

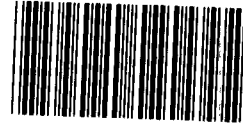
GAO

Report to the Commanding General  
Army Materiel Command

May 1992

ARMY MAINTENANCE

Savings Possible by  
Stopping Unnecessary  
Depot Repairs



146451

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**National Security and  
International Affairs Division**

B-248266.1

May 5, 1992

General Jimmy D. Ross  
Commanding General  
Army Materiel Command

Dear General Ross:

We have reviewed the Army Materiel Command's procedures for performing certain depot-level repairs. Our objectives were to determine whether depots performed unnecessary repairs on weapon systems, tactical vehicles, or their major components and, as a result, incurred unnecessary costs.

**Background**

The Army Materiel Command, through the Depot System Command (DESCOM), is responsible for managing 13 depots, 6 depot activities, and 15 other installations throughout the continental United States, Germany, and South Korea. The depot maintenance mission is to repair equipment that cannot or should not be repaired by field units.

Major subordinate commands, such as the Tank-Automotive Command (TACOM) and the Aviation Systems Command, determine which items are to be repaired at the depots. These commands designate items for specific repair programs by assigning work authorization codes that identify what type of repair should be performed. Depot repair programs generally fall into three categories—overhaul, inspect and repair, and modernization and conversion. Overhaul programs generally involve the complete rebuilding of an end item or secondary item<sup>1</sup> in accordance with written standards called depot maintenance work requirements. Inspect and repair programs usually involve inspecting the entire item and repairing only what is broken. Modernization and conversion programs involve modifying or converting end items and components to meet specific needs and are usually performed in conjunction with overhaul programs.

The subordinate commands submit their maintenance requirements to DESCOM, and it determines which depot will perform the work. We visited four depots during our review. The Red River, Anniston, and Tooele depots

<sup>1</sup>End items include principal assets such as tanks, vehicles, personnel carriers, and helicopters. Secondary items include major components such as engines and transmissions, spare parts, repair parts, and supplies for the principal assets.

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repair almost all tracked, armored, and tactical wheeled vehicles for TACOM, while the Corpus Christi depot repairs all of the Army's helicopters for the Aviation Systems Command.

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## Results in Brief

Two depots we visited perform unnecessary repairs, potentially resulting in unnecessary costs. At Red River Army Depot, depot personnel overhaul all 6V53 engines (used in M113 personnel carriers) in the secondary item program without first performing pre-shop analysis to determine exactly what is wrong with them. Failing to determine the extent of repairs necessary has resulted in some engines being overhauled when only minor repairs are needed. Using the results of a test Red River recently conducted, we estimate that the depot could save as much as \$1.1 million in fiscal year 1992 by establishing a pre-shop analysis program and performing only those repairs necessary to return the engines to service.

Tooele Army Depot overhauls certain end items and secondary items even when the major subordinate command specifically designates the items for inspect and repair programs. The depot is routinely overhauling items which were not intended to be overhauled. No pre-shop analysis is done to determine exactly what is wrong with them. As a result, Tooele Army Depot may be performing unnecessary and costly overhauls.

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## Red River Army Depot Overhauls 6V53 Engines Unnecessarily

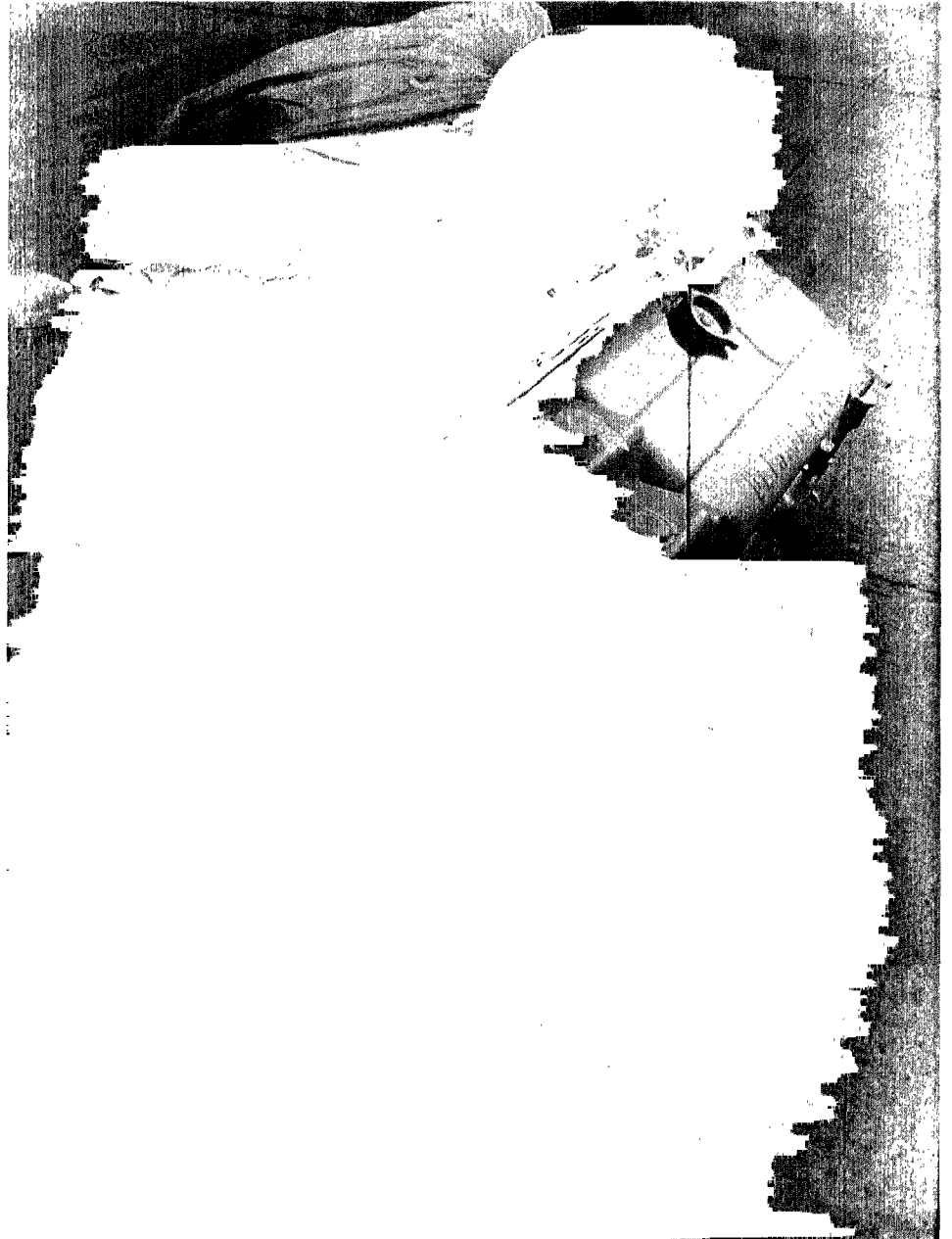
Red River Army Depot overhauls some 6V53 engines that do not require an overhaul. In accordance with directions from TACOM, 6V53 engines arriving at the depot under the secondary item program are disassembled and overhauled without first undergoing pre-shop analysis to determine the extent of necessary repairs. In contrast, engines removed from M113s at the depot are subjected to pre-shop analysis and diagnostic testing and, if possible, are adjusted or repaired and returned to the vehicle. Figure 1 shows an M113 personnel carrier, and figure 2 shows a 6V53 engine.

Figure 1: M113 Personnel Carrier



Source: U.S. Army.

**Figure 2: 6V53 Engine**



Source: U.S. Army.

Depot officials cited several examples in which 6V53 engines needing only minor repairs were submitted to the depot under the secondary item

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program and, therefore, were destined for a complete overhaul. These officials also cited cases in which depot personnel visiting field units performed minor repairs or adjustments, precluding the need for the engines to be submitted to the depot for overhaul.

In November 1989, Red River officials requested permission from TACOM to test 100 6V53 engines to determine whether pre-shop analysis and requalification<sup>2</sup> would return a reliable engine to the field at a cost savings to the Army. During this test, the depot planned to perform pre-shop analysis and diagnostic testing on the secondary item engines in the same manner as performed on the engines removed from M113s. If the engines passed the pre-shop analysis and diagnostic testing, minor repairs and adjustments would have been made and the engines returned to the field. Once reissued, the engines would have been tracked to monitor performance and evaluate reliability.

TACOM did not approve the depot's request. TACOM officials said pre-shop analysis and requalification procedures would not return a reliable engine to the field under the secondary item program. Although these procedures were considered sufficient for engines submitted in vehicles, they said engines submitted under the secondary program were in worse condition and must be overhauled to ensure future reliability. TACOM officials could provide no documentation or analysis supporting this belief.

Because TACOM did not allow Red River to conduct the test described above, data is not available to show whether requalified secondary item engines would, in fact, be reliable when returned to the field. However, procedures used at Corpus Christi Army Depot appear to confirm Red River officials' belief that all of the engines should be subjected to pre-shop analysis. Corpus Christi Army Depot subjects all engines (under the end item and secondary item programs) to such an analysis to determine the level of repair each engine needs. This analysis includes a review of the engine's maintenance records—which document all maintenance performed from the time the engine was placed in the aircraft up to its recent failure—and a visual examination of the engine. The examiner then designates the engine for either an inspection and repair or a complete overhaul. According to depot officials, this program has been successful in returning safe, reliable engines to the field, and such requalified engines have performed satisfactorily in the field.

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<sup>2</sup>Requalification is a process of performing diagnostic testing and making minor repairs and adjustments on an item before returning it to the supply system.

Our review indicated that requalifying the 6V53 engines would be more cost-effective than overhauling them. In September 1991, at our request, Red River officials tested 100 6V53 engines and estimated that 13 percent of them could be returned to the field through pre-shop analysis and requalification. Depot officials estimate the fiscal year 1992 cost to perform the pre-shop analysis and requalification to be about \$3,200 per engine. The depot is scheduled to overhaul approximately 1,544 6V53 engines in fiscal year 1992 at a cost per engine of about \$8,800.

If 13 percent of all these engines were requalified rather than overhauled, the depot could potentially save as much as \$1.1 million. Further, according to depot officials, specific components needing repair could be identified through pre-shop analysis and repaired without performing a complete overhaul. This would allow the depot to return the engine to the field at a cost greater than that for requalification, but less than that for an overhaul, resulting in additional savings.

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## Tooele Army Depot Performs Overhauls Not Intended by Commands

Tooele Army Depot overhauls certain end items and secondary items that require only inspection and repair. Depot officials decided that overhauls will be performed on any program involving 50 or more items, regardless of what repairs TACOM had identified as needed. These officials also decided that if a program with less than 50 items could be merged with a larger program, those items would also be overhauled.

Tooele depot officials made this decision to perform overhauls, in lieu of inspections and repair, for large quantity programs approximately 3 years ago. Neither DESCOM nor TACOM officials were involved in this decision; in fact, DESCOM officials were not aware of the depot's overhaul practices until we brought it to their attention.

According to Tooele's Director of Product Assurance, the decision was based on (1) maintenance experience demonstrating that most of the items submitted to the depot required an overhaul, not an inspection and repair, and (2) the belief that when numerous items are included, overhauls cost the same or less than inspect and repair programs. Tooele officials believe that since items are overhauled on a production line, the disassembly and repair process is streamlined and requires fewer maintenance staff hours. They also believe that even though more repair parts are required to perform the overhaul, the decrease in staff hours decreases the total cost to overhaul an item to a level equal to or below the cost to inspect and



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repair the item. However, depot officials could provide no analysis to support these beliefs.

TACOM's established guidance directs the depot to perform pre-shop analysis on the vehicles to determine the extent of work and parts required. However, as a result of Tooele's decision, items such as 2-1/2-ton trucks are routinely overhauled even though they were intended to be inspected and repaired.

Although TACOM's guidance prohibits unnecessary disassembly or removal of components, it provides the depot the latitude to determine the extent of necessary disassembly. Using this latitude, depot personnel completely disassemble and overhaul these vehicles without performing pre-shop analysis or diagnostic testing.

TACOM officials are familiar with the depot's maintenance procedures for 2-1/2-ton trucks. They believe that the depot is performing the types of repairs called for in the established guidance. However, they have been unable to determine what repairs the depot may be performing beyond those prescribed in the guidance.

Unlike Tooele, the other depots we visited (Red River, Corpus Christi, and Anniston) perform both inspect and repair and overhaul programs, depending on the work authorization codes of the programs. Officials at these depots indicated that inspect and repair programs are generally less costly to perform than overhaul programs. Tooele Army Depot's practice of overhauling items regardless of their condition or work authorization code can result in the depot performing unnecessary and costly repairs.

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## Recommendations

We recommend that you take the following actions:

- Direct the Commander, TACOM, to allow Red River Army Depot to perform pre-shop analysis on 6V53 engines repaired under the secondary item program to preclude unnecessary overhauls.
- Require the Commander, Tooele Army Depot, to stop performing overhauls not intended by TACOM or DESCOM and to comply with established guidance unless the depot can justify and factually support its assertions that overhauls are more economical to perform than inspecting and repairing items.

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## Scope and Methodology

We interviewed officials of and collected pertinent information from the Army Materiel Command, Alexandria, Virginia; the Army Tank-Automotive Command, Warren, Michigan; the Army Aviation Systems Command, St. Louis, Missouri; the Depot System Command, Chambersburg, Pennsylvania; the Red River Army Depot, Texarkana, Texas; the Corpus Christi Army Depot, Corpus Christi, Texas; the Tooele Army Depot, Tooele, Utah; and the Anniston Army Depot, Anniston, Alabama.

To determine whether 6V53 engines are overhauled unnecessarily at Red River, we interviewed maintenance and quality assurance officials at Red River and TACOM and reviewed documents regarding the procedures currently in place and those proposed by Red River officials. We also interviewed maintenance and quality assurance officials at the Corpus Christi and Anniston depots to gather information about their engine programs to provide a basis for comparison with the program at Red River.

To respond to our request for an estimate of the number of 6V53 engines submitted under the secondary program that are candidates for requalification through pre-shop analysis and diagnostic testing, Red River Army Depot officials conducted a test of 100 6V53 engines in September 1991. During this test, depot personnel performed pre-shop analysis on each engine and determined whether the engines would be candidates for dynamometer testing and possible requalification. Once this determination was made, depot workers disassembled and overhauled the engines as required by TACOM. While overhauling the engines, depot workers verified the results of their pre-shop analysis.

To determine whether Tooele Army Depot performs unnecessary repairs, we interviewed Tooele maintenance and quality assurance officials to obtain information on the depot's maintenance procedures. We interviewed TACOM and DESCOM officials to obtain their views regarding Tooele's practice of overhauling items intended for inspect and repair programs. We also compared Tooele's maintenance procedures for tactical wheeled vehicles with TACOM's guidance governing the repair of these items and the procedures used at Red River, Anniston, and Corpus Christi.

We conducted our review from April 1991 to March 1992 in accordance with generally accepted government auditing standards. We did not obtain Department of Defense comments on this report. However, we discussed a draft of this report with representatives of the Office of the Assistant Secretary of Defense for Production and Logistics and the Army's Office of

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the Deputy Chief of Staff for Logistics, who generally agreed with the report's findings.

We would appreciate your advising us of what action you plan to take regarding our recommendations.

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

Please contact me on (202) 275-4141 if you have any questions concerning this report. Major contributors to this report are listed in appendix I.

Sincerely yours,

A handwritten signature in cursive script that reads "Richard Davis".

Richard Davis  
Director, Army Issues

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# Major Contributors to This Report

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