Audit Report

OFFICE OF THE INSPECTOR GENERAL

ACQUISITION OF THE PALLETIZED LOAD SYSTEM

Report Number 92-003

October 9, 1991

Department of Defense

INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
400 ARMY NAVY DRIVE
ARLINGTON, VIRGINIA 22202-2884

October 9, 1991

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (FINANCIAL MANAGEMENT)

SUBJECT: Audit Report on the Acquisition of the Palletized Load System (Report No. 92-003)

We are providing this final report for your information and use. Comments on a draft of this report were considered in preparing the final report. We performed the audit from September 1989 through January 1991 as part of our continuing review of major acquisition programs.

The Army had not accurately quantified the acquisition requirements for the PLS program and had not determined the cost-effectiveness of all planned uses of the PLS. As a result, the acquisition requirements for the PLS were misstated by about $653.8 million. Also, the Army could unnecessarily spend at least $279.8 million by using the PLS to support Multiple Launch Rocket System units.

DoD Directive 7650.3 requires that all audit recommendations be resolved promptly. Therefore, the Assistant Secretary of the Army (Financial Management) must provide final comments on the unresolved recommendations by December 9, 1991.

The courtesies extended to the audit staff are appreciated. If you have any questions on this audit, please contact Mr. Rayburn H. Stricklin at (703) 614-3965 (DSN 224-3965) or Mr. Verne F. Petz at (703) 693-0388 (DSN 223-0388). Copies of this report are being provided to the activities listed in Appendix H.

Robert J. Lieberman
Assistant Inspector General
for Auditing

Enclosure

cc:
Under Secretary of Defense for Acquisition
Secretary of the Army
Assistant Secretary of the Army (Research, Development and Acquisition)

Office of the Inspector General

AUDIT REPORT NO. 92-003 October 9, 1991
(Project No. 9AL-0067)

AUDIT REPORT ON THE ACQUISITION OF THE PALLETIZED LOAD SYSTEM

EXECUTIVE SUMMARY

Introduction. The Palletized Load System (PLS), a nondevelopmental item configured to meet the Army's required operational land transportation capabilities, is a highly mobile, diesel-powered, 16.5-ton truck with all-wheel drive capability. Its 16.5-ton capacity offered the Army an opportunity to improve the efficiency of ammunition distribution through reductions in personnel and equipment. Also, the PLS was designed to load or unload its cargo on demountable flatracks in less than 1 minute. The PLS, an integral part of the Army's Maneuver Oriented Ammunition Distribution System, will be assigned to Transportation, Ordnance, and Field Artillery units. As of September 30, 1990, the Army PLS program was estimated at $1.4 billion.

Objectives. The audit's overall objective was to evaluate the program management of the PLS from the standpoint of economy, efficiency, and effectiveness to determine whether the system was being adequately readied for production and deployment. The audit also included a review of the adequacy and sufficiency of internal controls related to the audit objective.

Audit Results. The Army had not accurately quantified the acquisition requirements for the PLS program and had not determined the cost-effectiveness of all planned uses of the PLS. As a result, the acquisition requirements were misstated by about $653.8 million. Also, the Army could unnecessarily spend at least $279.8 million by using the PLS to support the Multiple Launch Rocket System (MLRS) units.

Internal Controls. Internal controls were inadequate to ensure that the Army accurately developed quantitative acquisition requirements for the PLS. Additionally, controls to determine whether planned uses of the PLS were cost-effective were not sufficient to protect DoD's interest. Our review of internal controls is discussed in Part I, page 3 of this report.

Potential Benefits of Audit. The principal benefits that will be realized from this audit are improved accuracy of the quantitative acquisition requirements for the PLS and potential monetary benefits of $279.8 millions that can be achieved by using an alternate, less costly type of truck to support MLRS units. These monetary benefits are discussed in Appendix E.

Summary of Recommendations. We recommended a total recalculation of PLS requirements and a reevaluation of the cost-effectiveness of the planned uses of the PLS, to include the support of MLRS units. We also recommended that the Army use the recalculations and analyses to reassess the size, cost-effectiveness, and affordability of the PLS program.

Management Comments. The Assistant Secretary of the Army (Research, Development and Acquisition) nonconcurred with the finding and recommendations. We believe the recommendations are still valid and have asked the Assistant Secretary to reconsider his position. The Acting Deputy Director (Tactical Warfare Programs), Office of the Director, Defense Research and Engineering, concurred with a recommendation, which provided for the Defense Acquisition Board's Conventional Systems Committee to review the recalculated PLS requirements and to reassess the size, cost-effectiveness, and affordability of the PLS program. However, after we received the Acting Deputy Director's comments, the Under Secretary of Defense for Acquisition reclassified the PLS program as an Army program rather than a Defense Acquisition Board program. As such, we redirected the recommendation to the Assistant Secretary of the Army (Research, Development and Acquisition) and asked him to comment on the recommendation.

AUDIT REPORT ON THE ACQUISITION OF
THE PALLETIZED LOAD SYSTEM

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This report was prepared by the Acquisition Management Directorate, Office of the Assistant Inspector General for Auditing, DoD. Copies of the report can be obtained from the Information Officer, Audit Planning and Technical Support Directorate, (703) 693-0340 (DSN 223-0340).

REPORT ON THE AUDIT OF THE ACQUISITION OF THE PALLETIZED LOAD SYSTEM

PART I - INTRODUCTION

Background

The Palletized Load System (PLS) is a highly mobile, diesel-powered, 16.5 ton truck that has all-wheel drive capability. The PLS, which is a nondevelopmental item, is an assemblage of commercially proven components configured to meet the Army's required operational capabilities. The PLS was intended to increase the efficiency of the Army's Maneuver Oriented Ammunition Distribution System (MOADS). The PLS was designed to load or unload its demountable flatracks in less than 1 minute. This capability could improve the efficiency of ammunition distribution and enable the movement of more ammunition with less personnel and equipment. The PLS trucks designated for field artillery units will have a materiel handling crane, in addition to the load handling system. This gives the trucks the added capability of unloading portions of their cargos at selected rearm points where it is not practical to drop the entire flatrack of ammunition. The PLS is an integral part of the Army's MOADS and will be assigned to ammunition transportation and ordnance units, as well as field artillery units.

In November 1985, the Army conducted a Force Development Test and Experimentation to evaluate the potential for using the PLS concept in ammunition distribution, to better define how the PLS would operate in the ammunition distribution system, and to determine which units would most benefit from having the PLS for ammunition resupply requirements. The Army awarded a lease contract to the Kenworth Division of PACCAR for 46 PLS trucks and companion trailers and 276 flatracks to conduct the Test and Experimentation. The Test and Experimentation, completed in November 1986, confirmed that the PLS would provide the Army with personnel savings.

The Army decided on a two-phase nondevelopmental item strategy with prototype testing. Phase I was for prototype test and evaluation, and Phase II was for production. After the PLS successfully completed the Concept Exploration/Definition Phase (Milestone I) and the Concept Demonstration/Validation Phase (Milestone II) of the acquisition process, the Army contracted for three prototype systems for test and evaluation.

On April 6, 1990, the Army Systems Acquisition Review Council met and approved the type classification for low-rate initial production. The acquisition quantity of 2,707 PLS trucks was approved, and the Program Executive Officer was given authority to request approval from the Office of the Secretary of Defense to enter into low-rate initial production. The Defense Acquisition Board granted approval for low-rate initial production on September 18, 1990. On September 28, 1990, the Army awarded a multiyear production contract for 5 program years (2,626 trucks), with a 100-percent option.

The PLS program is managed by the Project Manager, Heavy Tactical Vehicles, and comes under the direction of the Army's Program Executive Officer, Combat Support.

Objective and Scope

The overall audit objective was to evaluate the program management of the PLS from the standpoint of economy, efficiency, and effectiveness to determine whether the system was being adequately readied for production and deployment. We performed the audit in accordance with our critical program management elements approach. Under this approach, we focused our review on seven elements of program management that were critical to a system in late full-scale development. During the survey, we determined that no additional audit work was warranted on five program management areas. The results of our audit of those five areas are summarized in Appendix A. During the verification phase of this audit, we continued to assess the accuracy of requirements and of cost estimating and analysis. We also monitored the Preproduction Qualification Test results.

As part of our audit, we obtained and reviewed data and information covering the period June 1986 through January 1991. We reviewed selected data, such as contracts, requests for proposals, requirements documentation, contractor cost data, logistics support plans, life cycle cost estimates, budgetary data, test incident reports, detailed test plans, training plans, and program management data. We also interviewed personnel involved in the acquisition, testing, and administration of the PLS program.

This economy and efficiency audit was conducted from September 1989 through January 1991 in accordance with auditing standards issued by the Comptroller General of the United States, as implemented by the Inspector General, DoD, and accordingly included such tests of internal controls as were deemed necessary. A list of the activities visited or contacted is in Appendix F.

Internal Controls

We reviewed the adequacy of internal controls for quantifying acquisition requirements; achieving reliability, availability, and maintainability; maintaining schedules; contracting; establishing production preparedness; making cost estimates and analyses; testing; and establishing configuration control.

Internal controls were inadequate to ensure that the Army accurately developed quantitative acquisition requirements for the PLS. Controls over cost-effectiveness determinations on the uses of the PLS were also inadequate. These internal control weaknesses are discussed in Part II of this report. A copy of this report will be provided to the senior official responsible for internal controls within the Department of the Army.

Prior Audit Coverage

DoD internal audit organizations and the General Accounting Office had not made any audits of the PLS in the last 5 years.

Other Matters of Interest

During the survey phase of the audit, we reviewed the training plan for the PLS to determine if the plan was adequate to ensure that personnel were properly trained to operate the system. We found that the plan did not provide for a comprehensive exportable training package, which was imperative in light of the Army's decision to use soldiers that did not attend the Army drivers training school as operators of the PLS in combat units in Europe. In addition, the Army's Driver Training Standardization Office had not been involved in the plan's development to ensure that the plan would train soldiers to the Army's standards.

During our audit verification, we found that the Training and Doctrine Command (TRADOC) had reviewed the plan and made recommendations to improve the conditions that we found during our survey. TRADOC cited the finding on operator training contained in Department of Defense Inspector General Report No. 90-021, "Acquisition of the Heavy Expanded Mobility Tactical Truck," December 26, 1989, and recommended to the transportation school that a recommendation contained in the report be used in the PLS program. TRADOC's recommendation provided for the transportation school to develop an exportable training plan to be used for initial and sustainment training in the PLS program. We feel that TRADOC's action provided for an effective training plan. Also, the action satisfied our concerns about whether PLS operators will be trained to meet the Army's standards.

PART II - FINDING AND RECOMMENDATIONS

Program Requirements

FINDING

The Army had not accurately quantified the acquisition requirements for the Palletized Load System (PLS) program and had not determined the cost-effectiveness of all planned uses of the PLS. The conditions existed, in part, because the Army had not updated the requirements to reflect current world conditions and to recognize that a major weapon system that the PLS was planned to support will be phased out of the Army's inventory. Additionally, the Army had not assessed the cost-effectiveness of using the PLS to support Multiple Launch Rocket System (MLRS) units or the impact of the PLS's inability to operate at full cargo capacity in all operational areas. As a result, the PLS's acquisition requirements were misstated by about $653.8 million. Also, the Army could unnecessarily spend at least $279.8 million by using the PLS to support MLRS units.

DISCUSSION OF DETAILS

Background. The Army's Training and Doctrine Command (TRADOC) and its subordinate organizations determined the number of trucks, trailers, and flatracks (total program acquisition requirements) for the PLS. TRADOC used a four-step process in determining the requirements for the PLS. First, it developed a combat operational scenario in 1984, which was based on combat between U.S. and Soviet and Warsaw Pact forces. The scenario provided for U.S. forces to provide 3 days of intensive firing in a defense posture followed by a U.S. reinforced heavy brigade attack for 2 days. Then, TRADOC applied the firing rates in Field Manual 101-10-1 to the scenario to determine the amount of ammunition that would be expended on a daily basis in the scenario. Next, TRADOC revised the Army's Tables of Organization and Equipment (TOE) to reflect the number of personnel and types and quantities of PLS equipment needed to move the ammunition determined in the first two steps. The Army's TOE system was described in Army Regulation 310-31, "Management System and Tables of Organization and Equipment (The TOE System)," October 15, 1974, and is now described in Army Regulation 71-31, "Management System for Tables of Organization and Equipment," August 19, 1989. Finally, in June 1987, TRADOC used the TOE's to calculate its requirements for the PLS program.

By using the 4-step process, TRADOC determined that ordnance, transportation, and artillery units would have to move from 2,841 to 3,500 short tons[1/] of ammunition per day. Further,

1/ A short ton is unit of weight equal to .907 metric ton, 2,000 pounds, or 907.20 kilograms.

TRADOC determined, based on revised TOE's, that 3,872 trucks, 1,683 trailers, and 53,055 flatracks would be required to transport the ammunition. The distribution of that equipment, based on the TOE's, is shown below.

	PLS Equipment Required to Move 2,841 Short Tons Per Day		
Organization	Trucks	Trailers	Flatracks
Ordnance	678	603	39,851
Transportation	960	960	1,920
Artillery	2,114	0	2,114
Total	3,752	1,563	43,885

	PLS Equipment Required to Move 3,500 Short Tons Per Day		
Organization	Trucks	Trailers	Flatracks
Ordnance	798	723	49,021
Transportation	960	960	1,920
Artillery	2,114	0	2,114
Total	3,872	1,683	53,055

TRADOC subsequently updated the PLS requirements based on the results of the Total Army Analysis for FY's 1992 through 1996 (TAA 96). TAA 96 was made using scenarios that envisioned warfare in multiple theaters, including the European theater. As a result of TAA 96, the Army reduced its force structure. Further, the reduction in the force structure affected PLS requirements. As shown below, the requirements for PLS trucks and trailers decreased while the requirements for flatracks increased.

	PLS Equipment Required to Move 3,500 Short Tons Per Day		
Organization	Trucks	Trailers	Flatracks
Ordnance	699	636	97,749
Transportation	864	864	1,728
Artillery	1,874	0	1,874
Subtotal	3,437	1,500	101,351
POMCUS[2/]	260	60	320
TDA[3/]	68	28	81
Total	3,765	1,588	101,752

2/ Prepositioned Material Configured to Unit Sets.
3/ Tables of Distribution and Allowances.

Changes in World Conditions. The basis for the Army's total program acquisition requirements for the PLS was outdated. The requirements were based on scenarios that envisioned warfare both totally (European scenario 5.0) and in part (the European scenario used in TAA 96) against numerically superior Soviet and Warsaw Pact forces. Further, for the warfare envisioned in Europe, the Army planned for United States forces to rely substantially on European allies for transportation support (host nation support). For instance, the European theater had an abundance of transportation, including rail, truck, and inland waterway barges between the ports of debarkation and ammunition storage areas. Further, host nation support agreements existed with several allied countries. Under those agreements, the allied countries provided the personnel and equipment needed to transport supplies and materials that U.S. forces would need in combat.

World conditions have changed significantly since the scenarios were developed. The Soviet Union has moved much of its artillery beyond the Ural Mountains, Germany has reunified, and the Warsaw Pact has dissolved. Therefore, the opposing forces envisioned in the scenarios are no longer a viable threat. Further, today's Army finds itself with smaller opposing forces that operate in parts of the world where transportation is not as abundant as in European countries. These forces also will operate in parts of the world where the United States cannot rely on host nation support. Finally, DoD plans call for the Army to reduce its active forces from 18 to 12 divisions and to reduce its forward deployed forces in Europe by one-half by 1995.

Since the threat in Europe has changed significantly and other parts of world do not have as extensive transportation systems as our European allies, we believe the Army needs to recalculate its total program acquisition requirements for the PLS and adjust its requirements accordingly.

Changes Resulting From a System Phasing Out. One of the PLS's missions was to support units with 8-inch howitzers. Since the PLS requirements were originally developed, the Army decided to phase out 8-inch howitzers and replace them with the MLRS. Although the Army planned to phase out the 8-inch howitzers from FY 1992 to FY 2006, the Army did not reduce its requirements for PLS trucks, trailers, and flatracks that had been established to support units with 8-inch howitzers. As a result, the PLS requirements were overstated.

To determine the extent that the PLS requirements were overstated, we determined how many trucks, trailers, and flatracks in the PLS program would provide support to units with 8-inch howitzers. We calculated that 768 trucks and

768 flatracks were scheduled for direct support of units with the 8-inch howitzers. The 768 trucks represented about 41 percent of the 1,874 PLS trucks required to support field artillery units. As such, we also concluded that about 41 percent of the vehicles required to support ordnance and transportation units would be used to move 8-inch howitzer ammunition through the distribution system to field artillery units. Accordingly, about 41 percent of the PLS's requirements for ordnance and transportation units (640 trucks, 614 trailers, and 40,765 flatracks) will not be needed after the 8-inch howitzers are phased out.

In total, we estimated that the requirements for the PLS were overstated by 1,408 trucks, 614 trailers, and 41,533 flatracks because units using the 8-inch howitzers would not need the equipment. We also estimated that the unneeded equipment would cost about $653.8 million, as shown below.

		COST ($000)	
EQUIPMENT	QUANTITY	UNIT	TOTAL
Truck	1,408	$243.1	$342,284.8
Trailer	614	$ 40.6	24,928.4
Flatrack	41,533	$ 6.9	286,577.7
Total			$653,790.9

In January 1991, after our review of PLS requirements, the Army reduced the requirement for PLS trucks in support of 8-inch howitzer units from 768 trucks to 492 trucks (276 trucks). However, that reduction of 276 trucks did not decrease total PLS requirements because the Army established a new requirement for 276 PLS trucks to be prepositioned in or for Southwest Asia. The validity of the new requirement appears questionable because there are no other units requiring PLS equipment. As such, we believe the Army needs to reconsider the necessity of prepositioning 276 trucks for Southwest Asia.

Cost-Effectiveness of Using the PLS to Support MLRS Units. The Army issued a message in May 1989 that stated that the PLS would be used to support all MLRS activations after FY 1993. The Army's plan to use the PLS to support MLRS units does not appear to be cost-effective. The least expensive model of the PLS truck was about $100,000 (1990 dollars) more than the 10-ton Heavy Expanded Mobility Tactical Truck (HEMTT), which is used to transport MLRS rocket pods. However, because of the size of the MLRS pods, the PLS truck cannot carry any more MLRS pods than the HEMTT. Consequently, if the Army used the PLS to transport MLRS pods, we estimate that it could spend $279.8 million more for PLS trucks, trailers, and flatracks than it would spend for HEMTT trucks to transport the same number of MLRS pods. Unless the PLS provides life-cycle costs that would offset the additional investment required for PLS trucks, the PLS will not be cost-effective for support of MLRS units.

We were not the first organization to question the cost-effectiveness of using the PLS to support MLRS units. On March 26, 1990, TRADOC, as part of its report on "Palletized Load System Follow-on Analysis," concluded that the PLS could not be cost or operationally effective unless alternate operational concepts could be developed. TRADOC's Follow-on Analysis also pointed out that the PLS truck is configured in a way that could hamper the operational effectiveness of MLRS units. The operational concept of the PLS is to deliver ammunition using its dismountable flatrack capability. Dropping a flatrack that contains four MLRS rocket pods in one location combines two MLRS rearm points, thereby increasing the MLRS's vulnerability during rearming operations. To overcome this deficiency, the PLS truck must be equipped with a materiel handling crane.

The Follow-on Analysis also stated that the PLS operational concept of unloading cargo by the demountable flatrack system is contrary to the MLRS's "shoot and scoot" fighting doctrine. Commanders of MLRS battalions prefer to keep rocket pods on the truck so that, after a fire mission, the ammunition truck can follow the launcher to the next fire point. This doctrinal tactic eliminates the possibility of the launcher having to travel out of its way to the prepositioned rocket pods.

Cost-Effectiveness of the PLS with Reduced Cargo Capacity. Another factor that renders the cost-effectiveness of the total PLS program questionable is its severely limited cargo capacity. Evaluations by the Military Traffic Management Command and the Office of DoD Operational Test and Evaluation showed that the PLS truck and trailer cannot operate at maximum cargo capacity when transporting on primary roads in the United States and most foreign countries. The evaluations found that PLS trucks traveling with a full payload would cause damage to the roads and bridges, thereby making them impassable for the PLS and other military vehicles. In addition, during the Preproduction Qualification Test, the Army's Test and Evaluation Command was unable to obtain special permits to test the PLS on Maryland's interstate highways; therefore, the Army was unable to test the PLS at maximum cargo weight on primary roads.

Another evaluation of the PLS showed that it had cargo limitations when used off-road. The U.S. Army Waterways Experiment Station (WES) used the NATO Reference Mobility Model (NRMM) to predict the Vehicle Cone Index Number for PLS trucks. The Vehicle Cone Index Number is the minimum soil strength that will permit a vehicle to complete a specified number of passes over the same terrain. WES ran the NRMM model using the Lauterbach Quadrant in Germany.

WES concluded that the PLS vehicles showed a degradation in trafficability of 9 percent to 15 percent when compared to the HEMTT. This degradation in trafficability dictates that PLS trucks will not always be able to travel at maximum payload (16.5 tons) when performing their mission in Germany.

The cargo limitation, if not resolved, could render the PLS as not cost-effective. The primary reason is that the PLS, with its cargo limitation, would not be able to transport the amount of ammunition being carried by the current tractor trailer and HEMTT trucks. As previously discussed, each HEMTT costs about $100,000 less than a PLS truck.

The cargo limitation of the PLS, if not resolved, will adversely affect PLS mission accomplishment. The Required Operational Capability (ROC) for the PLS and the prototype contract for the truck required that the PLS be capable of unrestricted operation worldwide on varied terrains, ranging from paved roads to soft soil. In addition, the mission profile in the ROC stated that the vehicle would operate fully loaded 50 percent of the time. If the cargo limitation precludes the Army from operating fully loaded 50 percent of the time, the Army will not have enough transportation assets to support wartime operations.

In response to the cargo limitation problem, the Army reduced the PLS's operational requirement by amending the ROC on May 3, 1990. The ROC stated that the 16.5-ton PLS truck with crane, during peacetime training, must be capable of transporting 5 tons when traveling on primary highways, and the PLS truck-trailer combination, without the crane, must be capable of transporting 7 to 10 tons on primary highways.

The Army's action to reduce the amount of cargo transported may be a workable solution for peacetime training uses of the PLS, but it does not resolve the reduced ability of the PLS to use all types of roads during wartime. Neither does it eliminate the potential damage to roads and bridges when the PLS is fully loaded.

Conclusion. Acquisition requirements for the PLS were inaccurate because they had not been updated to reflect the current threat and changing missions. Further, the Army had not determined the cost-effectiveness of using the PLS to support MLRS units and using PLS trucks when less than fully loaded. We believe the Army should immediately recalculate and adjust its PLS requirements and make the appropriate cost analyses to determine the size, cost-effectiveness, and affordability of the PLS program. The results of recalculations and analyses should be provided to, and assessed by, the Army Systems Acquisition Review Council.

RECOMMENDATIONS FOR CORRECTIVE ACTION

We recommend that the Assistant Secretary of the Army (Research, Development and Acquisition):

1. Recalculate the Palletized Load System requirements using current threat and projected mission data, and use the revised requirements to adjust the Palletized Load System program. The recalculation should give proper consideration to:

a. Deleting from the Palletized Load System program the support requirements for the 8-inch howitzer units and the planned support of Multiple Launch Rocket System units.

b. Analyzing roads and terrain in various theaters of wartime operations to determine the extent that the cargo capacity limitation will increase Palletized Load System quantitative requirements.

c. Redetermining the cost-effectiveness of the Palletized Load System if the analysis shows that the Palletized Load System cannot operate at full cargo capacity in all planned theaters of operation.

2. Convene the Army Systems Acquisition Review Council to review the data stemming from the recalculations and analyses recommended above and redetermine the size, cost-effectiveness, and affordability of the Palletized Load System program.

MANAGEMENT COMMENTS

The Assistant Secretary of the Army (Research, Development and Acquisition) nonconcurred with Recommendations 1., 1.a., and 1.c. for the reasons discussed below. The Assistant Secretary did not comment on Recommendation 1.b. The complete text of the Assistant Secretary's comments is in Appendix B.

Recommendation 1. The Assistant Secretary inferred that PLS requirements were based on current threat data, thereby concluding that there was no need to recalculate the requirements. He explained that the requirements were quantified based on Illustrative Planning Scenarios, which were specified in the "Defense Military Guidance" and that the Army used to perform the Total Army Analysis for FY 1996 (TAA 96).

Recommendation 1.a. With regard to the part of the recommendation that dealt with PLS requirements in support of 8-inch howitzer units, the Assistant Secretary stated that, although 8-inch howitzer units are scheduled to phase out of the Army by FY 2006, preliminary observations from Desert Storm indicate that there is still a requirement for the 8-inch howitzer units. He added that not to field the PLS to support 8-inch howitzer units would deny some artillery units "modernized ammunition distribution vehicles" for over 12 years.

With regard to the part of Recommendation 1.a. that dealt with support of MLRS units, the Assistant Secretary inferred that the Army could not delete PLS requirements in support of MLRS units because the PLS is the only viable new vehicle to support MLRS units. He further inferred that the HEMTT could not be used to support MLRS units because the Army did not plan to buy any HEMTT's after FY 1992. He added that the PLS had been successfully tested in the MLRS role.

Recommendation 1.c. The Assistant Secretary stated that there was no need to redetermine the cost-effectiveness of the PLS because the overall mobility performance compares "very favorably" with the HEMTT in all terrains. For example, he stated that, in Middle East sand, the PLS's central tire inflation system and extra axle enabled it to operate on significantly larger portions of marginal terrain than the HEMTT. He added that, in addition to carrying a 50 percent greater load than the HEMTT, the PLS's entire 16.5-ton payload can be loaded and unloaded by one person in about 30 seconds.

The Acting Deputy Director (Tactical Warfare Programs), Office of the Director, Defense Research and Engineering, concurred with draft report Recommendation 2., which provided for him to convene the Defense Acquisition Board's Conventional Systems Committee and reassess the size, cost-effectiveness, and affordability of the PLS program. He stated that he would assess whether such action was needed by evaluating the Army's comments to our draft report. The complete text of the Acting Deputy Director's comments is in Appendix C.

The Assistant Secretary of the Army (Research, Development and Acquisition) also nonconcurred with certain facts and a conclusion that we presented in our draft report. The Assistant Secretary stated that the numbers that we used in our draft report as the quantitative acquisition requirements for the PLS program misrepresented the program's requirements. He said that the numbers were outdated. Further, he specifically noted that the PLS requirements in support of 8-inch howitzer units should be 492 PLS trucks, not 768 PLS trucks, as stated in our draft report. The Assistant Secretary also disagreed with our conclusion that the Army had not assessed the impact of the PLS's inability to operate at full-cargo capacity in all operational areas. He said that wartime use of the PLS was unrestricted.

In closing, the Assistant Secretary stated that we failed to recognize that the PLS represents a revolution in distribution systems. He explained that the PLS is not just a replacement for its predecessors but a whole new way of doing business. He added that our draft report made no mention of the savings in personnel and equipment provided by the PLS.

AUDIT RESPONSE TO MANAGEMENT COMMENTS

The comments that the Assistant Secretary of the Army (Research, Development and Acquisition) provided on Recommendations 1., 1.a., and 1.c., either were inconsistent with the facts that we gathered during our audit or were not responsive to the recommended actions. As such, we remain convinced that the Army needs to act on the recommendations. Accordingly, we ask the Assistant Secretary to reconsider his nonconcurrences with Recommendations 1., 1.a., and 1.c., and comment again on the recommendations, after considering our responses to his comments. Further, we also ask the Assistant Secretary to comment on Recommendation 1.b.

Recommendation 1. The reason that the Assistant Secretary of the Army (Research, Development and Acquisition) gave for nonconcurring with Recommendation 1. was incorrect. The requirements were not based solely on scenarios that were specified in Defense guidance and used in the TAA process. As explained previously in this report, the quantitative requirements for the PLS program were initially developed using European scenario 5.0, which was developed in 1984. Subsequently, the requirements were updated using the results of TAA 96. Furthermore, even if the requirements had been based exclusively on scenarios used in TAA 96, it would be incorrect to conclude that the requirements were based on current threat data because the scenarios used in TAA 96 were developed in 1988, before the major changes that occurred in Europe in 1990 and 1991.

Recommendation 1.a. The comments that the Assistant Secretary provided on this recommendation indicated that the Assistant Secretary did not consider all factors relevant to the need for the Army to delete from the PLS program the support requirements for 8-inch howitzer units. In stating that not fielding the PLS to support 8-inch howitzer units would deny some artillery units modernized equipment for over 12 years, the Assistant Secretary did not consider existing transportation assets in the artillery units. The artillery units have 5-ton trucks and HEMTT's, and reportedly both trucks performed well in Desert Shield and Desert Storm operations. Further, as 8-inch howitzer units are phased out of the force structure, there will be an increasing supply of both trucks to support 8-inch howitzer units that are awaiting phase out action. As such, we see no need to buy PLS equipment for units that are phasing out of the force structure when those units have and will continue to have adequate transportation equipment. Additionally, in commenting on the part of the recommendation pertaining to PLS requirements in support of MLRS units, the Assistant Secretary did not address why the Army could not buy additional HEMTT's rather than PLS trucks. The Assistant Secretary merely stated that no new

HEMTT's are planned for acquisition after FY 1992. We see no reason why the Army cannot continue to buy HEMTT's after FY 1992, if it is the most effective and efficient transportation solution.

Recommendation 1.c. The Assistant Secretary's comments to this recommendation indicate that he did not fully understand the basis for the recommendation. We made the recommendation because there could be serious consequences in operating fully-loaded PLS trucks on primary roads in the United States and most foreign countries. Specifically, use of fully-loaded PLS trucks could damage roads and bridges to the extent that they could become impassable, thereby preventing the PLS from providing responsive operational support. Further, if the PLS damages the roads and bridges, DoD could be held financially responsible for the damages. Another reason that we made the recommendation was that if the Army limits the amount of cargo that the PLS will carry in order to avoid damages to roads and bridges and to go over certain terrains, the Army will not have enough PLS trucks to support its anticipated wartime missions. Rather than addressing the problems or potential consequences posed by the PLS's limited cargo capacity, the Assistant Secretary responded with some PLS and HEMTT performance statistics (pages 20 and 32 of this report) that had little relationship to the basis for the recommendation. Specifically, the Assistant Secretary provided facts on PLS and HEMTT performance in soft soil, in NOGO areas, and on slopes. He also provided facts on the speed of the trucks. Only one of those facts, soft soil performance facts, related directly to the basis for the recommendation. Further, the soft soil performance facts, which the Assistant Secretary provided, supported the need for action on the recommendation because the facts showed that there would be a degradation in transportation support when using the PLS fully loaded. Additionally, none of the facts, which the Assistant Secretary provided, indicated whether or not there was a need for the Army to address the consequences of using fully-loaded PLS trucks on primary roads and bridges.

The action planned by the Acting Deputy Director (Tactical Warfare Programs) was responsive to draft report Recommendation 2. However, after the Acting Deputy Director commented on the recommendation, the Under Secretary of Defense for Acquisition removed the PLS program from the Acting Deputy Director's scope of responsibility by reclassifying the PLS program as an Army program rather than a Defense Acquisition Board program. As such, we redirected Recommendation 2. to the Assistant Secretary of the Army (Research, Development and Acquisition). We ask the Assistant Secretary to comment on Recommendation 2.

In response to the Assistant Secretary's nonconcurrence with our facts on the quantitative requirements of the PLS, we reviewed source documents on the facts and found that the quantitative requirements that we showed in our draft report did not include resulting force structure reductions. We have included those reductions in the quantitative requirements shown in this report.

The Assistant Secretary's reason for nonconcurring with our conclusion on the PLS's cargo limitation was incorrect. We discussed on page 9 of this report that the Military Traffic Management Command and the Office of DoD Operational Test and Evaluation concluded that the PLS truck and trailer cannot operate at maximum cargo capacity when transporting on primary roads in the United States and most foreign countries. Also, the U.S. Army Waterways Experiment Station concluded that the PLS vehicle showed a degradation in trafficability of 9 percent to 15 percent when compared to the HEMTT. Such evidence shows that use of the PLS in wartime operations will not be unrestricted.

In regard to the Assistant Secretary's closing remarks, we recognized on pages 1 and 2 of our draft report and on page 1 of this report that the PLS, because of its increased capacity and its loading and unloading system, can be more cost-effective and operationally beneficial than existing transportation equipment if the PLS can be used at maximum capacity. However, if certain conditions preclude maximum use of the PLS's capacity, we believe that the Army needs to redetermine whether the PLS is in fact cost and operationally effective for uses involving those limiting conditions.

The Assistant Secretary, in commenting on our draft report, referenced and enclosed extensive comments that the Director of Combat Development at the U.S. Army Transportation School made on our draft report. In Appendix D, we provide specific responses to the Director's comments.

AREAS NOT REQUIRING FURTHER REVIEW

During our audit, we reviewed the following areas and found no reportable conditions.

Reliability, Availability, and Maintainability (RAM). RAM estimates for the Palletized Load System (PLS) were developed based on historical data for similar equipment, such as the 10-ton Heavy Expanded Mobility Tactical Truck (HEMTT). The estimates for manpower and maintenance that were developed in the original Cost and Operational Effectiveness Analysis (COEA) appeared to be inaccurate. We informed the Army of our concerns, and during the course of the audit, the Army took action to update the COEA using updated manpower data. During the Preproduction Qualification Test, the system experienced hydraulic failures, especially when operating off-road. We discussed these problems with personnel in the Office of the Under Secretary of Defense for Acquisition and were told that during the Milestone III program review for the Full-Rate Production Decision, the Army would be required to fix the RAM problems before being given the authority to enter full-rate production.

Schedule Assessment. We found no deficiencies in the development/production schedules that were critical enough to affect the overall management of the PLS program. The schedules supported deployment requirements relative to mission needs. The production schedule has changed because of the congressionally mandated requirement that all major systems complete operational test and evaluation before proceeding into beyond low-rate initial production. This requirement resulted in contractors requesting an extension for the submission of the production proposals. As a result, the planned contract award date of June 4, 1990, was not met. The contract was awarded on September 28, 1990.

Contracting. We questioned the acquisition strategy that the Army used in procuring the PLS system. The Tank-Automotive Command used a two-phase competitive acquisition strategy with prototype testing. Two of the contractors had facilities in place and were producing heavy trucks. The third procured its test vehicles from a foreign truck manufacturer and planned to refurbish its own facilities for production if awarded the contract. During our review, we found that the Tank-Automotive Command was in compliance with Federal Acquisition Regulation, part 15, "Contracting by Negotiation." In addition, we reviewed the source selection plan and found that the plan would consider technical and production capability, cost, production management, and quality assurance. All of these elements were properly weighted to ensure the Army would be getting the best quality product at a fair and reasonable price.

In addition, the contractor's past performance on Government contracts would be evaluated during source selection. The contractual requirement for Initial Production Testing, Initial Operational Test and Evaluation, and the Milestone III Defense Acquisition Board review should ensure that the selected contractor will deliver a quality product that meets the Army's specifications.

We also had concerns about the pricing of the option quantities. Data we reviewed showed that the price for the option quantities should be about 10 percent less than the price for the base quantities because the contractor has a larger production base to allocate its fixed overhead expenses. In December 1989, we briefed the program manager and contracting personnel on this matter. The Army's position was that competition would ensure a fair and reasonable price, and as part of the source selection evaluation, the price would be evaluated, and any costs that were unfounded or unsupported would be questioned. Our review of the contract awarded to Oshkosh Truck Corporation showed that the prices for the option quantities were lower than the prices for the base quantity on the contractors' production proposals.

Production Preparedness. The PLS, a nondevelopmental item, is an assemblage of commercially proven components configured to meet the Army's product specifications. The U.S. Army Tank-Automotive Command considered production of this system to be low risk and did not involve any special facilities for production. Two of the potential contractors, Oshkosh Truck Corporation and PACCAR, had facilities in place and were producing heavy trucks. A third contractor, General Motors, planned to refurbish a factory in Flint, Michigan, to produce the PLS if awarded the production contract. During the source selection process, producibility and capability to meet surge requirements were to be included as part of the source selection criteria.

Configuration Control. The plans for configuration management appeared to be adequate. Each competing contractor was responsible for developing the system's configuration to meet contract specifications using commercially proven components. After contract award, the winning contractor's design will be frozen, and any changes will require Army approval.

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, DC 20310-0103

30 MAY 1991

SARD-ZCS

MEMORANDUM FOR INSPECTOR GENERAL, DEPARTMENT OF DEFENSE (AUDITING)

Final Report Page No.

SUBJECT: DOD IG Draft Audit Report on Palletized Loading System (PLS) (Project No. 9AL-0067)

This memorandum is the Army response to the subject DOD IG draft audit report. The Army nonconcurs with the findings and recommendations of the draft audit report. Detailed comments and recommendations are attached in memorandums at Tab B and Tab C. 21 and 29

The Army nonconcurs with the finding that the Army had not accurately quantified the acquisition requirements for the PLS program. The numbers used by the DOD IG were not the system requirement quantities the Army used in support of the PLS Defense Acquisition Board (DAB) Milestone Decision Review III A. The numbers used in the DOD IG report are the pre-Quick Silver/Total Army Analysis (TAA) 96 quantities. These numbers misrepresent the Army position.

The Army nonconcurs with the DOD IG recommendation that the PLS requirements be recalculated using current threat and projected mission data. The Total Army Analysis (TAA) process uses Illustrative Planning Scenarios (IPS). Use of the IPS is different from using a specific scenario, such as Europe 5.0, in that it is theater independent. Each IPS used was consistent with the Defense Military Guidance, which relates directly to the current threat. In each case a need for PLS was demonstrated. This process is explained in greater detail in the US Army Transportation School memorandum (Tab B). 21 - 28

The Army nonconcurs with the DOD IG recommendation to delete from the PLS program requirements for the 8-inch howitzer and planned support of Multiple Launch Rocket System units. Of note, the PLS requirement in support of the 8-inch howitzer requirement at the time of the DOD IG audit was 492 systems, not 768 as stated in the report. That number is currently being refined based on new force structure guidance. Further, although 8-inch howitzer units are scheduled to phase

out of the force by 2006, preliminary observations from Desert Storm indicate there is still a requirement for the 8-inch howitzer. Not to field PLS to 8-inch units now would deny some artillery units modernized ammunition distribution vehicles for over 12 years.

Regarding the HEMTT for new MLRS units, no new HEMTTs are planned for acquisition after FY 92. PLS is the only viable candidate new vehicle to fill the requirement for MLRS. PLS has been successfully tested in the MLRS role.

The Army nonconcurs with the DOD IG finding that the Army had not assessed the impact of PLS's inability to operate at full-cargo capacity in all operational areas. It is true that there will be peacetime limitations on PLS movement over highways, but there are similar limitations for other heavy trucks, including HEMTT. Wartime use of PLS is unrestricted.

Further, the Army nonconcurs with the DOD IG recommendation that the Army determine whether the cargo capacity limitation will render the PLS as not cost-effective for its mission. The overall mobility performance of the 16.5-ton capacity PLS compares very favorably with the 10-ton HEMTT in all terrain as indicated in recent testing at the Waterways Experiment Station (Table 1, Tab C). In Mid-East sand, the PLS Central Tire Inflation Systems (CTIS) and extra axle permit it to operate on significantly larger portion of marginal terrain. In addition to carrying a 50 percent greater load than the HEMTT, the entire 16.5-ton payload can routinely be loaded or unloaded by one person in about 30 seconds. PLS contributes significantly to the Army's goal to reduce manpower and Material Handling Equipment (MHE) requirement for cargo handling operations. 32

Finally the DOD IG failed to recognize that the PLS represents a revolution in the distribution systems. It is not just a replacement for its predecessors, but a whole new way of doing business. The report makes no mention of the savings in personnel, HEMTTS, M915's, semitrailers, MHE and the like that PLS provides.

Stephen K. Conver
Assistant Secretary of the Army
(Research, Development and Acquisition)

DEPARTMENT OF THE ARMY
U S ARMY TRANSPORTATION SCHOOL
FORT EUSTIS, VIRGINIA 23604-5389

REPLY TO
ATTENTION OF:

ATSP-CDC

06 MAY 1991

Final
Report
Page No.

MEMORANDUM FOR COMMANDER, U.S. ARMY MATERIEL COMMAND, ATTN: SARD-ZCS/AMCDE-S, 5001 EISENHOWER AVE, ALEXANDRIA, VA 22333-0001

SUBJECT: Supporting Analysis for Response to DOD IG Audit Report

1. References:

a. Draft Audit Report, DOD IG, 29 March 1991, Subject: Report on the Audit of the Acquisition of the Palletized Load System (PLS), Project No. 9AL-0067.

b. Meeting, HQ, AMC, 26 April 1991, Subject: Development of Army Response to DOD IG Draft Report on the Audit of the PLS.

2. Per your request made during the meeting at reference b, the following supporting rationale/analysis is provided to support SARDA response to the subject report. Addressed below are specific comments that refute assertions made in the DOD IG Report (ref a), followed by comments of a more general nature.

3. Specific comments:

a. Pages 7-10: NONCONCUR. Many of the report's assertions in this area are not reflective of the total requirements determination process that has been followed to date. In addition, the numbers used by the DOD IG were not the system requirement quantities the Army used in support of the PLS DAB (MDR IIIb). 5 - 7

(1) A key step in the requirements determination process that was conducted by the Army, the Audit Trail of PLS Requirements (TWV COEA), 26 April 1990, was not discussed in the report. Although the DOD IG report did quote quantities developed within the PLS Audit Trail, they were not the final quantities that this study developed.

(2) The PLS Audit Trail is a very comprehensive document in which the Army's requirements for PLS were recalculated based on changes in the force structure since the time of the original COEA. The PLS Audit Trail addressed basic changes in the overall force structure, which were changes between TAA 93 (POM 92) force structure and the projected TAA 96 force. In addition, the PLS Audit Trail adjusted the TAA 96 requirements in accordance with the current Quick Silver force reduction estimates at the time.

Finally, the alleged misuse of scenarios as discussed in the DOD IG report indicates a lack of understanding as to what this information was used for within the series of analyses related to the program and the Army force structuring/unit design process.

(3) In regard to the use of scenarios, the methodology used in the PLS COEA was an equal effectiveness/comparative cost analysis. This is of significant importance, if one is to understand the requirements determination process and how it relates to scenario use. Within this methodology, the number of replacement systems (PLS trucks, trailers, and flatracks) required to provide the equivalent capability of the base case equipment (those equipment items currently required on unit TOEs) is determined for each individual unit involved. The exact manner in which this "equivalent capability" is determined varies for the Transportation, Field Artillery, and Ordnance units involved, due to the role that each of these elements plays in the total ammunition distribution process. A discussion of this in any more detail is perhaps beyond the scope of this paper. But it is within this part of the analysis that the use of scenarios is involved. The intent of this type analysis is to, independent of the specifics of any one given scenario, determine the number of replacement systems necessary to perform at the same level as the base case. Hence, the focus is on the capability of the unit, vice the specifics of the scenario.

(4) The methodology involves using the requirements (for tonnage, etc) as prescribed or generated by the scenario to determine the capability of the base case system. Results of this analysis may show the base case capability to be lacking in that it may be unable to deliver the requisite tonnage in all cases. This is of little concern at this point in the process and is only an indication of the level of risk originally accepted within the design of the units involved. Having established and noted what this base case capability is, modeling and/or other analyses are performed to determined the number of new systems required to provide the same capability, using the same scenario based requirements. In this respect, the scenario is virtually irrelevant; any scenario could be used, as the focus is on matching the base case capability, rather than designing to meet the scenario's requirements. Once the the number of replacement systems is determined, comparative life cycle costs, as well as other types of analysis (i.e. deployability) are conducted to fully compare the base case and the replacement system options.

(5) It should be noted that the PLS option, because of its inherent efficiencies (self load/unload), exceeds the system capability of the base case concommitant with meeting the individual component elements' (TC, FA, Ord) required capabilities. This is not to say that the PLS requirement is overstated in this regard. The base case capability must be met, and it is only because of the characteristics of the PLS that overall system efficiencies can be realized. These efficiencies and the equipment replacement ratios associated with the PLS option translate directly to significant savings in terms of personnel requirements and equipment operating and sustainment (O&S) costs over the life cycle, when compared to the base case.

(6) In summary, the scenarios, as used within the series of analyses, are used purely as a tool to aid in establishing the quantities of systems within the individual units involved. And, because of the basic nature of the methodology employed, can not possibly lead to an overstatement of the requirement across the force structure.

(7) Once the various individual unit alternative designs are determined, they are "played" within the Total Army Analysis (TAA) process. This is the Army's force structuring process, conducted on a recurring basis (every two years). As each TAA is conducted, it establishes the benchmark for the structuring of the force. The number of each type of individual unit required within the total force structure is determined as the result of this process. Within the TAA, a series of scenarios, known as Illustrative Planning Scenarios (IPS), are utilized. Use of the IPS is different from using a specific scenario, such as Europe 5.0, in that it represents the aggregated requirements across the Army's three major theaters of interest (SWA, NEA, NATO) over an extended period of time. The requirements data from the IPS are used in a manner such as to preclude focusing on an individual theater, which appeared to be one of the DOD IG's major concerns. As each TAA is conducted, the IPS are updated in order to be consistent with the Defense Military Guidance, which relates directly to the current world threat. In summary, it is through this process that we ensure that the Army's force structure is consistent with the current threat, which was another of the DOD IG's concerns.

(8) The original COEA and initial requirements determination utilized TAA 93. The Audit Trail, as its first step, updated the total requirement for PLS using the force structure from TAA 96, which is the current "benchmark." Then, using this (TAA 96) as a new baseline, the then current estimate of force decrements (Quick Silver) were applied against the force

structure to reduce the associated PLS requirements accordingly. It is these numbers that were used as the program requirements by the Army at the time of the DAB.

(9) The numbers used in the DOD IG report on pages 8 and 9 are the pre-Quick Silver TAA 96 quantities and therefore should not have been used, in that these are not the final numbers developed within the PLS Audit Trail. As stated above, they are not the numbers the Army used to define the program requirements for the DAB. Use of these figures carries over in the portion of their report that deals with 8" howitzer requirements, making their analysis in this area inaccurate. As an aside, the numbers they presented do not fully address the flatrack requirements, as was done in the PLS Audit Trail. 6 6

b. Page 11-13: NONCONCUR. The assertions made in this portion of the DOD IG report pertaining to 8" howitzer requirements, the supporting CSS force structure, and MLRS truck requirements are questionable. While it is in fact true that the Army is phasing 8" howitzer units out of the force structure by converting these units to MLRS, this is not scheduled to be completed until approximately 2006. The Army's Field Artillery Echelon Above Division (EAD) Transition Plan prescribes the schedule for the conversion of 8" units to MLRS. The actual schedule for the conversion of these 8" units to MLRS is primarily dependent on the number of M270 MLRS launchers the Army can afford to buy. Any reduction in the funding of this program will slow the transition plan, resulting in 8" units remaining in the force structure, in greater numbers, for an increased period of time. In addition, preliminary observations from Desert Storm indicate a potential continued role for 8" units in the force beyond the dates prescribed in the current EAD transition plan. Not fielding PLS to 8" units now would deny some units modernized vehicles for over 12 years. 7 - 9

(1) Another reason why not fielding PLS to 8" units does not make sense is that the PLS is the current candidate vehicle to fill new MLRS unit requirements, once the current pool of available HEMTTs (M985) is exhausted. In this light, 8" units with PLS that convert to MLRS will have a "jump on the problem" as it pertains to filling truck requirements (MLRS units have a greater vehicle requirement per unit than do 8" units). The larger issue as to whether it is best to field PLS to MLRS units is discussed below.

(2) There are other consequences associated with not fielding PLS to 8" units. The first of these is that the personnel savings (approximately 425 FA drivers) associated with

having a fewer number of vehicles in these units would not be realized. This is fairly significant when the military pay and allowances (MPA) portion of O&S costs are considered over the life cycle. Another consideration is that some of the ammunition handling capability could possibly have to be put back into the force structure, in the form of personnel and/or equipment at the ATP/ASPs. The operational impact would be a reduced throughput capability at ATP/ASPs; this is totally inconsistent with the direction of our maneuver oriented ammunition distribution system. Also, if 8" units do not receive PLS, they must retain their current ammunition hauler, the M977 HEMTT. This presents a problem in that upon fielding of PLS, these M977s have been scheduled to be redistributed to meet requirements in Apache and Mechanized Infantry units; without these HEMTTs, another solution must be resourced for these units.

(3) As alluded to earlier, the DOD IG report used the pre-Quick Silver requirements figures for the 8" units. Therefore, their assertion that the 8" requirements represent 36% of the total Field Artillery requirement is inaccurate. In actuality, it is about 26% of the Field Artillery requirement (492/1874), although the relevance of this percentage is questionable. In the next portion of their report, this 36% figure is used in an attempt to establish that if the 8" howitzer portion of the program was not executed, that a directly proportional amount of the CSS force structure (Transportation & Ordnance) would not require the system. This is invalid and indicates misunderstanding of the class V distribution system.

(4) The DOD IG report states (page 11) that they "observed that 36 percent of the vehicles required to support Ordnance and Transportation units would be used to move 8" howitzer ammunition through the distribution system to Field Artillery units." They further assert that therefore, 36% of the Transportation and Ordnance requirements would not be needed after the 8" howitzers are phased out. There are several things wrong with this assertion. 8

(5) First, as was pointed out earlier, the wrong requirements quantities were used, therefore their quantitative analysis, to include the cost information they presented is inaccurate. Their presentation of the cost information is incomplete in that it is not a life cycle analysis and one-sided in that it does not show the cost of the base case alternative, precluding any comparison.

(6) Secondly, as has already been established, there will be 8" units in the force structure well beyond the completion of the current program. Whether the 8" units have PLS organic to them or not, they still generate the same demands for ammunition on the Class V distribution system, which is operated by the Transportation and Ordnance units. These units can not be cut by any percentage or our capability to deliver ammunition would be severely hindered. In addition, their "straight-line" use of the 36% figure indicates that they are under the impression that PLS supports only the Field Artillery community, when in fact the capability vested in the Transportation and Ordnance units is there to support the movement of all class V for all units. This includes MLRS, which is particularly relevant, because as 8" units are phased out of the force structure, they are actually converting to MLRS design. MLRS units actually place a greater demand on the distribution system (Transportation & Ordnance units) because the cube requirements associated with the volume of MLRS rocket pod containers (RPC) exceeds the tonnage associated with the 8" howitzer.

(7) In regard to the portion of the report that discusses the cost effectiveness of PLS becoming the ammunition hauler organic to MLRS units, the following is offered. The DOD IG references a two year old message that stated that the Army would use PLS to support all MLRS unit activations after FY 93. This was based on the lack of HEMTT availability beyond that date, as well as a fairly ambitious or optimistic rate at which the Army would buy M270 MLRS launchers. It was also before anyone had heard of Quick Silver. Obviously some things have changed since that time. Among other things, the truck requirement per MLRS battalion has been reduced from 54 to 36. While this is a TOE change essentially directed by the CG, TRADOC, it is appropriate under MOADS doctrine. Under MOADS, MLRS units only have to go the brigade or DS ATP for their RPCs (prior to MOADS, MLRS units had to got to the ASP/CSA for RPCs). Fewer HEMTT requirements per battalion allows us to support more MLRS unit activations using available HEMTTs and delays the MLRS need for PLS until the FY 98 timeframe. At the same time, the "objective" force structure looks as if there will be on the order of 40 MLRS battalions, as opposed to the 62 battalions envisioned in 1989, when the referenced message was sent. This indicates that the DOD IG report is perhaps based on incomplete information; their cost figures are likely in error due to these factors.

(8) The DOD IG report also referenced the "Palletized Load System Follow-on Analysis," which was completed on 26 March 1990. In general terms, the Follow-on Analysis established that use of PLS organic to MLRS units appeared to be neither cost or operationally effective. The report espoused the Field Artillery School position that the requisite replacement ratio between HEMTT and PLS within MLRS units must be 1:1. With this as the replacement ratio, opting for PLS is obviously not cost effective. But, with the HEMTT no longer available as an option, this is a mute point. In addition, many of the operational effectiveness concerns addressed in the report were tied to materiel related issues. Many of these have been overcome by successful testing after the completion of the Follow-on Analysis report.

4. General comments:

a. The logistics support concept being developed within AirLand Battle Future relies heavily on the PLS capability. The distribution system will be characterized by extended lines of communications over which we will have to rapidly mass or "maneuver" our logistics support capability. The mobility of the PLS, coupled with its self load/unload and increased tonnage capabilities, is critical to the success of this concept.

b. Our Operation Desert Shield/Storm Observations substantiate/support the need for the PLS. In many cases the availability of MHE severely hampered our ability to push forward ammunition. The PLS' inherent load/unload capability serves to virtually eliminate the time spent waiting to be loaded and the actual loading and unloading times at ammunition storage sites and transfer points. The PLS' increased tonnage and mobility as compared to the M915 (or the HEMTT in sand) would have greatly enhanced our throughput capability.

c. Finally, we nonconcur with the DOD IG's assertions pertaining to the load carrying capacity and any relation between this and cost effectiveness; it is our understanding that AMSAA and the materiel developer are providing you with ample information to refute the issues the DOD IG report contained in this area.

5. Point of contact for this action is MAJ Zargan, ATSP-CDC, AV 927-6542.

6. Team T-School--Proud, Positive, and Proactive!

FOR THE ASSISTANT COMMANDANT:

ELIJAH TONEY
COL, TC
Director of Combat Developments

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION CORPS OF ENGINEERS
3909 HALLS FERRY ROAD
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REPLY TO
ATTENTION OF

CEWES-GM-L (70-1r)

19 Apr 91

MEMORANDUM FOR Commander, U.S. Army Training and Doctrine Command,
ATTN; ATZF-TW/COL John G. Larkins, Fort Eustis, VA 23604

SUBJECT: Mobility Performance of the HEMTT and the Palletized Loading System (PLS)

1. References:

a. Your visit on 4 Apr 91.

b. Draft memorandum, 29 Mar 91, subject: Report on the Audit of the Acquisition of the Palletized Load System (Project No. AL-067).

2. This memo provides mobility information on the PLS at payloads of 11, 13, and 16.5 tons and the M985 HEMTT at a payload of 11 tons. The soft soil performance, percent NOGO area off-road and mobility rating speed at tactical standard were used in the performance specification to assess mobility performance. These same parameters were used to assess the performance of the HEMTT and the PLS at various payloads and surface conditions in Germany and the Mid-East. The PLS mission profile calls for extensive on-road performance; therefore, the mobility rating speeds at tactical support are also given. The slope climbing capability, an important mobility parameter, is also examined.

3. The enclosed table lists the performance data for the HEMTT and the PLS at various payloads. These data show that the PLS outperforms the HEMTT for almost all mobility parameters at 11 and 13 tons. At 16.5 tons, the PLS outperforms the HEMTT in many terrain and surface conditions. The NOGO performance off-road for all vehicles is low in the Mid-East study area. Off-road, the HEMTT with a 11 ton payload will outperform the PLS with a 16.5 ton payload in the wet season in the German study area. The superior ride performance of the PLS is a distinct advantage over the HEMTT. The soft soil and slope performance show that the PLS has slightly better soft soil and slope climbing capability over the HEMTT which can be attributed to the PLS's central tire inflation system. Due to lack of specifics in the draft memorandum, we are not sure what is meant by the 15 percent degradation of the PLS versus the HEMTT. We have reviewed our files and find no statement regarding a 15 percent degradation of the PLS versus the HEMTT. When you consider the load and unload times associated with the two vehicles and the closeness of the 32 mobility factors listed in the table, it appears that in most instances the PLS exhibits better performance than the HEMTT.

4. Any questions concerning this data should be directed to Messrs. Keafur Grimes or Donald D. Randolph at (601) 634-3319 or (601) 634-2694, respectively.

FOR COMMANDER AND DIRECTOR:

Encl

WILLIAM F. MARCUSON III
Chief, Geotechnical Laboratory

Table 1 Definition

Vehicle Cone Index - Non-dimensional measure of the soil strength required to support one pass of the vehicle without becoming immobilized.

Percent NOGO - The percentage of a given terrain area denied to the vehicle for various reasons; i.e., traction, power, obstacle size etc. The PLS is essentially the same as the HEMTT in Europe and Mid-East areas with the exception of Mid-East sand where it is over 200 percent better.

Tactical Standard/Tactical Support Mobility - Mobility levels defined by the percentage of time a vehicle is drivrn on highway, secondary roads and off-road terrain. The PLS truck is required to have tactical standard mobility. In nine of the twelve situations shown for both levels of mobility, the PLS is better than the HEMTT.

Maximum Slope - The maximum longitudinal grade (percent) that the vehicle can ascend. The combined effects of the fifth axle and the CTIS provides the 16.5-ton PLS with an advantage over the 11-ton HEMTT in seven of the ten slope/soil strength combinations addressed.

TABLE 1

Vehicle Performance Data for the M985 (HEMTT) and the Palletized Loading System (PLS)

Vehicle	Soft Soil Performance, Vehicle Cone Index: Fine-grained soils at Given Tire Deflection, Cross-Country	Fine-grained soils at Given Tire Deflection, Mud/Snow	Coarse-grained soils at Given Tire Deflection, Cross-Country	Coarse-grained soils at Given Tire Deflection, Mud/Snow
M985 11 TON	33	30	42	31
PLS 11 TON	30	27	37	23
PLS 13 TON	32	29	39	25
PLS 16.5 TON	35	32	43	27

Vehicle	Percent NOGO Area: Germany, Dry	Germany, Wet	Germany, Snow	Mid-East, Dry	Mid-East, Wet	Mid-East, Sand
M985 11 TON	6.5	19.3	15.7	4.8	4.8	17.3
PLS 11 TON	7.6	15.1	18.4	4.4	4.4	6.2
PLS 13 TON	7.6	17.1	17.7	4.4	4.4	6.3
PLS 16.5 TON	7.7	21.5	17.6	4.4	4.4	7.2

Vehicle	Tactical Standard Mobility Level, mph: Germany, Dry	Germany, Wet	Germany, Snow	Mid-East, Dry	Mid-East, Wet	Mid-East, Sand
M985 11 TON	11.8	10.5	12.0	14.4	14.1	1.6
PLS 11 TON	12.9	11.7	11.6	16.6	15.9	2.4
PLS 13 TON	12.8	11.3	11.3	16.4	15.6	1.9
PLS 16.5 TON	12.5	8.1	10.8	16.2	15.2	1.9

Vehicle	Tactical Support Mobility Level, mph: Germany, Dry	Germany, Wet	Germany, Snow	Mid-East, Dry	Mid-East, Wet	Mid-East, Sand
M985 11 TON	15.1	14.6	15.7	16.9	16.7	16.3
PLS 11 TON	16.7	15.9	15.1	19.6	19.0	18.3
PLS 13 TON	16.5	15.7	14.6	19.4	18.8	18.0
PLS 16.5 TON	16.2	15.1	13.8	19.1	18.2	17.4

Soil Strength RCI	Maximum Slope percent, Fine-Grained Soils: M985 11 Ton	PLS 11 Ton	PLS 13 Ton	PLS 16.5 Ton
300	65	65	65	65
100	62	62	62	62
60	54	57	56	55
40	28	40	37	31
30	NOGO	16	11	NOGO

Soil Strength CI	Maximum Slope percent, Coarse-Grained Soils: M985 11 Ton	PLS 11 Ton	PLS 13 Ton	PLS 16.5 Ton
300	36	39	38	37
100	20	24	23	22
60	11	16	15	13
40	4	9	8	6
30	NOGO	4	3	2

OFFICE OF THE DIRECTOR OF
DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, DC 20301-3030

15 APR 1991

(TWP)

MEMORANDUM FOR DoD IG
Attn: Director, Acquisition Management Directorate

SUBJECT: DOD IG Draft Audit Report on Palletized Loading System (PLS) (Project No. 9AL-0067)

I concur with the recommendations made in subject draft report to review PLS acquisition plans in light of current or expected changes in mission requirement or force structure. In order to assess whether a formal Conventional Systems Committee review is appropriate, I have requested that the Army provide me within 30 days with their response to the recommendations made in the draft report, and in particular with the results of the specific analyses called out in recommendation 1.a., p.17. 11

Frank Kendall
Acting Deputy Director
(Tactical Warfare Programs)

AUDIT RESPONSES TO MANAGEMENT COMMENTS

This Appendix provides detailed responses to comments that the Director of Combat Development at the U.S. Army Transportation School provided to higher level Army officials in response to our draft report. As shown in Appendix B, the Office of the Assistant Secretary of the Army (Research, Development and Acquisition) relied heavily on the Director's comments to establish the Army's position on conclusions and recommendations in our draft of this report.

Director's Comments. As shown in paragraphs 3.a., 3.a.(1), and 3.a.(2) of his comments, the Director stated that our draft report did not fully describe the total process that the Army used to determine the numbers of trucks, trailers, and flatracks to buy in the Palletized Load System (PLS) program. Specifically, he stated that our draft report did not contain any discussion on a key step within the requirements determination process used by the Army--the Army's development of the "Audit Trail of PLS Requirements."

Audit Response. The Director was correct in stating that we did not discuss the "Audit Trail of PLS Requirements" (the Audit Trail) in our draft report. However, we saw no need to discuss the Audit Trail as part of our description of the process that the Army used to determine PLS requirements. Furthermore, we still see no necessity to address the Audit Trail in the report. The Audit Trail of PLS Requirements is merely what its title indicates--a record of various changes to PLS quantitative requirements.

Director's Comments. In paragraph 3.a.(2) of his comments, the Director stated that " . . . the alleged misuse of scenarios as discussed in the DOD IG report indicates a lack of understanding as to what this information was used for within the series of analyses related to the program and the Army force structuring/unit design process." Further, in support of his statement, the Director provided extensive comments (see paragraphs 3.a.[3] through 3.a.[8]) explaining how the Army determined how many PLS trucks, trailers, and flatracks it needed, how many PLS trucks, trailers, and flatracks should be in each transportation unit, and how many PLS Transportation, Ordnance, and Field Artillery transportation units should be in the Army force structure to move ammunition.

Although not explicitly stated in his comments, the Director inferred that our draft report was incorrect in stating that PLS requirements were based on an outdated scenario. As such, the Director indirectly said that the Army did not need to redetermine PLS requirements. He stated that European scenario 5.0, which we stated that the Army used as the basis for determining PLS requirements, had practically no effect on PLS requirements determinations. To emphasize his point, he added

that any scenario could have been used because the focus of the Army's PLS requirements determination process was to determine how many PLS trucks, trailers, and flatracks were needed to replace transportation assets authorized for certain types of transportation units, not to determine the transportation assets needed to satisfy the scenario's requirements. The Director further maintained that PLS requirements could not have been based on an outdated scenario because the requirements were adjusted based on the results of Total Army Analysis (TAA) 96, which was made using scenarios consistent with Defense guidance.

Audit Response. We disagree with the Director's comments that European scenario 5.0 had no effect on the PLS requirements determination process. It is documented in the Cost and Operational Effectiveness Analysis for the PLS that European scenario 5.0 was used to determine the number of short tons of ammunition that the Army would have to move each day to support a war effort in Europe. Also, the Audit Trail clearly reflects the number of PLS trucks, trailers, and flatracks necessary to move those short tons. Further, the Audit Trail included calculations showing that the Army determined the number of flatracks required in the PLS program based solely on the number of short tons of ammunition that the Army would have to move each day under European scenario 5.0. Considering such evidence, the Director had no factual basis to state that European scenario 5.0, which was developed in 1984 before changes in world conditions, had no effect on PLS requirements determinations.

The Director was also incorrect in concluding that PLS requirements were developed using current scenarios simply because the requirements were adjusted based on the results of TAA 96. We agree that PLS requirements were adjusted using the results of TAA 96. Furthermore, we understand that TAA 96 was based on scenarios stemming from Defense guidance current at the time that the Army initiated efforts to perform TAA 96. However, such facts do not mean that the scenarios used in TAA 96 were current. They were not. The scenarios used in TAA 96 were developed in 1988, before the major changes that occurred in Europe in 1990 and 1991.

Director's Comments. In paragraph 3.a.(9) of his comments, the Director stated that the numbers of trucks, trailers, and flatracks that we showed in our draft report as required for the PLS program did not represent the latest requirement quantities for the program. He explained that the quantities presented in the draft report did not include reductions for decreases in the Army's force structure.

Audit Response. The Director was correct. We adjusted the requirement quantities so that this report reflects the requirement quantities as of the time of our audit.

Director's Comments. In paragraphs 3.b. through 3.b.(6) of the Director's comments, the Director questioned our conclusion that PLS requirements were overstated because the PLS program included requirements for PLS trucks, trailers, and flatracks to support 8-inch howitzer units that the Army planned to phase out of the inventory. Key reasons that the Director provided for questioning our conclusion are itemized below.

- PLS equipment is needed to support 8-inch howitzer units because the units are not scheduled to be phased out of the Army until FY 2006. Also, it is possible that 8-inch howitzer units could remain in the Army after FY 2006 because the phase out schedule is dependent on the Army acquiring the Multiple Launch Rocket System (MLRS).

- Preliminary observations from Desert Storm indicate a potential continued role for 8-inch howitzer units.

- The Army plans to use PLS to support MLRS units. Since MLRS units are replacing 8-inch howitzer units, PLS equipment bought for 8-inch howitzer units could be transferred to MLRS units when the 8-inch howitzer units are phased out.

- The Army would not achieve personnel savings (about 425 field artillery drivers) by not buying the PLS to support 8-inch howitzer units.

- Not using the PLS to support 8-inch howitzer units would require the Army to buy more Heavy Expanded Mobility Tactical Trucks (HEMTT) because the HEMTT's in 8-inch howitzer units are scheduled to be redistributed to meet requirements in Apache and Mechanized Infantry units.

- The number of PLS trucks specified in the draft report in support of 8-inch howitzer units was in error because the report did not reflect reductions in the requirements that the Army made shortly before the audit was finished in January 1991. The draft report showed 768 trucks and 768 flatracks in support of 8-inch howitzer units. The Army reduced those numbers to 492 trucks and 492 flatracks.

The Director also stated that our conclusion that a proportional share of PLS equipment planned for Transportation and Ordnance units was not needed because there was no PLS requirement for support of 8-inch howitzer units. (Note: In our draft report, we stated that 36 percent [768 of 2,114 PLS trucks] of the PLS requirements in support of Field Artillery units were for support of 8-inch howitzer units that were phasing out of the Army. Further, since the 8-inch howitzer units would not be in the Army, we stated that 36 percent of the PLS requirements in

support of Transportation and Ordnance units was not needed.) The Director maintained that our conclusion was invalid for two reasons. First, PLS requirements in support of 8-inch howitzer units represented only 26 percent (492 of 1,874 PLS trucks) of the requirements in support of Field Artillery units. Second, PLS requirements for Transportation and Ordnance units could not be reduced by 26 percent because the units would still have to support either 8-inch howitzer units or MLRS units.

Audit Response. The Director was not realistic in commenting on our conclusions on the need for PLS to support 8-inch howitzer units. The reality is that the Army plans to phase out 8-inch howitzer units by FY 2006. As such, we do not see any overriding advantage in buying PLS equipment to support units that are scheduled to phase out of the force structure.

In response to the Director's comments about 8-inch howitzer units being without PLS equipment to FY 2006, we see no need for the Army to buy PLS equipment for 8-inch howitzer units that the Army has scheduled to phase out of its force structure. The units have 5-ton trucks and HEMTT's, and reportedly both types of trucks performed well in Desert Shield and Desert Storm operations. Further, as 8-inch howitzer units are phased out of the force structure, there will be an increasing supply of trucks available to support units that are awaiting phase out action.

As for the Director's comments on 8-inch howitzer units remaining in the force structure after FY 2006, we considered those comments incomplete because the Army had not decided that the units will remain in the force structure. If or when the Army decides to keep 8-inch howitzer units in the force structure, the Army can then decide the extent that it would be cost-effective to buy PLS equipment to support the units.

The Director's comments about the need for PLS to support MLRS units were also incomplete. We do not consider PLS support of MLRS units to be cost-effective for two reasons: the PLS truck costs $100,000 more than the HEMTT, and the PLS truck will carry no more MLRS pods than the HEMTT.

Regarding the Director's comments concerning the loss of personnel savings by not using the PLS to support 8-inch howitzer units, any personnel savings realized as a result of using PLS equipment to support the units will be shortlived. The savings would only be realized for the relatively short period of time that the PLS equipment would be available to support units that are phasing out of the force structure. Further, we question

whether the resultant savings in total will be sufficient to more than offset the cost of using PLS equipment for only a limited part of the equipment's expected life.

As for the Director's comments about our draft report not accurately reflecting the numbers of PLS trucks and flatracks in support of 8-inch howitzer units, his comments were correct. Our draft report reflected the numbers of PLS trucks and flatracks planned for the units before reductions that the Army made in January 1991. We have made appropriate adjustments to the numbers in this report. We also agree with the Director that, since the Army deleted 276 PLS trucks from support of 8-inch howitzer units, there is only 26 percent (1,874 ÷ 492) of the trucks in Ordnance and Transportation units in support 8-inch howitzer units. However, an additional 15 percent (1,874 ÷ 276) of trucks shown as required for Ordnance and Transportation units was originally for support of 8-inch howitzer units. The Army now contends that the same 15 percent of trucks will be in support of the 276 trucks that the Army plans to preposition for Southwest Asia, but we disagree. As stated in our report, we question the Army's plan to preposition 276 trucks for Southwest Asia. Accordingly, we question the need for all 41 percent (26 + 15 percent) of the trucks in Ordnance and Transportation units that was originally in support of 8-inch howitzer units.

Last, we disagree with the Director's comments that PLS requirements in Transportation and Ordnance units could not be reduced by 26 percent. As we have previously discussed, 8-inch howitzer units were scheduled to phase out of the force structure, and it would not be cost-effective to use PLS equipment to support MLRS units. Therefore, there is no justification for the portion of PLS's requirements in Transportation and Ordnance units that are related to support of either 8-inch howitzer or MLRS units.

Director's Comments. In paragraph 3.b.(7) of his comments, the Director stated that the PLS requirements for support of MLRS units has been reduced. He explained that the number of PLS trucks for each MLRS battalion was reduced from 54 trucks to 36 trucks. Further, he added that " . . . the 'objective' force structure looks as if there will be on the order of 40 MLRS battalions, as opposed to the 62 battalions envisioned in 1989. . . ."

Audit Response. We contacted Army officials and found that the Army had reduced the number of trucks assigned to each MLRS battalion from 54 trucks to 36 trucks. The Commanding General of TRADOC directed the reduction. As such, we adjusted the data shown in this report to recognize the reduction in the number of PLS trucks planned for each battalion. However, we did not adjust data shown in this report to recognize the planned reduction in the number of MLRS battalions planned for the force structure because the Army, as of September 5, 1991, had not made the reduction.

Director's Comments. In paragraph 3.b.(8) of his comments, the Director stated that it was a "mute" point as to whether the HEMTT's were as cost-effective as PLS trucks in supporting MLRS units. We assume that the Director made this statement because the production line for HEMTT's is scheduled to be discontinued in FY 1993.

Audit Response. We disagree with the Director's comments about the cost-effectiveness of the HEMTT in support of MLRS units being a moot point. The HEMTT would be more cost-effective than the PLS truck to support MLRS units because it costs substantially less and can carry the same number of MLRS pods. Also, the fact that the production line for the HEMTT is scheduled to be discontinued in FY 1993 should not present a major obstacle. If the Army continued to buy HEMTT trucks, we believe the contractor would keep the production line open.

Director's Comments. In closing, the Director provided in paragraphs 4.a. and 4.b. some general comments on the need for the PLS. He stated that "The logistics support concept being developed within Airland Battle Future relies heavily on the PLS capability." He further commented that the mobility of the PLS, coupled with its self load and unload and increased tonnage capabilities, is critical to the success of the logistics support concept. He also stated the his organization's observations of Operations Desert Shield and Desert Storm substantiate the need for the PLS. In support of this statement, he pointed out the lack of materiel handling equipment "severely hampered" the Army's ability to push ammunition forward and concluded that the PLS with its capabilities would have greatly enhanced the Army's ability to deliver needed materiels to operational units.

Audit Response. We have not questioned the cost or operational benefits of the PLS' self load and unload features and increased capacity. We recognize that the features and capacity provide opportunities for economies when properly used. Our report, however, does address planned uses of the PLS, which we do not believe are justified from a cost-effectiveness viewpoint, as well as other matters. We believe proper management attention to those matters would only improve the PLS program and ensure that our scarce Defense dollars are spent wisely.

POTENTIAL MONETARY AND OTHER BENEFITS RESULTING FROM AUDIT

Recommendation Reference	Description of Benefits	Amount and/or Type of Benefits
1.	Economy and Efficiency. Palletized Load System (PLS) acquisition requirements will be based on current threat and mission data.	Nonmonetary.
1.a.	Economy and Efficiency. The Army will not purchase the PLS for a system that is being phased out and the Army will use less costly vehicles to support Multiple Launch Rocket Systems units.	$279.8 million of funds to better use.*
1.b. and 1.c.	Program Results. The Army will determine whether the cargo capacity limitation will render the PLS as not cost-effective for its mission.	Nonmonetary.
2.	Program Results. The Army Systems Acquisition Review Council will have an opportunity to make PLS program decisions based on accurate data.	Nonmonetary.

* Additional savings could be realized on this recommendation, depending on the results of the Army's recalculation of requirements. For example, the recommendation provides for PLS requirements to be reduced by $653.8 million. However, we did not claim the $653.8 million as a potential monetary benefit because it could be offset by other conditions that the Army will consider in its recalculation. After the Army completes its recalculation, we may claim additional potential monetary benefits.

ACTIVITIES VISITED OR CONTACTED

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U.S. Army Armor Center, Fort Knox, KY
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Waterways Experiment Station, Vicksburg, MS

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