Audit Report

OFFICE OF THE INSPECTOR GENERAL

ACQUISITION OF THE TUBE-LAUNCHED, OPTICALLY-TRACKED WIRE-GUIDED MISSILE SYSTEM

No. 91-017 December 4, 1990

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Department of Defense

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

December 4, 1990

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (FINANCIAL MANAGEMENT)

SUBJECT: Report on the Audit of the Acquisition of the Tube-Launched, Optically-Tracked, Wire-Guided Missile System (Report No. 91-017)

This is our final report on the Audit of the Acquisition of the Tube-Launched, Optically-Tracked, Wire-Guided Missile System (TOW) for your information and use. Comments on a draft of this report were considered in preparing the final report. Also, the report was updated to reflect missile procurement quantities shown in the President's FY 1991 budget and to incorporate component breakout guidance provided by the Deputy Secretary of Defense in August 1990. We made the audit from July 1989 through March 1990. The overall audit objective was to evaluate the acquisition management of TOW regarding nine program management elements critical to the late production and deployment phase of the acquisition process. We also reviewed the adequacy and efficiency of internal controls relating to the management of the TOW program. Program cost from FY 1963 through FY 1997 is budgeted to be about $8 billion. The Army procured 250,838 TOW missiles through FY 1990, and plans to procure about 68,000 during FY's 1991 through 1997, as shown in the President's FY 1991 budget. The TOW program is managed by the TOW Project Office under the Program Executive Officer for Fire Support, Department of the Army.

The TOW acquisition program was generally managed quite effectively. We did not identify any problems in five of the nine program areas audited. The audit results for those five areas are summarized in Appendix A. However, we identified opportunities for improvements involving logistics support, contract procedures, system modification and improvement, and mission effectiveness. The following paragraphs summarize the results of the audit, and the findings, recommendations, and management comments are discussed in Part II of this report.

Technical data packages for the TOW launch systems were not adequate to provide for efficient procurement of 50 repair parts. In addition, the Sacramento Army depot was unable to implement revised test procedures and to modify equipment required as a result of an engineering change to a component of the Bradley Fighting Vehicle launch system. As a result, the

Army procured unusable repair parts. Also, item managers were unable to fill high priority requisitions, necessitating the issuance of the next higher assembly. In addition, TOW maintenance personnel did not receive all required hands-on training (page 5).

The TOW Project Office has pursued component breakout procurement strategies for some TOW components in the past, but now has opportunities to update and expand its efforts. We estimated that breakout of seven additional missile components could result in $39.6 million in cost savings for FY's 1992 through 1997, based on missile procurement quantities reflected in the President's FY 1991 budget (page 11).

The TOW Project Office established warranties with expected-failure thresholds that were not cost-effective. As a result, $4.1 million spent during FY's 1984 through 1989 for TOW warranties was not cost-effective (page 17).

As a result of our exit conference, the Army took immediate action to correct conditions regarding contracting procedures and production acceptance testing. Because of the Army's prompt action to correct these conditions, the conditions are not being reported as audit findings, but are summarized in the Other Matters of Interest section of the report.

On June 26, 1990, we provided a draft of this report to the Assistant Secretary of the Army (Financial Management) for comments. The Army nonconcurred with Recommendation A.1., to perform configuration audits of any future procurements of repair parts. The Army stated that configuration audits are performed as a result of a Class I Engineering Change to an item. Therefore, there is no need to perform a new configuration audit for each procurement. As a result of the Army's comments, we have revised our recommendation. We request that the Army provide final comments on the revised recommendation including proposed corrective actions and completion dates. The Army concurred with Recommendation A.2., to program adequate funds for future engineering changes. The Army's response satisfied the intent of the recommendation.

We recommended (B.1.) that the Project Office revise its 1990 breakout study and break out components when it is cost-beneficial to do so. We also recommended (B.2.) that the Project Office revise the March 1990 component breakout study by showing contractor indirect costs on the Government savings and support any risk factors used in the component breakout study revision.

The Army nonconcurred with Recommendation B.1., stating that a component breakout study, which was made during March 1990, showed that component breakout was not economical. The Army nonconcurred with Recommendation B.2., stating that redistribution of indirect costs over existing contracts after component breakout will result in higher Government contract costs. The Army also stated that the 20-percent risk factor was acceptable by general costing allowances for unknown, unscheduled cost increases. We believe these recommendations are still valid for reasons discussed in Part II of this report. We request that the Army reconsider its position when commenting on the final report.

We recommended (C.1.) that the Commander, U.S. Army Missile Command, determine the adequacy of the system for recording and reporting warranty defects. We also recommended (C.2.) that the Program Executive Officer for Fire Support use available historical data on defects in determining the cost-effectiveness of warranties included in future contracts. The Army concurred with Recommendation C.1., stating that the administrative system to record and report warranty defects was determined to be adequate. We request that the Army provide us with the specific actions that were taken to determine that the warranty defects reporting system was adequate. The Army concurred with Recommendation C.2., stating that the TOW Project Office will use available historical data on warranty claims to determine the cost-effectiveness of warranties included in future contracts.

The Army Program Executive Officer for Fire Support disagreed with the amount of potential monetary benefits of Recommendations B.1. and B.2. We believe that these benefits are valid for reasons discussed in Part II of the report; therefore, we ask that management provide final comments on the estimated monetary benefits, identified in Appendix I, of $39.6 million. Potential monetary benefits are subject to resolution in the event of nonconcurrence or failure to comment.

DoD Directive 7650.3 requires that all audit recommendations be resolved promptly. Accordingly, final comments on the unresolved issues in this report should be provided within 60 days of the date of this memorandum.

This report contains data that may be contractor sensitive. Therefore, the report should not be released outside of the Department of Defense.

The courtesies extended to the audit staff are appreciated. If you have any questions on this audit, please contact Mr. Thomas Gimble at (703) 614-1414 (AUTOVON 224-1414) or Mr. William Van Hoose at (703) 693-0382 (AUTOVON 223-0382). The audit team members are listed in Appendix K. Copies of this report are being provided to the activities listed in Appendix L.

Robert J. Lieberman
Assistant Inspector General
for Auditing

Enclosure

cc:
Secretary of the Army

REPORT ON THE AUDIT OF THE ACQUISITION OF THE TUBE-LAUNCHED, OPTICALLY-TRACKED, WIRE-GUIDED MISSILE SYSTEM

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Prepared by:
Acquisition Management
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Project No. 9AL-0054.01

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REPORT ON THE AUDIT OF THE ACQUISITION OF THE TUBE-LAUNCHED, OPTICALLY-TRACKED, WIRE-GUIDED MISSILE SYSTEM

PART I - INTRODUCTION

Background

The Tube-Launched, Optically-Tracked, Wire-Guided Missile System (TOW) was designed to defeat tanks, armored vehicles, and other targets, such as field fortifications. The TOW development program was approved in January 1963. The first production contract was awarded to Hughes Aircraft Company in June 1968, and the missile was fielded in 1970. In 1980, the Army embarked on a program to improve the performance of the TOW against advanced enemy armor. The first version, the Improved TOW, which involved an improved warhead to increase armor penetration characteristics, was fielded in 1981. The second version, the TOW 2, contained a larger warhead. The third version, the TOW 2A, was designed to defeat reactive armor [1/] and was fielded in 1987. In September 1987, the Army awarded a cost-plus-incentive-fee contract to Hughes Aircraft Company for full-scale development of the fourth version, the TOW 2B. The TOW 2B was designed to fly over, and fire down on, a target. The Army expected to begin development and operational testing of the TOW 2B in May 1990. In July 1989, the Army awarded a second source production contract to McDonnell Douglas Corporation for 300 TOW 2A missiles. However, on May 31, 1990, the Deputy Under Secretary of Defense for Acquisition authorized the TOW Project Office to proceed with the termination of the second source production contract with McDonnell Douglas Corporation. This action was taken because projected procurement quantities were not sufficient to support two production sources. The Army used three launch subsystems to fire all versions of the TOW missiles, which were the ground, airborne, and Bradley Fighting Vehicle launch system.

The TOW Project Office manages the TOW program under the direction of the Program Executive Officer for Fire Support, Department of the Army. Program costs through FY 1997 will be about $8 billion.

1/ Reactive armor is mounted on the outside of a tank and relies on explosively driving metal plates into the path of a warhead's shaped-charge jet, thus degrading the warhead's penetration capabilities.

Objective and Scope

The overall audit objective was to evaluate the acquisition management of the TOW to determine whether the System was effective, economically procured, and properly supported. We made the audit in accordance with our critical program management element approach. Under this approach, we focused our evaluation on the nine elements of program management that are critical to the late production and deployment phase of the TOW program. During the survey phase of the audit, we determined that additional audit work was not warranted on five program management elements. The results of our review of these five elements are summarized in Appendix A. During the verification phase of the audit, we assessed the status of the four remaining program management elements: modification and improvement program, mission effectiveness, contract procedures, and logistics support.

This performance audit was conducted from July 1989 to March 1990 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. We obtained and reviewed data and information from January 1985 through March 1990 to support the audit. We interviewed personnel involved in the acquisition of TOW and other cognizant personnel. Our Technical Assessment Division and the DoD Office of the General Counsel provided assistance in the area of contract procedures. Also, our Quantitative Methods Division provided technical assistance in the area of production acceptance testing. A list of the activities visited or contacted is in Appendix J.

Internal Controls

We reviewed the internal controls applicable to the critical program management elements included in the scope of our audit. The internal controls applicable to these elements were deemed to be effective in that no material deficiencies were disclosed by the audit.

Prior Audit Coverage

On August 30, 1989, the General Accounting Office issued Report No. GAO/C-NSIAD-89-26 (OSD Case No. 7959), "Antitank Weapons System, The Army Is Struggling To Maintain Effectiveness." The Chairman, Subcommittee on Procurement and Military Nuclear Systems, House Committee on Armed Services, tasked the General Accounting Office to assess the impact of the improved Soviet reactive and main armor as threats to the Army's ability to defend against a Warsaw Pact attack. The General Accounting Office concluded that the Army made several attempts at developing integrated analytical approaches to solving antiarmor

deficiencies, but fell short of a solution. The Army concurred with the GAO findings and conclusions and stated that the Armor/ Anti-Armor Special Task Force will produce a program that overcomes the deficiencies. The audit report contained no recommendations.

Other Matters of Interest

Development and Operational Testing. Our review of the TOW modification and improvement program disclosed a condition regarding development and operational testing. In order to have an impact on the testing program, we issued a separate report. Audit Report No. 90-111, "Development and Operational Testing for the Tube-Launched, Optically-Tracked, Wire-Guided (TOW 2B) Missile System," was issued on September 21, 1990. The report stated that the Army's preliminary development and operational testing plan did not provide tests to ensure that the TOW 2B missile performed in accordance with operational requirements. The report was classified.

Corrective Actions Taken During Audit. We identified reportable conditions in the areas of contracting procedures and production acceptance testing, and management implemented acceptable corrective actions before the issuance of the draft report. Therefore, these conditions were not included in Part II of this report.

Contracting Procedures. Army missile procurement funds of approximately $104,000 were improperly used to accomplish a research and development task for the TOW 2B missile. Also, the TOW project engineering services contractor, Hughes Aircraft Company, was allowed to procure automatic data processing equipment for the Army without following the appropriate guidance in the Defense Federal Acquisition Regulation Supplement. After our exit conference on February 23, 1990, the U.S. Army Missile Command (MICOM) allocated Army Research, Development, Test, and Evaluation funds of $104,000 to engineering services contract DAAH01-88-C-0962, to fund the research and development task performed under contract DAAH01-88-C-0962. Also, on May 21, 1990, MICOM notified the Hughes Aircraft Company that in accordance with Federal Acquisition Regulation requirements, all automated data processing equipment required for Government contracts is to be procured through the General Services Administration. As a result of MICOM's prompt and adequate actions on these matters, they are not reported in Part II of this report.

Production Acceptance Testing. The Army production acceptance testing program did not ensure that the TOW missiles met reliability requirements. This condition occurred because Hughes Aircraft Company did not make a random selection of TOW missiles. In order for the sample to be random, each missile in

the lot must have an equal chance of being selected. As a result, the Army could have accepted missiles into the inventory with lower reliability than the test results indicated. During May 31 through June 6, 1990, MICOM and TOW Project Office personnel provided us with documentation showing that the Defense Plant Representative Office (DPRO) [2/] at Hughes Aircraft Company implemented selection procedures to ensure that each missile had an equal chance of being selected for sampling. As a result of the prompt implementation of adequate procedures to correct this condition, it is not being reported in Part II of this report.

2/ At the time of the audit, this was an Air Force Plant Representative Office, but the July 1990 reorganization changed the command name and the chain of command.

PART II - FINDINGS AND RECOMMENDATIONS

A. Logistics Support

FINDING

Technical data packages for 50 repair parts for the Tube-Launched, Optically-Tracked, Wire-Guided Missile System (TOW) did not support efficient procurement of repair parts. This condition occurred because adequate configuration audits of the data packages were not performed. In addition, the Sacramento Army Depot was unable to implement revised test procedures because of modifications required on test equipment as a result of an engineering change to a component of the Bradley Fighting Vehicle launch system. This occurred because the U.S. Army Tank-Automotive Command, Bradley Fighting Vehicle System Project Office, did not program adequate funds to implement the change. As a result, the Army procured unusable repair parts. Also, item managers were unable to fill high priority requisitions resulting in the issuance of the next higher assembly. In addition, TOW maintenance personnel did not receive all required hands-on training. Additionally, the lack of sufficient parts and hands-on training could adversely affect the readiness of some TOW systems in the field. Also, inadequate technical data packages resulted in procurement of defective parts costing $265,420, and additional cost of $294,771 was incurred from production delays.

DISCUSSION OF DETAILS

Background. The U.S. Army Missile Command (MICOM), Missile Logistics Center, is responsible for logistics support for the TOW. The Missile Logistics Center manages the 3,155 repair parts needed to support the 3 TOW launch systems installed on approximately 17,000 launch platforms and associated test equipment. The three TOW launch systems are the Bradley Fighting Vehicle, the airborne, and the ground. Army depots performed depot level maintenance for the three TOW launch systems, except test equipment and some components of the Bradley Fighting Vehicle launch system. The prime contractor, Hughes Aircraft Company, maintained the test equipment and those components of the Bradley Fighting Vehicle launch system not maintained by the Army.

DoD Instruction 5010.19, "DoD Configuration Management Program," October 28, 1987, requires that configuration audits be performed to verify the configuration item's conformance to specifications. The configuration audits were needed to verify and document that the item and its technical data package were in agreement, were accurate, were complete, and satisfied total program requirements. Also, the Instruction states that configuration audits shall be used to reverify the functional or physical characteristics of production and operational items resulting

from the configuration change control process. The Project Office needs to perform the configuration audits to make sure that the Army has adequate technical data packages.

As of October 4, 1989, 123 of the 3,155 TOW parts used on the 3 launch systems were out-of-stock at the Missile Logistics Center. Inadequate technical data packages caused out-of-stock conditions for 50 of the 123 parts. We did not identify any systemic problems for the remaining 73 out-of-stock parts. The 50 parts having inadequate Technical Data Packages are listed in Appendix B.

Technical Data Packages. Technical data packages were not adequate to provide effective procurement of TOW repair parts. The technical data packages should have contained the documentation needed for procurement, such as engineering drawings, quality requirements, and testing procedures and requirements. The TOW Project Office was responsible for reviewing the technical data packages and ensuring that changes to the packages were made after receipt of the changes from the prime contractor.

The TOW Project Office performed six configuration audits between September 1986 and September 1988 as well as performing technical reviews before procurement of parts. However, these audits and reviews did not always identify and correct technical data package problems. In addition to causing out-of-stock conditions for TOW parts, this lack of adequate audits resulted in the procurement of unusable parts and insufficient training of TOW maintenance personnel. Examples of problems with technical data packages follow.

Material Specifications. A vendor manufactured a motor (National Stock Number 1430-01-007-9559) using steel for the casing, as specified in the technical data package. Using steel as specified made the motor weigh 50 ounces, which exceeded the required 37-ounce maximum weight limit. This resulted in the Army purchasing $168,250 of unusable motors.

Engineering Drawings. A vendor was delayed in delivering a modulator assembly (National Stock Number 1440-00-723-7329) because of illegible engineering drawings. This resulted in the contractor requesting $42,329 to defray costs of work stoppages beyond the contractor's control and directly related to the illegible drawings.

Procurement History Files. We reviewed procurement history files on 11 items identified as having problems with technical data packages. Of the 11 items, we identified 3 contracts totaling $265,420 in which all parts delivered were unusable. Also, contractors requested monetary consideration of $294,771 on two additional contracts because of delays that resulted from technical data package problems. Details are in Appendix C.

Maintenance Training. Army schools did not have sufficient operational test equipment on hand to provide all required hands-on training to their students because of a lack of repair parts. Of the 50 out-of-stock items having inadequate technical data packages, 9 were repair parts needed to maintain the test equipment. The U.S. Army Ordnance Missile and Munitions Center and School (the School) trained TOW/Dragon repairers, who required 253 hours of academic training to maintain TOW launch systems and ancillary equipment. Approximately 70 of those hours were designated for hands-on training using test sets. As of August 1989, only 49 percent of the School's test sets were operable. School personnel informed us that this was inadequate to provide the required hands-on training. For example, the School was authorized one bore-sight collimator test set; however, the test set was in unserviceable condition, and none of the required training on the use of the bore-sight collimator test set could be accomplished. The U.S. Army Transportation School trained the repairers for the TOW airborne launch system. This training required 129 hours of instruction, of which 65 hours were for hands-on training using the field test sets. However, only five of the Transportation School's eight field test sets were available for training purposes. Transportation School personnel informed us that this was inadequate to provide the required hands-on training. Therefore, students had to rely on on-the-job training on the use of the test sets after they graduated and were assigned to an operational unit. During our visits to the 1st Cavalry Division and the 101st Airborne Division, we were informed that there were not enough senior maintenance personnel to provide this type of on-the-job training. The inadequate training provided to TOW weapon system repairers could affect the maintenance program of operational units and affect readiness.

Depot Level Maintenance Capability. As of March 1990, the Sacramento Army Depot was not performing required repairs on the error detector cards for the Bradley Fighting Vehicle TOW launch system. This occurred because the depot test procedures and equipment had been changed. The problem has been ongoing since 1984 when the U.S. Army Tank-Automotive Command, Bradley Fighting Vehicle System Project Office, approved engineering change 81-2010-020, which required changes to two error detector cards, part numbers 12293458 and 12333914. The engineering change specified that changes were required to the instrument drive software to properly test the error detector cards. However, the Tank-Automotive Command did not program funds to accomplish these changes, and management of the error detector cards was transferred to MICOM in 1985. The TOW Project Office also failed to fund changes to the depot test procedures and equipment. As a result, Sacramento Army Depot stopped overhaul of error detector cards.

To support requirements for satisfying readiness objectives, the Missile Logistics Center issued the next higher assembly when an item was required for immediate and emergency requirements and was not available. In the case of the error detector cards, the item manager authorized the issuance of the next higher assembly, the integrated sight unit valued at $174,528. This resulted in the integrated sight unit being turned in to the depot for overhaul instead of the error detector card. The depot's cost to overhaul an error detector card was $984, while the cost to overhaul an integrated sight unit was $13,694. As of February 16, 1990, there were 152 unserviceable error detector cards in the Army's CONUS supply system awaiting overhaul and 134 requisitions for error detector cards on backorder.

DoD Directive 4151.16, "DoD Equipment Maintenance Program," August 23, 1984, states that an activity shall seek the most cost-effective method of achieving system readiness objectives; this includes the use of contractor depot maintenance support when consistent with operational requirements. MICOM had a basic ordering agreement (DAAH01-88-G-0007) with the Hughes Aircraft Company for depot repairs, which included the Bradley Fighting Vehicles's TOW launch system. As part of this agreement, Hughes Aircraft Company could overhaul the error detector cards for $3,381. We calculated that the Army could save about $10,268 per error detector card, if it used Hughes Aircraft Company to overhaul the cards rather than issuing the next higher assembly. Because the Missile Logistics Center only fills the immediate and emergency requirements by issuance of the next higher assembly, we could not calculate exact savings. On March 22, 1990, the Missile Logistics Center issued an order to Hughes Aircraft Company to overhaul error detector cards to meet immediate needs, while the Maintenance Engineering Directorate at the Logistics Center completed the necessary actions to get the Sacramento Army Depot back on line to overhaul the error detector cards. Therefore, no recommendations to the Logistics Center are deemed necessary.

Readiness. The lack of repair and replenishment parts was affecting the readiness of TOW launch systems. As of October 4, 1989, there were 2,956 backordered requisitions for the 123 out-of-stock parts. The Army units and the Ordnance and Transportation Schools used requisition priority designators 02 and 03 to indicate that a system was inoperable and that the activity was unable to perform its assigned mission without the out-of-stock part. Priority designators 02 or 03 were assigned to 778 (26 percent) of the 2,956 backordered requisitions.

Also, during our visits to the 1st Cavalry Division and the 101st Airborne Division, we identified readiness conditions below 90 percent. Readiness for the TOW airborne launch systems at the 3rd Battalion, 101st Aviation Regiment, Aviation Brigade, 101st Airborne Division, Fort Campbell, Kentucky, was 72 percent

for the period November 15 through December 15, 1989. Of the 778 backordered, high priority requisitions, 64 were for airborne launch systems. Readiness for the Improved TOW Vehicle (ground launch system) at the 1st Cavalry Division was 66 percent for the period December 15, 1989, through January 15, 1990; 22 of the 34 percent of not mission capable time was caused by MICOM managed items. Of the 778 backordered requisitions, 71 were for the ground launch system. Therefore, filling the out-of-stock parts could enhance the unit's readiness posture.

Conclusion. Correction of the technical data packages and arranging depot repair capability for error detector cards would result in less out-of-stock parts, procurement of usable parts, reduced logistics costs, and improved readiness. Also, providing required repair parts so that TOW maintenance training facilities would have adequate operable training equipment would result in better trained TOW maintenance personnel.

RECOMMENDATIONS, MANAGEMENT COMMENTS, AND AUDIT RESPONSE

We recommend that the Program Executive Officer for Fire Support direct the Tube-Launched, Optically-Tracked, Wire-Guided Missile System project manager to:

1. Perform configuration audits, in accordance with DoD Instruction 5010.19, for any future procurements of parts in those cases where there has been a Class I Engineering Change since the last satisfactory procurement and correct the technical data package problems for the 50 parts identified in this report.

Program Executive Officer for Fire Support Comments. The Program Executive Officer for Fire Support nonconcurred with the recommendation in the draft report that recommended the performance of configuration audits for any future procurements of repair parts, in accordance with DoD Instruction 5010.19. He stated that configuration audits are performed as part of the effort to develop a new item of equipment or a Class I Engineering Change Proposal to an item of equipment. Therefore, there is no need to perform a new configuration audit for each procurement. Such a procedure would be expensive and have a low return on the resource investment. On a case-by-case basis, a new configuration audit should be performed only if changes in technology indicate a need.

Audit Reponse. As a result of the Program Executive Officer's comments, we revised the recommendation and request that the Army respond to our revised recommendation. Management's complete comments are in Appendix H, and our summary of management comments with our response is in Appendix G.

2. Program adequate funds to implement future engineering changes, including test procedures and equipment for the depot, at the time the engineering change is approved.

Program Executive Officer for Fire Support Comments. The Program Executive Officer concurred with the recommendation stating that adequate funds will be programmed to implement future engineering changes, as recommended.

Audit Response. The Army's response satisfied the intent of the recommendation.

Pages 11 through 16 removed at the request of Project Office for the Tube-Launched, Optically-Tracked, Wire-Guided Missile System for distribution outside the Department of Defense.

C. Product Warranties

FINDING

The TOW Project Office established warranties with expected-failure thresholds that were not cost-effective. Also, only 11 valid claims were filed against 1 of 11 failure-free warranty contracts awarded from FY 1984 through FY 1989. These conditions occurred because the Project Office did not use historical data on the TOW system's warranty claims to determine the cost-effectiveness of warranties, and the Project Office did not determine if the administrative system was adequate for recording and reporting warranty defects and was operating as intended. As a result, the Army was not obtaining cost-effective warranties.

DISCUSSION OF DETAILS

Background. The 1984 DoD Appropriations Act, section 794, requires written warranty coverage on all weapon systems. U.S.C., title 10, section 2403, January 1985, revised the requirements of section 794. The U.S.C. covers weapon systems with a unit weapon system cost of more than $100,000 or systems with a total procurement cost in excess of $10 million. The Secretary of Defense may waive the warranty requirement if the warranty is not determined to be cost-effective. DFARS 246.770 provides guidance for developing a cost-benefit analysis. Also, Federal Acquisition Regulation (FAR) 46.703(c) shows that an adequate administrative system for reporting defects must exist or be established. The FAR further indicates that the reporting system should consider item complexity, storage time, location where the item will be used, and the difficulty in tracing responsibility of defects in the administration and enforcement of the warranty. The Army issued its policy incorporating the warranty requirements in Army Regulation 700-139, "Army Warranty Program Concepts and Policies," March 10, 1986.

The TOW Project Office negotiated contracts using two warranty concepts: expected-failure and failure-free. The expected-failure concept is based on the knowledge that the Army procures material that will fail. The contractor, however, is not liable for failures that are expected, but should be liable for failures that exceed expected failures. Army Regulation 700-139, chapter 4, section I 4-2.a, shows that the use of the expected-failure concept requires the Army and the supplier to agree that the reliability factors will yield a given number of expected failures during the warranty period. Failures above the expected-failure threshold are covered by the warranty. The failure-free concept requires a period of failure-free usage. Under this concept, each warranted defect is subject to contract remedy (adjustment) during the warranty term. In some cases, TOW system subcomponents are covered under the failure-free warranties, while higher level components are covered under the

expected-failure warranty. Claims against failure-free subcomponents did not count against the warranty deductible provision under the component's expected-failure warranty.

Expected-Failure Thresholds. The TOW Project Office had established expected-failure thresholds at levels that lessened the Army's opportunity to recover costs against the warranty. We reviewed the expected-failure warranties for 11 Bradley Fighting Vehicle and airborne launch system contracts (Appendix E). These contracts were for procurements from FY 1984 through FY 1989, and warranty coverage and administration cost were separately priced for four contracts valued at $1.5 million.

Bradley Fighting Vehicle. The first expected-failure warranty for the TOW, contract no. DAAH01-84-C-A081, covered the Bradley Fighting Vehicle launch system. The deductible threshold was 257 defects per 100 systems. The contract was for delivery of approximately 1,500 systems, which resulted in a deductible threshold of 3,855 defects. Since the Army filed only 75 valid claims against the expected-failure threshold when the warranty expired, we believe the Government did not have a cost-beneficial warranty. In seven later contracts for Bradley Fighting Vehicle TOW launch systems, the deductible thresholds were established at the system component level. There were about 129 deductible defects per 100 Bradley Fighting Vehicle launch systems (integrated sight unit 76, missile guidance set 35, and missile launcher 18). This shows an improvement, but is not realistic when compared to past experience.

Warranties for the above seven contracts are due to expire between September 30, 1990, and January 31, 1994. We recognize that the potential for obtaining benefits from these warranties still exists; however, as of March 1990, no valid warranty claims were filed against any of the seven contracts. Based on the rate of claims, we believe the Government's warranties are not cost-effective.

Airborne Launch System. Our review of expected-failure warranties for three contracts for airborne launch systems disclosed that the deductible defects for 100 launch systems was approximately 265 (telescopic sight unit 87, missile launcher 44, missile command amplifier 17, stabilization control amplifier 87, and electronic power supply 30).

The warranties for contract no. DAAH01-87-C-0614 expired on April 30, 1989. This contract required delivery of 47 telescopic sight units, which resulted in a deductible threshold of 41 defects for the contract. However, only one valid claim was filed. The warranties for the other two contracts are due to

expire between August 31, 1991, and April 30, 1993. As of March 1990, no valid warranty claims had been filed against either of these two contracts. Based on the rate of claims, we believe the Government will receive no benefits from the warranty coverage.

Although the Army, in some of its cost-effectiveness analyses, used test data from similar systems or wrote a narrative justification for expected-failure warranties, warranty historical data were not used. These historical data showed that the Army fell far short of reaching the warranty thresholds for the TOW Bradley Fighting Vehicle and airborne launch systems. As a result, there was little assurance that the Army obtained cost-effective warranties.

Defect Reporting System. There was no assurance that the administrative system for reporting warranty defects was operating properly. We did not find any indication that the TOW Project Office investigated the defect reporting system to determine if the TOW launch systems were actually as failure-free as the number of claims indicated, or if defects were not being reported. Procedures for reporting warranty defects were contained in Army Technical Bulletins. An adequate reporting system was needed to ensure that the Army received all the warranty benefits available and to provide a data base of defects for use in the determination of the cost-effectiveness of future expected-failure warranties. Project Office officials informed us that funds were not available to determine the adequacy of the warranty defect reporting system.

Failure-Free Warranties. As a result of a potentially inadequate defect reporting system, the Army may not have obtained all warranty benefits that it was entitled to for failure-free warranties. The Army had 11 contracts (Appendix F) containing failure-free warranties from FY 1984 through FY 1989 for TOW missiles, components of the Bradley Fighting Vehicle's TOW launch systems and airborne launch systems, night sights, and modification kits. Six of these warranties were separately priced at $2.6 million and five were not separately priced. The warranties for 8 of these contracts expired as of March 1990, and only 11 valid warranty claims were filed. These 11 valid claims were all against contract no. DAAH01-84-G-0008 for airborne launch system components. In addition, the warranty for another contract was scheduled to expire on May 31, 1990, and the Army had not filed any valid claims against this contract. We believe that the number of valid warranty claims may be low, and that the warranty defect reporting system must be investigated to ensure that claims are being filed when a warranted defect occurs.

RECOMMENDATIONS, MANAGEMENT COMMENTS, AND AUDIT RESPONSE

1. We recommend that the Commander, U.S. Army Missile Command, determine whether the administrative system to record and report warranty defects was adequate, as required by Federal Acquisition Regulation 46.703(c).

Commander, U.S. Army Missile Command Comments. The Commander, U.S. Army Missile Command, concurred with the recommendation stating that the warranty defects reporting system was determined to be adequate, as required by the Federal Acquisition Regulation 46.703(c).

Audit Response. We do not consider the reply responsive and request that the Commander, U.S. Army Missile Command, in response to this final report, provide us with the specific actions that were taken to determine that the warranty defects reporting system was adequate.

2. We recommend that the Program Executive Officer for Fire Support use available historical data on warranty claims to determine the cost-effectiveness of warranties in future contracts.

Program Executive Officer for Fire Support Comments. The Program Executive Officer concurred with the recommendation and stated that the TOW Project Office will use available historical data on warranty claims to determine the cost-effectiveness of warranties included in future contracts.

Audit Response. The Army's proposed action satisfies the intent of the recommendation.

Other Comments. The Army stated that it disagreed with some of the implications of the finding. The fact that a less than expected number of warranty claims had been received is not justification for concluding that the expected-failure threshold is too high. One of the objectives of the warranty program is to encourage the contractor to improve its quality. If this objective is achieved, the warranty claims will be less than expected. The auditors made no attempt to determine what the correct failure threshold should have been. Tangible benefits are not the sole consideration in determining the effectiveness of warranties. The intangible benefits, such as improvements in reliability benefits and user satisfaction as a result of better, more reliable weapon systems were not considered. An analogy would be that you want your car to break down numerous times so

that you can make money on your car warranty. The Army further stated that the defect reporting system is dictated by the standard logistic support system and is no different from the reporting of any defect, whether warranted or not, on any other system.

Audit Response. We did not attempt to determine a failure threshold based on available historical data because we understood that the established expected-failure threshold was based on contractual reliability requirements. Therefore, reducing the expected-failure thresholds would require changes to contract reliability requirements resulting in increased costs to the Government. Our position was that if the number of defects being reported through the defects reporting system actually represented the reportable defects that occurred, these statistics should be used in determining the cost-effectiveness of the product warranties. We did not question that an objective of the warranty program was to encourage contractors to improve product quality. However, the expected-failure thresholds for the contracts that we reviewed provided little, if any, encouragement for improved quality because of the level of failure that would have to occur before the warranty was effective. Also, we do not agree with the Army's analogy regarding automobile defects. A correct analogy would be that if your previous experience with new automobiles was three defects during the first 2 years of use, then when purchasing a new automobile and the automobile dealer offers to sell a warranty that will repair all defects during the first 2 years after the first 25 defects, a rational buyer would first consider the cost-effectiveness of such a warranty.

SUMMARY OF CRITICAL PROGRAM MANAGEMENT ELEMENTS FOR WHICH AUDIT WORK WAS DISCONTINUED AT THE END OF THE SURVEY PHASE

During the survey phase of the audit, we determined that additional audit work was not required for the following five program management elements.

Extent and Impact of Cost Increases. We identified no significant effect on the TOW Program as a result of cost increases. Since 1985, annual procurements of missiles had been relatively stable and cost increases had not affected quantities procured. For example, the unit cost of a TOW 2A missile increased from $7,259 in 1986 to $7,400 in 1989. However, the cost of the TOW 2B missile could exceed these costs and could affect planned production quantities. As a result of the FY 1989 competition for the Bradley Fighting Vehicle's launch system, the price of the launch system dropped by $106,701 per unit.

Operation and Maintenance Budget and Spending Trends. We found no inappropriate budgeting and spending of operation and maintenance funds. In FY 1989, operation and maintenance funds of $6 million were used primarily for logistics support and engineering services. The U.S. Army Missile Command's Logistics Center managed the operation and maintenance funds for logistics support, while the TOW Project Office used operation and maintenance funds primarily for engineering services.

Cost Estimating and Analysis. Our review of the FY 1988 and FY 1989 missile procurements showed that independent Government cost estimates were prepared and used as a basis for determining the negotiation objectives. Also, the contracting officer obtained Defense Contract Audit Agency proposal evaluations and cost analyses for determining the contract negotiation objectives. The procurement of Bradley Fighting Vehicle launchers was competitive in FY 1989. An independent Government cost estimate was prepared and compared to two competitive bids received for the Bradley Fighting Vehicle launchers.

Transition from Contractor of Organic Support. During the audit, the Army was assuming the logistics support function from TOW contractors for the Bradley Fighting Vehicle launch system, and completion is scheduled for 1993. Maintenance of the ground and airborne launch systems was entirely organic. Hughes Aircraft Company provided limited depot support for test equipment and the Bradley Fighting Vehicle launch system. In November 1989, the Hughes Aircraft Company shipped test equipment to the Sacramento and Mainz Army Depots, which will allow complete organic repair of the Bradley Fighting Vehicle launcher

beginning about the middle of 1992. The Hughes Aircraft Company will continue depot repair of some test equipment throughout the life of the TOW system. The TOW missile did not require depot maintenance, and missile modifications were performed at the Anniston Army Depot.

Production Indicators. Hughes Aircraft Company had adequate quality assurance procedures. Although the missile production contract did not contain provisions for a work measurement system, Hughes Aircraft Company used a work measurement system that appeared to be operating satisfactorily.

SUMMARY OF OUT-OF-STOCK PARTS WITH TECHNICAL DATA PACKAGE DEFICIENCIES AS OF OCTOBER 4, 1989

BRADLEY FIGHTING VEHICLE LAUNCH SYSTEM	NATIONAL STOCK NUMBER
Integrated Sight Unit	1240-01-096-5151
Optical Eyeshield	1240-01-113-8657
Visual Module Assembly	1240-01-167-1316
Clamp, Compressor	1240-01-195-3544
Circuit Card Assembly	1240-01-197-1758
Integrated Sight Unit	1240-01-216-6331
Assembly Shield	1240-01-217-2352
Wiring Cable	1240-01-217-2356
Cooler Assembly	1240-01-217-3808
Prism, Optical Instrument	1240-01-244-9847
Periscope Head	1240-01-256-6913
Thermal Interface Kit	1240-01-262-9909
Bit Squib	1336-01-107-7617
Cable Assembly	1440-01-092-0648
Cable Assembly	4935-01-167-1328
Cable Assembly, Special	4935-01-167-1350
Circuit Card Assembly	4935-01-168-7360
Circuit Card	4935-01-189-0677
Cable Assembly, Power	4935-01-195-3791
Cable Assembly, Post	5855-01-111-9169
Cable Assembly, Special	5995-01-L24-1073
Circuit Card Assembly	5999-01-236-4342
Circuit Card Assembly	5999-01-236-4343
Circuit Card Assembly	5999-01-264-0588
Circuit Card Assembly	5999-01-265-4643
Circuit Card Assembly	5999-01-275-7240
Cable Assembly	6150-01-107-7836
Cable Assembly, Special	6150-01-167-1349
Cable Assembly, Special	6150-01-271-7383

AIRBORNE LAUNCH SYSTEM	
Amplifier, Stabilizer	1440-00-625-3702
TOW Control Panel (LAAT)	1440-01-091-1996
TOW System Evaluation Missiles	4935-00-629-3472
Monitor and Control Unit	4935-00-629-3485
Circuit Card Assembly	4935-01-017-6121
Circuit Card Assembly	5999-00-631-4389

SUMMARY OF OUT-OF-STOCK PARTS WITH TECHNICAL DATA PACKAGE DEFICIENCIES AS OF OCTOBER 4, 1989 (continued)

MANPORTABLE COMMON THERMAL NIGHT SIGHT SYSTEM FOR GROUND LAUNCH SYSTEM	NATIONAL STOCK NUMBER
Cell, Optical Element	5855-01-067-7799
Eyepiece Assembly	5855-01-118-2222
Wiring Harness, Branch	5855-01-156-8119
Imager Alignment Assembly	5855-01-247-0012
Window, Optical Instrument	5855-01-248-5758
Eyepiece Display	5855-01-248-9242
Collinator, Thermal	5855-01-077-4523
Reticle Assembly	5855-01-171-6217
Circuit Card Assembly	5999-01-256-6946
GROUND LAUNCH SYSTEM	
Missile Guidance System	1430-01-143-9408
Optical Cell Assembly	1440-00-462-8364
Traversing Unit	1440-01-115-3405
Sight, Optical, Guide	1440-01-198-5891
Modular Assembly	1440-01-241-1047
Glow Lamp	6240-00-438-6999

CONTRACTS FOR ITEMS IDENTIFIED AS HAVING TIME AND COST PROBLEMS DUE TO INADEQUATE TECHNICAL DATA PACKAGES

CONTRACT NUMBER	NATIONAL STOCK NUMBER	COST INCURRED FROM CONTRACT VALUE	INADEQUATE TECHNICAL DATA PACKAGES
Unusable Parts (100 percent defective parts):			
DAAH01-88-C-0771	1430-01-007-9559	$ 32,350	$ 32,350
DAAH01-84-C-0846	1430-01-007-9559	168,250	168,250
DAAH01-88-C-0081	5990-00-457-8940	64,820	64,820
	Subtotal	$ 265,420	$265,420
Delay Problems:			
DAAH01-87-P-2924	1440-00-723-7329	$ 709,317	$ 42,329
DAAH01-89-C-0204	1240-01-217-2356	1,277,587	252,442
DAAH01-86-G-0008	1240-01-217-3808	3,354,086	*
DAAH01-88-C-0634	1240-01-217-2353	2,100,654	*
DAAH01-90-C-0114	1240-01-167-1316	4,919,490	*
DAAH01-48-F-0486	4935-01-167-1328	23,489	*
DAAH01-89-D-0112	1240-01-217-2352	24,298	*
DAAH01-89-C-0273	5999-01-236-4342	71,275	*
	Subtotal	$12,480,196	$294,771
	Total	$12,745,616	$560,191

* As of December 1989, these contracts did not identify additional costs that required modification of the contract; however, the Government could incur additional cost because of time delays.

Page 29 has been removed due to contents containing proprietary and For Official Use Only information.

EXPECTED-FAILURE WARRANTY CONTRACTS

Bradley Fighting Vehicle Launch System

Contract Number/ Systems/Components	Deductible Defects Per 100 Systems	Systems/ Components Procured	Deductible Threshold 1/	Valid Warranty Claims Filed	Warranty Expiration Date	Warranty Cost
DAAH01-84-C-A081						
Total Systems 2/	257 2/	1,500	3,855	75	3/	4/
DAAH01-86-C-0907						
Integrated Sight Unit	76	666	506			
Missile Guidance Set	37	666	246			
Missile Launcher	22	580	128			
			880	0	September 30, 1990	$612,650
DAAH01-87-C-0582						
Integrated Sight Unit	76	437	332			
Missile Guidance Set	37	437	162			
			494	0	July 31, 1991	588,751
DAAH01-87-C-0991						
Integrated Sight Unit	60	325	195			
Missile Guidance Set	15	325	49			
			244	0	May 31, 1991	256,000
DAAH01-88-C-0353						
Missile Launcher	18	936	168	0	May 31, 1993	5/
DAAH01-89-C-0233						
Integrated Sight Unit	76	217	165			
Missile Guidance Set	35	217	76			
			241	0	January 31, 1994	5/
DAAH01-89-C-0207						
Integrated Sight Unit	76	514	391			
Missile Guidance Set	35	514	180			
			571	0	January 31, 1994	5/
DAAH01-89-C-0429						
Missile Launcher	18	581	105	0	January 31, 1993	5/

EXPECTED-FAILURE WARRANTY CONTRACTS (continued)

Airborne Launch System

Contract Number/ Systems/Components	Deductible Defects Per 100 Systems	Systems/ Components Procured	Deductible Threshold 1/	Valid Warranty Claims Filed	Warranty Expiration Date	Warranty Cost
DAAH01-87-C-0614						
Telescopic Sight Unit	87	47	41	1	April 30, 1989	$ 62,190
DAAH01-88-C-0047						
Telescopic Sight Unit	87	14	12			
Missile Launcher	44	56	25			
Missile Command Amplifier	17	14	2			
Stabilization Control Amplifier	84	14	12			
Electronic Power Supply	30	14	4			
			55	0	August 31, 1991	5/
DAAH01-89-C-0521						
Telescopic Sight Unit	87	31	27			
Missile Launcher	44	98	43			
Missile Command Amplifier	17	31	5			
Stabilization Control Amplifier	87	31	27			
Electronic Power Supply	30	31	9			5/
			111	0	April 30, 1993	
Total Warranty Cost						$1,519,591

1/ As of March 12, 1990.
2/ The deductible defects for Contract No. DAAH01-84-A081 were for complete systems. For later contracts, the deductible defects were for components of the system.
3/ Warranty has expired, date of expiration unknown.
4/ Data not available.
5/ Not separately priced.

FAILURE FREE WARRANTY CONTRACTS

Contract Number	Component	Cost	Warranty Expiration Date	Valid Claims Filed 1/
DAAH01-84-C-0577	Night Vision Sight Equipment Sets	$ 40,719	2/	0
DAAH01-84-C-0750	Night Vision Sight Equipment Sets	314,726	2/	0
DAAH01-84-C-0899	3/	4/	2/	0
DAAH01-84-C-0938	3/	4/	2/	0
DAAH01-84-C-0974	Modification Kits	800,000	2/	0
DAAH01-84-G-0011	Modification Kits	111,197	2/	0
DAAH01-84-G-0008	Airborne subsystems	232,804	2/	11
DAAH01-85-C-1291	Night Vision Sight Equipment Sets	4/	December 31, 1993	0
DAAH01-86-C-0220	Missile Production	4/	2/	0
DAAH01-86-C-0726	Night Vision Sight Equipment Sets	1,112,000	May 31, 1990	0
DAAH01-89-C-0036	Night Vision Sight Equipment Sets	4/	September 30, 1990	0
Totals		$2,611,446		11

1/ As of March 12, 1990.
2/ Warranty has expired, date of expiration unknown.
3/ Contract has expired, description data not available.
4/ Not separately priced.

DETAILS OF ARMY COMMENTS WITH AUDIT RESPONSES TO LOGISTICS SUPPORT FINDING

The details of the Army's nonconcurrence with the finding and Recommendation A.1. are discussed below.

General Comments.

Army comment. The Program Executive Officer stated that the 123 repair parts that were in an out-of-stock condition represented only 3.9 percent of the repair parts managed. This exceeded the Army Materiel Command's goal of 85-percent availability of repair parts.

Audit response. Repair parts availability is defined by Army Regulation 710-1 as the "Number of demands eligible for fill - backorders + number of demands eligible for fill against available assets." It is not the ratio of total line items stocked to those line items that were in an out-of-stock condition, as indicated by the Army.

Army comment. The Program Executive Officer stated that the report reference to the Tube-Launched, Optically-Tracked, Wire-Guided Missile System (TOW) Project Office at the U.S. Army Tank-Automotive Command should be deleted because it did not have such a project office.

Audit response. We have revised the finding as suggested by the Army.

Technical Data Packages.

Army comment. The Program Executive Officer stated that National Stock Numbers 1240-01-217-2352 and 5999-01-236-4342 should be deleted from the report because no defective parts had been delivered. Therefore, the dollar value of defective parts should be reduced from $360,993 to $265,420.

Audit response. The above two National Stock Numbers were deleted from our schedule of defective parts, decreasing the dollar value as stated above. Although no defective parts were delivered, there were problems with the technical data packages. An attempt was made to second source National Stock Number 1240-01-217-2352; however, because of the inadequate technical data package, the second source could not manufacture the item, and it remained sole source to the original manufacturer. National Stock Number 5999-01-236-4342 was out-of-stock as of October 4, 1989, because of an inadequate technical data package. The Army's response, dated August 3, 1990, stated that the contractor still had not delivered the part.

Army comment. The Army disagreed with our statement that configuration audits have not controlled technical data package problems and stated that a large number of problems with technical data packages had been found and corrected through configuration audits.

Audit response. We do not disagree that the Army may have found a large number of technical data package problems in the past and corrected those problems. However, during our audit, we identified 50 items that were in an out-of-stock condition because of technical data package problems, and the TOW Project Office's memorandum of March 26, 1990, responding to the audit closing conference agreed that problems with the 50 items were technical data package related.

Army comment. The Army stated that the 50 items that the auditors identified as being out-of-stock due to inadequate technical data packages represented only 1.6 percent of the TOW parts managed.

Audit response. The significant issue is not that the 50 items represented 1.6 percent of the items managed, but how many requisitions were backordered because of these 50 items. As of September 11, 1990, the U.S. Army Ordnance Missile and Munitions Center and School (the School) had 84 backorders for TOW items, of which 15 were for items we identified as having technical data package problems. These backordered parts were causing training for the Bradley Fighting vehicle launch system to be at 33-percent capability, only two of six systems used for training were operable.

Army comment. The Army stated that contractors alleged technical data package problems when the problems may have been the capabilities of the contractor.

Audit response. Our review of contract files including correspondence between the Army and the contractors at the U.S. Army Missile Command's Procurement Directorate did not identify any case where the Army claimed that the contractor alleged technical data package problems when there were none. During a visit to Texas Instruments, Incorporated, a recently qualified second source producer of the integrated sight unit, we were informed that Texas Instruments could not produce the integrated sight unit from the technical data package. Because of problems with the technical data package, Texas Instruments requested an integrated sight unit, and using reverse engineering was able to produce the unit.

Army comment. The TOW Project Office requested a detailed list of the alleged technical data package problems to ascertain if the problems were in fact technical data package problems.

Audit response. We furnished the TOW Project Office a list of National Stock Numbers for the 50 items at the audit closing conference, and we have furnished the Project Office and the Army Missile Command's Missile Logistics Center subsequent lists with details of problems identified. Also a TOW Project Office memorandum dated March 26, 1990, recognized problems with these 50 items as being related to the technical data packages.

Army comment. The Army stated that 10 of the items identified in our report as having technical data package problems had been procured previously, indicating no problems with the technical data packages.

Audit response. These 10 items may have been procured previously; however, during our review, there were, or had been, procurement problems with these items resulting from inadequate technical data packages.

Maintenance Training.

Army comment. The Army stated that there were no backorders for items identified by the audit for the School. The Army based this conclusion on a review that the item manager made after the issuance of the draft report.

Audit response. On September 18, 1990, after receipt of the Army's comments, we visited the School. We found that as of September 11, 1990, the School had 84 outstanding requisitions for TOW items, of which 35 had been assigned a priority of 03. Also, 15 of the 84 requisitions were for items we identified as having technical data package problems. These backordered parts were causing training for the Bradley Fighting Vehicle launch system to be at 33-percent capability, only two of six systems used for training were operable. The Army's statement that the Missile Logistics Center did not have any backordered requisitions for the School was factual, because repair parts for the School were requisitioned under the Redstone Arsenal supply account (W80Q7X) rather than the School's supply account (WP31P36), which has been the standard procedure for at least 33 years.

Depot Level Maintenance Capability.

Army comment. The Army stated that there were no safety factors involved in stopping repairs to error detector cards at the Sacramento Army Depot.

Audit response. In that we only had a verbal indication of potential safety problems, we have deleted all reference to safety problems from the report.

Army comment. The Army stated that the repair order to the Hughes Aircraft Company for repair of error detector cards was in-process before the auditor's exit conference on February 23, 1990, and the auditors had been so informed.

Audit response. The Army may have considered the use of Hughes Aircraft Company for the repair of error detector cards before February 23, 1990; however, the error detector card problem started during 1984, and the order to Hughes Aircraft Company for overhaul of error detector cards was not issued until March 22, 1990.

Army comment. The Army stated that records at the U.S. Army Missile Command's Missile Logistics Center did not show any examples of an integrated sight unit issued instead of an error detector card; therefore, the repair costs in the draft report were totally erroneous.

Audit response. Records at the U.S. Army Missile Command's Missile Logistics Center did not show any examples of an integrated sight unit issued instead of an error detector card because the records did not provide for such information. However, we did identify instances in which organizations would cancel requisitions for error detector cards and on the same day requisition integrated sight units. For example, on August 19, 1989, the Mississippi National Guard canceled a requisition for one error detector card (Document W35W7F92222501) and requisitioned an integrated sight unit (Document W35W7F92222500). Also, on September 7, 1989, the Red River Army Depot canceled a requisition for four error detector cards (Document W45G1892492060) and requisitioned six integrated sight units (Document W45G1892492059). Therefore, we believe that integrated sight units were requisitioned and issued in place of error detector cards, resulting in the turn in, and complete overhaul of, the integrated sight unit rather than the error detector card.

Army comment. The Army stated that updated configurations of test program sets for error detector card 12293458 were fielded on June 6, 1990, and for error detector card 12333914 on May 14, 1990.

Audit response. The Engineering Change that required the above updates was approved during 1984, which is an excessive period of time. The Army has agreed that Engineering Changes will be funded to prevent future problems.

Readiness.

Army comment. The Army stated that the U.S. Army Missile Command's Missile Systems Readiness Directorate stated that the 101st Airborne Division reported a readiness rate of 94 percent as of both November 15, 1989, and January 15, 1990, not 72 percent as stated in the finding.

Audit response. We have revised the finding to show that the 72-percent readiness rating for the TOW airborne launch system at the 101st Airborne division pertained only to the organization we visited, the 3d Battalion, 101st Aviation Regiment.

Army comment. The Army stated that at the 1st Cavalry Division, the TOW system accounted for only 10.9 percent of the 34 percent non-mission capable time.

Audit response. The finding was revised to show that of the 34 percent not mission capable time for the Improved TOW Vehicle at the 1st Cavalry Division, 22 percent was caused by TOW system items. Our 22 percent differs from the Army's 11 percent because the Army did not consider the Traversing Unit (National Stock Number 1440-01-115-3405) and the Night Sight Battery Power Conditioner Cable Assembly (National Stock Number 6150-01-143-9399) as TOW system equipment. These items were managed by the U.S. Army Missile Command's Missile Logistics Center; therefore, we believe that the non-mission capable time related to these items should be charged to the TOW system.

Army comment. The Army stated that the audit report's statement that priority designators 02 and 03 indicated that systems were inoperable was not entirely true. "In order to identify a request for an item required for a non-mission capable (NMC) system the requisition must have a RDD of 999 or the character 'N' or 'E' in the first portion of the RDD field."

Audit response. These codes may be required for the requisition; however, they are in addition to, and do not replace, the 02 and 03 priority designators. Our analysis was based on records of backordered 02 and 03 requisitions. We understand that if an 02 or 03 requisition is received without the additional codes, the system automatically cancels the requisition. Therefore, all recorded backordered 02 and 03 requisitions should also have had the additional codes or they would have been canceled.

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

13 August 1990

SARD-SM

MEMORANDUM FOR THE INSPECTOR GENERAL, DEPARTMENT OF DEFENSE (AUDITING)

SUBJECT: Follow up Response on the Draft Report on Development and Operational Testing for the Tube-Launched, Wire-Guided Missile System (Project Number 9AL-0054)

1. The enclosed is provided as a follow up to your request for review and action on the subject report.

2. These issues were erroneously provided to HQ, MICOM for response and as a result were not included with our original response.

3. POC for this action is MAJ Wilbourn, DSN 224-8284.

Richard D. Kline

RICHARD D. KLINE
Colonel, GS
Director, Missile Systems

CF:
SAIG-PA
SARD-ZE

DEPARTMENT OF THE ARMY
PROGRAM EXECUTIVE OFFICE, FIRE SUPPORT
REDSTONE ARSENAL, ALABAMA 35898-8000

REPLY TO
ATTENTION OF

AMSMI-IR (36-2)

AUG 3 1990

MEMORANDUM THRU Headquarters, Department of the Army, Office of Assistant Secretary for Research, Development and Acquisition, ATTN: SARD-SF, Washington, D.C. 20310-0103

MEMORANDUM FOR Department of Defense, Office of Inspector General, ATTN: DODIG/AIG(A), 400 Army Navy Drive, Arlington, VA 22202-2884

SUBJECT: DODIG Draft Report on Audit of the Acquisition of the Tube-Launched, Optically Tracked, Wire Guided Missile System (Project 9AL-0054)

In accordance with AR 36-2, the Program Executive Office, Fire Support position on the subject report is enclosed.

Encl

THOMAS M. DEVANNEY
COL, OD
Acting Deputy PEO

AN EQUAL OPPORTUNITY EMPLOYER

DODIG Draft Report on the Audit of the Acquisition of the Tube-Launched, Optically-Tracked, Wire-Guided Missile System Project No. 9AL-0054.01

FINDING A - LOGISTICS SUPPORT.

FINDING: "Technical data packages for 50 repair parts for the Tube-Launched, Optically-Tracked, Wire-Guided Missile System (TOW) launch systems were inadequate to provide effective procurement of repair parts. This condition occurred because adequate configuration audits were not performed. In addition, an Army depot was unable to implement revised test procedures because of modification required on test equipment as a result of an engineering change to a component of the Bradley Fighting Vehicle launch system. This occurred because the U.S. Army Tank-Automotive Command, TOW Project Office, did not program adequate funds to implement the change. As a result, the Army procured unusable repair parts, item managers were unable to fill high priority requisitions and authorized issue to the next higher assembly, and TOW maintenance personnel did not review all required hands-on training. Additionally, the lack of sufficient parts and hands-on training could adversely affect the readiness of some TOW systems in the field. Also, inadequate technical data packages resulted in procurement of defective parts costing $360,993, and additional cost of $294,771 was incurred from production delays."

ADDITIONAL FACTS: Nonconcur with the findings on logistics support. As an editorial comment, there is no "U.S. Army Tank-Automotive Command, TOW Project Office." In regard to the statement in the background portion of this report that "as of October 4, 1989, 123 of 3,155 TOW parts used on the three launch systems were out-of-stock," it should be noted that this accounts for only 3.9 percent of the TOW items managed. The AMC goal and funding for stock availability of stocked items is 85 percent. Therefore, the on-hand availability of TOW parts far exceeds this goal. In the area of non-usable parts procured as a result of defective technical data package (TDP), item manager advises that materiel procured on contract DAAH01-89-D-0112, NSN 1240-01-217-2352 is being issued to user and they are not

aware of any problems with the item. Also, item on contract DAAH01-89-C-0273, NSN 5999-01-236-4342, has not yet been delivered by the contractor. These two items should be deleted from the report, thereby reducing dollar value of defective parts from $360,993 to $265,420. Facts pertaining to each of the logistics elements highlighted in this report (maintenance training, depot level maintenance capability, and readiness), are as follows:

a. Re: Technical Data Packages (Pages 17-19).

Page 6

Comments: Nonconcur in the statement "However, these audits and reviews did not identify or correct technical data package problems." The statement indicates audits did not correct TDP problems. The fact is that a large number of problems have been found and corrected through configuration audits. If indeed the 50 out-of-stock items identified were a correct figure to be attributed to the lack of an adequate TDP, then TDP problems affected 50 of 3,155 repair parts used on the three launch platforms. In other words only approximately 1.6 percent of the 3,155 repair parts in the three systems were out-of-stock because of alleged TDP problems. Another problem that must be noted in quoting such statistics about TDPs is that when a contractor gets into contractual problems, one of the easiest ways out is to claim there is a problem with the TDP. The TOW PMO needs a detailed copy of the alleged TDP problems in order to ascertain if the problems were in fact TDP problems. Therefore, it is recommended that the sentence be reworded to read "Although these audits found a number of TDP problems, they did not find the problems that apparently caused 50 parts to be out-of-stock."

Nonconcur in the position that "Technical data packages .. were inadequate to provide effective procurement of TOW repair parts ..." TDP's have been successfully used for many years by multiple contractors. The examples show the capabilities of the contractors more often than defects in the TDP. Business motives can cause contractors to claim TDP problems in order to explain delays, manufacturing mistakes, and cost engineering change proposals (ECPs).

Procurement history of the 1430-01-007-9559, listed as drawing tolerance, shows the item has been procured on 14 separate contracts over a period of 8 years from 4 separate contractors. The second example, 1240-01-217-2352, has much less procurement history as a spare part, as shown below, but the drawing, 12333932, gives a suggested source of supply and a MIL-N material. This item is delivered as part of the Bradley TOW 2 subsystem. The third example, engineering drawing, 1440-00-723-7329, shows 22 contracts over a period of 17 years and six separate contractors. This item is also a component of the "optical sight sensor." Approximately 7000 of the optical sight sensors have been procured for the U.S. Army plus additional quantities for the U.S. Marines and FMS customers. See Attachment, page 6.

b. Re: Maintenance Training (Page 19).

Page 7

Comments: Nonconcur. Report states that Army schools did not have sufficient operational test equipment on hand to provide all required training to their students because of lack of repair parts. Immediately upon notification of this statement, the item manager in MICOM Missile Logistics Center (MLC) screened their backorder file and there were no back-orders for the school against items identified by the auditor. If the item manager receives high priority requisitions for an item which is not available, the next higher assembly, if available, is issued. This section of the audit report appears to be mixing training equipment for ground TOW system and airborne TOW launch systems which makes it very difficult to assess the problem.

c. Re: Depot Level Maintenance Capability (Pages 20-22).

Page 7

Comments: Nonconcur. The draft report states that "as of March 1990, the Sacramento Army Depot (SAAD), stating safety reasons related to a change to the depot test procedures and equipment, stopped performing repairs on the error detector cards for the Bradley Fighting Vehicle TOW launch system." The report also alleges that due to U.S. Army Tank-Automotive Command and the TOW Project Office failure to fund changes to the depot test procedures and equipment, SAAD halted overhaul of error detector cards (EDC). The TOW Project Office contacted appropriate MLC Maintenance Engineering and Materiel Management representatives and

MICOM managed item reported as causing down time was the AN/TAS-4A night sight. Although information on which component of the AN/TAS-4A failed is not available, sufficient quantity of AN/TAS-4As was available in depot to provide as a next higher assembly if needed. The report also states that users use priority designators 02 and 03 to indicate that systems are inoperable. This is not entirely true. In order to identify a request for an item required for a non-mission capable (NMC) system the requisition must have a RDD of 999 or the character "N" or "E" in the first portion of the RDD field. Latest readiness report available, 15 May 1990, for the 1st Cavalry Division reflects 83 percent mission capable rate. The DA Form 3266-1 for this period did not identify any TOW items contributing to the NMC time.

RECOMMENDATIONS: "We recommend that the Program Executive Officer for Fire Support Direct the Tube-Launched, Optically-Tracked, Wire-Guided Missile system Project Manager to:

a. Perform configuration audits for any future procurements of repair parts, in accordance with DOD Instruction 5010.19.

b. Program adequate funds to implement future engineering changes, including test procedures and equipment for the depot, at the time the engineering change is approved."

ACTION TAKEN: Nonconcur with Recommendation a. Configuration audits are performed as part of the effort to develop a new item of equipment or a Class I ECP to an item of equipment. There is no need to perform a new configuration audit for each procurement. Such a procedure would be expensive and have a low return on the resource investment. On a case-by-case basis, a new configuration audit should be performed only if changes in technology indicate a need.

Concur with Recommendation b. Adequate funds will be programmed to implement future engineering changes, as recommended.

A summary of the 10 listed National Stock Numbers:

ITEM	NSN	CONTRACTS	PERIOD	QTYS	CONTR'S
Motor/TACH	1430-01-007-9559	14	8 yr	589	4
Resolver	5990-00-457-8940	24	17 yr	10,290	7
Shield Assy	1240-01-217-2352	2	3 yr	230	2
Circuit Card Assy	5998-01-236-4342	4	2 yr	79	3
Modulator Assy	1440-00-723-7329	22	17 yr	2,511	6
Cable, Wiring	1240-01-217-2356	1	1 yr	598	1
Cooler Assy	1240-01-217-3808	1	1 yr	290	1
Sight Assy, Basic	1240-01-217-2353	5	4 yr	334	3
Visual Module Assy	1240-01-167-1316	6	5 yr	518	4
Cable Assy	4935-01-167-1328	3	4 yr	61	2

In addition, incorrect statements have been made concerning defective parts on national stock number (NSN) 1240-01-217-2352 (pages 18, 19, and 43) and NSN 5999-01-236-4342 (pages 19 and 43). According to records maintained at the U.S. Army Missile Command (MICOM) Missile Logistics Center and Procurement Directorate, neither NSN has experienced any defective/unusable parts against contracts listed.

Page 49 removed at the request of Project Office for the Tube-Launched, Optically-Tracked, Wire-Guided Missile System for distribution outside the Department of Defense.

Page 50 removed at the request of Project Office for the Tube-Launched, Optically-Tracked, Wire-Guided Missile System for distribution outside the Department of Defense.

Page 51 removed at the request of Project Office for the Tube-Launched, Optically-Tracked, Wire-Guided Missile System for distribution outside the Department of Defense.

DODIG Draft Report on the Audit of the Acquisition of the Tube-Launched, Optically-Tracked, Wire-Guided Missile System Project No. 9AL-0054.01

FINDING C - PRODUCT WARRANTIES.

FINDING: "The TOW Project Office established warranties with high expected failure thresholds that were not cost effective. Also, only 11 valid claims were filed against 1 of 11 failure-free warranty contracts awarded from FY 1984 through FY 1989. This condition occurred because the Project Office did not use historical data on the TOW system's warranty claims to determine if the Project Office administrative systems were adequate for recording and reporting warranty defects. As a result, the Army was not obtaining cost-effective warranties."

ADDITIONAL FACTS: Nonconcur with some of the implications of the finding and the following comments are submitted for accuracy and clarification:

a. Finding: The TOW Project Office established warranties on hardware with high expected failure thresholds that were not cost effective.

Comments: Nonconcur.

(1) The fact that a less than expected number of warranty claims had been received is not justification for concluding that the expected failure threshold is too high. One of the objectives of the warranty program is to encourage the contractor to improve his quality. If this objective is achieved, the warranty claims will be less than expected. No attempt was made by the auditors to determine what the correct failure threshold should have been.

(2) Tangible benefits are not the safe consideration in determining the effectiveness of warranties. The intangible benefits such as improvements in reliability and user satisfaction as a result of better, more reliable weapon systems were not considered. An analogy would be that you want your car to break down numerous times so you can make money on your car warranty.

b. Finding: There was no assurance that the administrative system for reporting warranty defects was operating properly.

Comments: Nonconcur. The defect reporting system is dictated by the standard logistic support system. The reporting of TOW warranty claims is no different from the reporting of any defect, whether warranted or not, on any other system.

RECOMMENDATIONS: "We recommend that the Commander, U.S. Army Missile Command:

1. Determine the adequacy of the administrative system to record and report warranty defects as required by Federal Acquisition Regulation 46.703 (c).

2. Use available historical data on warranty claims to determine the cost-effectiveness of warranties included in future contracts."

Response: Concur in the recommendations. Recommendation #1 is being addressed by the U.S. Army Missile Command.

Relative to Recommendation #2, available historical data on warranty claims will be used by the TOW project office to determine the cost effectiveness of warranties included in future contracts.

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

21 AUG 1990

SARD-SM

MEMORANDUM FOR THE INSPECTOR GENERAL, DEPARTMENT OF DEFENSE (AUDITING)

SUBJECT: Final response to the Draft Report on Development and Operational Testing for the Tube launched, Wire-Guided Missile System (Project Number 9 AL-0054) (U)

1. The enclosed response is the final installment on your request for review and action on the subject report.

2. This installment provides the HQ, MICOM position on selected issues.

3. POC for this action is MAJ Wilbourn, DSN 224-8284/85.

Richard D. Kline

RICHARD D. KLINE
Colonel, GS
Director, Missile Systems

CF:
SAIG-PA
SARD-ER

DEPARTMENT OF THE ARMY
HEADQUARTERS, U. S. ARMY MATERIEL COMMAND
5001 EISENHOWER AVENUE, ALEXANDRIA, VA 22333-0001

10 AUG 1990

AMCIR-A (36-2b)

MEMORANDUM FOR HQDA(SAIG-PA), WASH DC 20310-0103

SUBJECT: DODIG Draft Report on the Audit of Acquisition of Tube-Launched, Optically Tracked, Wire Guided Missile (AMC No. D8934) (9AL-0054.1)

1. We are providing the AMC position on those recommendations addressed to the Commander, U.S. Army Missile Command.

2. Mr. Frank Taylor, (202) 274-9023, is the HQ AMC point of contact.

FOR THE COMMANDER:

Leonard H. Maguire

LEONARD H. MAGUIRE
Chief, Internal Review and
Audit Compliance Office

Encl
as

DEPARTMENT OF THE ARMY
UNITED STATES ARMY MISSILE COMMAND
REDSTONE ARSENAL, ALABAMA 35898-5000

REPLY TO
ATTENTION OF

AMSMI-IR (36-2) 6 Aug 90

MEMORANDUM FOR Commander, U.S. Army Materiel Command,
ATTN: AMCIR-A, 5001 Eisenhower Avenue,
Alexandria, VA 22333-0001

SUBJECT: DODIG Draft Report on the Audit of the Acquisition of Tube-Launched, Optically Tracked, Wire Guided Missile (AMC No. D8934)

1. Reference Memorandum, AMCIR-A (36-5C), 10 Jul 90, subject as above.

2. In accordance with referenced memorandum, the proposed AMC position on subject draft report is enclosed.

Encl

JAMES D. AMATO
Colonel, GS
Chief of Staff

AN EQUAL OPPORTUNITY EMPLOYER

Command Reply

DODIG Draft Report on the Audit of the Acquisition of the Tube-Launched, Optically-Tracked, Wire-Guided Missile System (AMC No. D8934)

FINDING C - PRODUCT WARRANTIES.

FINDING: "The TOW Project Office established warranties with high expected failure thresholds that were not cost effective. Also, only 11 valid claims were filed against 1 of 11 failure-free warranty contracts awarded from FY 1984 through FY 1989. This condition occurred because the Project Office did not use historical data on the TOW system's warranty claims to determine the cost effectiveness of warranties and did not determine if the Project Office administrative system was adequate for recording and reporting warranty defects. As a result, the Army was not obtaining cost-effective warranties."

ADDITIONAL FACTS: Command disagrees with some of the implications of the finding and the following comments are submitted for accuracy and clarification:

a. Finding: The TOW Project Office established warranties on hardware with high expected failure thresholds that were not cost effective.

Command Position: Nonconcur.

(1) The fact that a less than expected number of warranty claims had been received is not justification for concluding that the expected failure threshold is too high. One of the objectives of the warranty program is to encourage the contractor to improve his quality. If this objective is achieved, the warranty claims will be less than expected. No attempt was made by the auditors to determine what the correct failure threshold should have been.

(2) Tangible benefits are not the safe consideration in determining the effectiveness of warranties. The intangible benefits such as improvements in reliability and user satisfaction as a result of better, more reliable weapon systems were not considered. An analogy would be that you want your car to break down numerous times so you can make money on your car warranty.

b. Finding: There was no assurance that the administrative system for reporting warranty defects was operating properly.

Command Position: Nonconcur. The defect reporting system is dictated by the standard logistic support system. The reporting of TOW warranty claims is no different from the reporting of any defect, whether warranted or not, on any other system.

RECOMMENDATION C-1: "We recommend that the Commander, U.S. Army Missile Command determine the adequacy of the administrative system to record and report warranty defects as required by Federal Acquisition Regulation 46.703 (c).

ACTION TAKEN: Concur. The administrative system to record and report warranty defects as required by Federal Acquisition Regulation 46.703 (c) is determined to be adequate. AR 700-139, Army Warranty Program Concepts and Policies, states that the warranty concept must be tailored to fit the item and its intended use with minimal burden impact on standard Army logistical procedures and minimal warranty task execution burden on the field user. Warranty technical bulletins instruct field users to submit warranty claims only on depot repairable items; furthermore, the field users are instructed to perform all authorized organizational and intermediate level maintenance in accordance with standard military maintenance procedures. DA PAM 738-750 provides implementation instructions for the Warranty Program Army-wide. Warranties are implemented to stay within these guidelines.

RECOMMENDATION C-2: "We recommend that the Commander, U.S. Army Missile Command use available historical data on warranty claims to determine the cost-effectiveness of warranties included in future contracts."

ACTION TAKEN: Concur. MICOM Supplement 1 to AR 700-139 specifies that the requiring element is responsible for performing cost effectiveness analysis of warranties. Therefore, this recommendation should be addressed to the appropriate project manager.

3

SUMMARY OF POTENTIAL MONETARY AND OTHER BENEFITS RESULTING FROM THE AUDIT

Recommendation Reference	Description of Benefit	Amount and/or Type of Benefit
A.1.	Program Results. Performance of configuration audits could potentially eliminate procurements of unusable parts. Also, technical data packages would provide for satisfactory procurement resulting in less out-of-stock parts.	Undeterminable. The monetary benefits were not identifiable because we could not qualify the costs that could be avoided by the implementation of our recommendation.
A.2.	Program Results. Programming funds for test equipment during implementation of engineering changes will prevent backlogs at the depots and preclude the issuance of the next higher assembly.	Undeterminable. The monetary benefits were not identifiable because we could not qualify the costs that could be avoided by the implementation of our recommendation.
B.1. and B.2.	Program Results. Reduce production contract cost by eliminating unnecessary contractor management cost and have the Government supply the component to the contractor.	Funds Put to Better Use. Appropriation: Army Procurement Funds FY — Dollars 1992 — 6,667,047 1993 — 6,293,847 1994 — 6,667,047 1995 — 6,667,046 1996 — 6,667,046 1997 — 6,667,046 Total — $39,629,079
C.1. and C.2.	Program Results. This would allow the Army to obtain repairs under the warranty provisions of the contract. Use of historical data in cost-effectiveness analysis will ensure maximization of warranties.	Undeterminable. By reporting warranty claims in an effective manner, the Army would save money by not having to procure additional parts for repair work. Also, the Army would save money by only procuring cost-effective warranties.

ACTIVITIES VISITED OR CONTACTED

Office of the Secretary of Defense

Under Secretary of Defense for Acquisition, Washington, DC
Assistant Secretary of Defense, Program Analysis and Evaluation, Washington, DC

Department of the Army

Assistant Secretary of the Army (Research, Development and Acquisition), Washington, DC
U.S. Army Materiel Command, Washington, DC
U.S. Army Missile Command, Redstone Arsenal, AL
U.S. Army Forces Command, Fort McPherson, GA
U.S. Army Training and Doctrine Command, Fort Monroe, VA
101st Airborne Division, Fort Campbell, KY
1st Cavalry Division, Fort Hood, TX
Anniston Army Depot, Anniston, AL
Sacramento Army Depot, Sacramento, CA
U.S. Army Ordnance Missile and Munitions Center and School, Redstone Arsenal, AL
U.S. Army Aviation Logistics School, Fort Eustis, VA

Department of the Navy

U.S. Naval Air Systems Command, Arlington, VA

Defense Agencies

Defense Plant Representative Offices:
- Hughes Aircraft Company, Missile Systems Group, Tucson, AZ
- Hughes Aircraft Company, Electro-Optic and Data Systems Group, El Segundo, CA
- Hughes Aircraft Company, Training and Support Systems Group, El Segundo, CA

Defense Contract Audit Agency Resident Offices:
- Hughes Aircraft Company, Tucson, AZ
- Hughes Aircraft Company, El Segundo, CA

Non-Government Activities

Hughes Aircraft Company:
- Missile Systems Group, Tucson, AZ
- Electro-Optic and Data Systems Group, El Segundo, CA
- Training and Support Systems Group, Long Beach, CA

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Program Executive Officer for Fire Support
Project Manager for the Tube-Launched, Optically-Tracked, Wire-Guided Missile System
Commander, 101st Airborne Division
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Commander, Sacramento Army Depot
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