to be on hand or on order at all times. When a part is issued from on-hand stocks, a replacement request is to be made within 1 day.

At the units visited, the major command had set goals of having only 5 percent of the parts authorized for stock-age at a zero balance and having less than 20 percent of the unit's repair part requests be of the highest priority, that is, for parts needed on not operationally ready equipment. However, these goals were not always met. The units visited had a zero balance for 21 to 27 percent of their authorized repair parts. Also, some of these units occasionally used improper priorities in ordering needed

parts. In fact, some high-priority requests, calling for special handling by support activities, were for routine replenishment of unit stocks. Some misuse of priorities and the apparent need for more training and supervision of supply personnel are shown by the following two examples:

--At one unit more than 33 percent of the repair part requests were high priority. Of these, over 22 percent were for parts the unit was authorized to stock and some were actually for replenishment of stocks. During April 1978, the unit placed four high-priority orders for 12-volt batteries, similar to automobile batteries. Although the orders indicated the batteries were needed to fix not operationally ready equipment, they were actually needed to replenish unit stocks.

--Although less than 12 percent of another unit's repair part requests were high priority, over 20 percent of the high-priority requests were for parts that the unit was authorized to stock. In fact, several of these requests for such parts as pulleys and filter elements were for replenishment of stocks. Moreover, such items as regulators, generators, and engine pumps were not on hand or on order in sufficient quantities to meet the unit's authorized stockage levels as of April 27, 1978. Almost 3 weeks later, the unit still had not ordered these items in sufficient quantities.

The inadequate training of supply personnel, in our opinion, has contributed to these problems. At one unit, all four supply clerks were new and only two had received some supply training. At another unit, none of the supply clerks had received sufficient training to be assigned the needed military job specialty code. Instead, their job specialties were track vehicle mechanic, Chapparral crewman, tank crewman, and tank crew leader. Although these two units were authorized only one supply clerk each, both units believe more than one was needed and therefore assigned untrained personnel to supply duties. The lack of training has also been discussed in an October 1977 Army Inspector General report. The report stated that many supply problems were directly related to inadequate knowledge even though Army personnel, from the company commander to the basic soldier, are supposed to receive sufficient training through Army service schools and on-the-job training. Also, the report stated insufficient qualified supply personnel adversely impacted the inspected units' ability to manage materiel.

Responsiveness of supply support activities

Army regulation allows supply support activities up to 5 days to fill units' repair part requests when the materiel is available at the activities. However, unit supply records indicated that more than 5 days were needed to satisfy over 70 percent of the requests we examined.

Army regulation 1/ also requires that support activities fill from on-hand stocks 52 to 68 percent of the units' requests. At one of the support activities visited, an official said the activity's high zero balance (26 percent) had adversely affected its ability to meet units' needs. For example, in April 1978, the activity could satisfy only about 33 percent of the repair part requests; the remaining 67 percent were generally forwarded to other supply sources.

The responsiveness of supply support activities was also affected by the Army's automated supply system, which determines if requested parts are available at the supply activities. If a part is not available, the request is generally sent to the next higher supply activity and supply status information is periodically sent to the unit requesting the part. If the unit does not receive such information, it is to note that the request is no longer being processed and reorder the needed part.

At one unit, 26 percent of the repair part requests examined had been canceled, primarily because the unit had not received status information. Records at the supply support activity showed that information had not been sent because the unit's requests

--had been satisfied,

--had been incorrectly entered into the computer for another unit,

1/ Army Regulation 710-2, "Materiel Management for Using Units, Support Units, and Installations," states that between 75 and 85 percent of unit repair part requests should be for items stocked by supply support activities and between 70 and 80 percent of the unit requests for stocked items should be filled by the activity from on-hand stocks. The product of these management goals represents the total number of unit requests that should be satisfied from on-hand stocks.

- were for parts that should have been requested from another supply source,
- were not on record as being received by the support activity, or
- were due to be issued to the unit.

Although the supply support activity's records showed that 40 percent of the requests canceled by the unit had been already issued, unit records did not indicate the parts had been received. Unit officials said this was a common problem. Apparently neither support activity or unit controls are adequate to ensure that units always receive requested parts or are able to detect when warehouse or unit recordkeeping errors occur. There is a need for such controls.

Of the repair part requests that were entered into the computer for the wrong unit, 75 percent were illegibly prepared by the unit and 25 percent were caused by key punch errors at the supply support activity. The support activity tried to eliminate such errors by providing prepunched cards for all parts issued to units so that only the quantity, document number, and priority need be entered when the parts are reordered. However, activity officials said that only 3 to 5 percent of the cards given to the units were being used and that a significant number of key punch errors were still occurring. If units were required to use the cards, the effectiveness of supply support could be improved.

MAINTENANCE TASK ASSIGNMENTS

The Army's policy is to do maintenance at the lowest level possible to keep the equipment in the users' hands. In assigning maintenance tasks to the various maintenance levels, equipment specialists generally consider

- past field experiences with similar equipment,
- capabilities of maintenance units,
- the configuration of the equipment,
- the existing Army maintenance organization,
- the cost of support equipment, and
- the number of labor-hours needed to accomplish the maintenance task.

Equipment specialists try to assign maintenance tasks to the unit level when the work can generally be done within 8 hours, available common tools can be used, and costly special test equipment is not needed.

The tasks are usually assigned based on engineering estimates made early in the equipment's development and then are validated through simulated tests. Once the assignments have been validated, no concerted effort is made to assess their actual workability. Rather, the Army relies heavily on materiel readiness reports to measure how well the decisions support users' needs. However, as noted earlier, reported equipment conditions are questionable. Task assignments are generally revised only when major equipment modifications are made. For example, equipment specialists said that the maintenance tasks for one piece of equipment were assigned before 1969 and have not been significantly changed since then. For another, the tasks had been changed; however, these changes occurred primarily because the equipment was modified rather than because original decisions were reevaluated.

At all five units visited, unit and support level maintenance personnel said that tasks are not necessarily assigned to the lowest possible maintenance level. For the equipment we reviewed, these officials identified over 100 tasks assigned to a support maintenance level that could be done at the unit level without significant increase in resources. In their opinion, doing more tasks at the unit level would increase maintenance efficiency and equipment would not be lost to the unit for as long as it is now.

Some of the tasks identified as being within unit level capabilities follow.

1. For the M109/M109A1 Howitzer

- Replacing the cannon's firing block assembly.
- Replacing and repairing the tray of the projectile rammer assembly.
- Replacing the fan drive assembly to the cooling system.

2. For the M60A1 Tank

- Repairing the air cleaner.
- Replacing the fuel tank.

--Repairing the driver's seat.

3. For the M167 Vulcan Gun

--Repairing the firing contact assembly.

--Inspecting, testing, and repairing the feeder assembly.

--Inspecting, replacing, and repairing the feeder housing and guides.

4. For the M561 Gama Goat

--Replacing the water pump.

--Replacing the tractor propeller shafts and joints to the transmission to transfer coupling.

--Replacing the transmission assembly.

Officials from support maintenance levels agreed with 24 percent of the tasks unit mechanics said were improperly assigned to support levels. They said that some other identified tasks could probably be done by unit mechanics in peacetime, but not in wartime, since units must be mobile.

Several maintenance supervisors told us that unit personnel sometimes carry out tasks that are assigned to support levels in an effort to save time. For example, one unit's mechanics change water pumps, which takes about 1 hour and requires no special tools, rather than send vehicles to the support maintenance level for such work, which has taken up to 3 weeks. The lead maintenance supervisor said this repair action increases equipment availability and reduces unit labor-hour requirement for the repair by over 8 hours. That is, if the vehicle were sent to the support level, unit personnel would have to spend 4 hours to strip the vehicle of all accessories vulnerable to pilferage or damage, as requested by the support maintenance level; 4 hours to reinstall these accessories when the vehicle is returned, and 30 minutes to deliver and retrieve the vehicle. Additional time may also be required at the unit if the support maintenance level, during its acceptance inspection, identifies deficiencies which should have been repaired by the unit and which would impair support level work. When such deficiencies are found, the equipment is returned to the unit. The unit must make the repairs, and then the equipment must be returned to the support maintenance activity.

Although unit personnel have recognized that they can do certain tasks assigned to support maintenance levels, they seldom suggest changes to task assignments. According to maintenance supervisors, unit personnel generally did not use the Army's system for recommending such changes because:

- They lacked adequate information to prove the tasks had been improperly assigned.
- Equipment specialists' responses to other suggested changes had been slow.
- The reasons for rejecting prior suggestions had appeared to be inadequate.

We believe that maintenance tasks assignments should be periodically reevaluated with a view to assigning them to the lowest possible level. But because equipment operators do not fully carry out their present maintenance responsibilities (see pp. 18 to 21), additional tasks should be assigned to the unit level only if units have established adequate incentive programs. With the incentive to do a good job, unit personnel, in our opinion, could take on certain support level tasks and could thereby increase equipment availability. Equipment availability would also improve because unit personnel would have more opportunity to practice and expand their maintenance skills.

CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The Army has not provided for sufficient quality controls to make sure that its units do maintenance work properly and report accurately the condition of their equipment. Until improvements are made, units will continue to have difficulty in properly maintaining equipment necessary for rapid transition to wartime operations.

Current maintenance assistance programs are not sufficient to ensure needed equipment conditions are maintained or to compensate for the lack of command emphasis and incentives. Because commander's attitudes permeate the organization and frequently result in the lack of supervisory involvement, emphasis, and control, needed maintenance is not always done, equipment deficiencies are not always properly recognized and reported, and equipment operators have not always developed necessary maintenance proficiencies.

In addition, the Army has decreased the amount of formal maintenance training and have tasked individual units to provide needed maintenance instruction through on-the-job training programs. However, the Army does not evaluate the effectiveness of such programs. Without an incentive to develop aggressive programs, unit commanders have done little to develop the necessary skills and knowledge of unit personnel. It, therefore, appears that the Army's demands on equipment operators may be unreasonable for the types of motivation, supervision, and training being received.

Operators must not only ensure that their equipment is functioning but also must carry out scheduled maintenance tasks and detect and report equipment deficiencies. Considering the limited amount of motivation and formal training, the nonexistence of effective on-the-job training programs at the units, the lack of incentives for operators to use training aids, and the lack of supervisory control and/or assistance over the operator's work, it is not surprising that equipment deficiencies often are not recognized, reported, or corrected. Moreover, the magnitude of the equipment deficiencies found during our inspection of unit equipment indicates that if supervisors were involved, they were not adequately trained since they were not effectively helping equipment operators recognize and report equipment defects.

Because equipment deficiencies often were not recognized and reported, unit commanders received inaccurate information on equipment conditions. In addition, support maintenance levels are not routinely informing unit commanders of the effectiveness of their units' maintenance. Unit commanders need accurate information, from both lower and higher command and support maintenance levels, so that appropriate decisions on maintenance workloads and unit priorities can be made.

Unit maintenance operations have been impaired by supply support problems. Again, insufficient training, supervision, and command emphasis contributed to the problems.

We believe that all management elements (discussed in chapter 2) are critical to units having good maintenance conditions and no single element can be faulted for the conditions we have observed. However, we believe the conditions noted during our review demonstrate a need for increased emphasis on the importance of effective unit maintenance. The importance placed on unit maintenance needs to be shown through unannounced periodic inspections of equipment conditions that include consideration for the effectiveness of on-the-job training programs in developing and sustaining needed maintenance proficiencies as well as whether unit commanders make work-time available for the proper usage of training aids.

To improve unit maintenance effectiveness, the Army needs an education program that concentrates on developing good maintenance practices as part of unit routine. This program should ensure commanders emphasize maintenance, and provide incentives to motivate personnel to properly carry out maintenance and supply responsibilities. Also, the importance of reporting actual equipment conditions should be stressed. Unannounced independent inspections of equipment conditions could help measure the program's effectiveness.

But what should be done by individual units? The key to reinforcing the importance of unit maintenance, in our opinion, is the unit commander and his emphasis on maintenance. To improve the accuracy of information needed to properly manage maintenance operations, an interest in all aspects of maintenance and logistical support must be shown. Through his involvement, as well as that of supervisory personnel, a commander can motivate his unit to achieve a high state of readiness by properly doing maintenance and supply tasks. He can stress the importance of training and quality control, and he can provide incentives for effective work. Once unit personnel have been provided with such incentives, unit equipment operational conditions could

be further improved by the Army ensuring maintenance tasks are assigned to the lowest possible level.

RECOMMENDATIONS

We recommend that the Secretary of the Army:

- Institute a maintenance education program that stresses command emphasis and incentives and motivates people to do maintenance and supply duties properly, including the reporting of actual equipment conditions. Unannounced independent inspections of equipment conditions should be used to help measure program effectiveness.
- Make sure that unit commanders and supervisors are sufficiently involved in maintenance operations so that their knowledge is transferred to equipment operators and unit mechanics.
- Require units to establish approved, planned on-the-job training programs designed to develop necessary maintenance skills, knowledge, and abilities.
- Evaluate the effectiveness of unit training programs during periodic unit inspections.
- Make sure that support maintenance levels routinely provide unit commanders with available information on maintenance effectiveness.
- Periodically reevaluate maintenance task assignments using feedback information from various maintenance levels, and as appropriate, reassign the tasks to the lowest level possible.

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