Audit Report

OFFICE OF THE INSPECTOR GENERAL

FUNCTIONAL AND PHYSICAL CONFIGURATION AUDITS OF THE ARMY PALADIN PROGRAM

Report No. 96-130 May 24, 1996

Department of Defense

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Acronym

DCMC	Defense Contract Management Command

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

Report No. 96-130 **May 24, 1996**

MEMORANDUM FOR AUDITOR GENERAL, DEPARTMENT OF THE ARMY

SUBJECT: Audit of Functional and Physical Configuration Audits of the Army Paladin Program (Project No. 5AE-0032.02)

Introduction

We are providing this report for your information and use. This report is the third in a series of reports resulting from our audit of functional and physical configuration audits of Defense systems. A functional configuration audit is a formal examination of functional characteristics of test data for configuration items to verify that the item has achieved its specified performance. A physical configuration audit is a formal examination to verify that the configuration item "as built" conforms to the technical documentation that defines the item. Enclosure 2 provides definitions of technical terms used in this report.

Audit Results

The Paladin Program Office adequately performed its physical configuration audit and verified the closure of action items. However, for the functional configuration audits, the Program Office had not completed management actions needed to verify the closure of data-source-matrix line items (items) and to determine whether unverified items still needed to undergo a functional configuration audit. During our audit, the Program Office took appropriate corrective actions to verify and close the items and to conduct functional configuration audits of unverified items.

Objective

The audit objective was to evaluate the adequacy of the functional and physical configuration audit processes for the acquisition of the Paladin Program. Specifically, we determined whether functional and physical configuration audits verified and documented that configuration items agreed with their configuration identifications and were complete, accurate, and satisfied program requirements. We also evaluated the management control program as it related to our audit objective. The Paladin Program is one of five programs included in our ongoing audit of management of functional and physical configuration audits of Defense systems. In Enclosure 1, we discuss the scope and methodology used to accomplish the objective as well as management controls and prior audit coverage.

Audit Background

Paladin Program. The Army's Paladin (M109A6 Howitzer) Program is an acquisition category II program. The Paladin is a self-propelled, fully tracked, 155mm weapon that possesses ground mobility; all-weather operational capability; and nuclear, biological, and chemical crew protection.

In April 1993, the Army awarded the production contract for the Paladin to United Defense, Limited Partnership, York, Pennsylvania. The Army plans to acquire 877 Paladins, under the current multiyear contract, as a product improvement to current M109A2/A3 howitzers at an estimated total program cost of $1.3 billion. As of May 3, 1996, the Army had accepted delivery of and fielded 338 and 238 Paladins, respectively. All Paladins under the multiyear contract are scheduled to be delivered by first quarter FY 1999. Enclosure 3 shows a diagram of the Paladin.

Configuration Management Guidance. Configuration management guidance is in DoD Regulation 5000.2, "Mandatory Procedures for Major Defense Acquisition Programs (MDAPS) and Major Automated Information System (MAIS) Acquisition Programs," March 15, 1996, and Military Standard 973, "Configuration Management," April 17, 1992.

DoD Regulation. The Regulation mandates that the program manager use a systems engineering process that includes configuration management to control the system products, processes, and related documentation. Further, the Regulation mandates that, as part of systems engineering, the program manager establish a configuration management process to identify, document, and verify the functional and physical characteristics of an item; record the configuration of an item; control changes to an item and its documentation; and provide a complete audit trail of decisions and design modifications.

Military Standard. The development contract for the Paladin required the use of Military Standard 1521B, "Technical Reviews and Audits for Systems, Equipments, and Computer Software," June 4, 1986, that established guidance for conducting functional and physical configuration audits. On April 5, 1995, the Defense Standardization Improvement Council incorporated Military Standard 1521B into Military Standard 973. Military Standard 973 requires audits of configuration items to verify conformance to specifications, drawings, interface control documents, and other contract requirements. The Program Office modified the contract accordingly to show the new military standard.

Conducting Configuration Audits. The Paladin Program Office conducted functional configuration audits in June 1990, June 1992, January 1993, June 1995, and September 1995 and a physical configuration audit from October through December 1992.

Functional Configuration Audit. To accomplish the functional configuration audits, the Paladin Program Office verified requirements from the system specifications. For example, one system specification requirement is that the system must function at atmospheric pressure conditions ranging from

945 to 1,060 millibars and at elevation surface conditions ranging from 1,312 feet below sea level through 9,974 feet above sea level. The Program Office considered the system specification requirements to be configuration items and defined those configuration items as data-source-matrix line items for verification and tracking purposes.

Physical Configuration Audit. To accomplish the physical configuration audit, the Paladin Program Office verified that the Paladin conformed to the technical documentation using the first system produced. The Paladin Program Office and the contractor conducted the physical configuration audit on all components and assemblies having quality assurance provisions and specifications and resolved audit deficiencies during the audit.

Discussion

The Paladin Program Office adequately performed the physical configuration audit and verified the closure of action items. However, for the functional configuration audits, the Program Office had not completed management actions needed to verify the closure of data-source-matrix line items and to determine whether unverified items still needed to undergo a functional configuration audit. During our audit, the Program Office took appropriate corrective actions to verify and close the items and to conduct functional configuration audits of unverified items.

Establishing Suspense Dates. For the functional configuration audits, the Paladin Program Office did not assign action officers and establish suspense dates for closure of data-source-matrix line items not meeting specified performance. As of February 6, 1996, the Program Office had 10 out of approximately 900 items open that had not achieved the performance specified in the system specifications. The data base listing those open items did not identify the responsible action officers and closure dates for the items. Paladin Program management officials indicated that the omission of action officers and suspense dates was an oversight. In taking corrective action, the Paladin Program Office identified four more items that had not achieved the performance specified in the system specifications. By April 30, 1996, the Program Office had completed corrective actions and closed all 14 items.

Verifying Line Items. The Paladin Program Office had not determined whether unverified data-source-matrix line items still needed to undergo a functional configuration audit. As of February 6, 1996, the Program Office had 88 out of approximately 900 items that apparently had not undergone a functional configuration audit. Program Management officials indicated that they were not sure whether the items still needed to undergo a functional configuration audit or whether the items had been verified as the result of a previous audit.

On February 26, 1996, the Program Office reviewed the 88 items and determined that 57 items could not be tested or had achieved the specified performance based on the results of previous tests. For the remaining 31 items, the Program Office assigned action officers to review the items by April 30,

1996. The Program Office also identified one additional item that required further review by the action officers. To accomplish the review, the action officers determined whether the items still needed to be verified or obtained documentation indicating that the item had been verified. For items needing to undergo a functional configuration audit, the Program Office assigned an action officer and established a suspense date for closure. On April 30, 1996, the Program Office completed its review and closure of all 32 items.

Management Comments

We provided a draft of this report to you on May 15, 1996. Because the report contains no findings and recommendations, written comments were not required and none were received. Therefore, we are publishing this report in final form.

We appreciate the courtesies extended to the audit staff. If you have questions on this report, please contact Mr. John E. Meling, Audit Program Director, at (703) 604-9091 (DSN 664-9091) or Mr. Jack D. Snider, Audit Project Manager, at (703) 604-9087 (DSN 664-9087). Enclosure 4 lists the distribution of this report. The audit team members are listed inside the back cover.

David K. Steensma

David K. Steensma
Deputy Assistant Inspector General
for Auditing

Enclosures

Scope and Methodology

This enclosure discusses the scope and methodology used to accomplish the objective as well as management controls and prior audit coverage.

Scope

We conducted this program audit from December 1995 through May 1996 and reviewed data dated from October 1985 through May 1996. To accomplish the objective, we:

o examined the full-scale development contract DAAA21-86-C-0023, valued at about $3.2 million, and the production contract DAAA21-93-C-0044, valued at about $387 million, with United Defense, Limited Partnership,* including statements of work, contract data requirements lists, contract line items, and related correspondence;

o reviewed engineering change proposals, requests for waivers and deviations, contract modifications, deficiency notices, software problem and change reports, hardware problem reports, system specifications, program test results, test incident reports, and Army configuration regulations;

o reviewed the minutes of the functional and physical configuration audits conducted on the Paladin Program and the action items generated during those audits; and

o discussed issues relating to the effectiveness of the functional and physical configuration audit process for Paladin hardware and software with program, technical, and contracting officials from the Office of the Assistant Secretary of the Army (Research, Development and Acquisition); Program Executive Office, Field Artillery Systems, Picatinny Arsenal, New Jersey; Paladin Program Office, Picatinny Arsenal, New Jersey; Defense Contract Management Command (DCMC), United Defense, Limited Partnership, York, Pennsylvania (the contract administrator); and United Defense, Limited Partnership, Ground Systems Division, York, Pennsylvania (the prime contractor).

Methodology

We conducted the audit 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 management controls as we deemed necessary. We did not rely on computer-processed data to develop conclusions on this audit. Technical experts from the Quantitative Methods and

*In February 1994, FMC and BMY [Bowen, McLaughlin, York] Combat Systems merged to form a new company called United Defense, Limited Partnership.

the Technical Assessment Divisions, Inspector General, DoD, provided technical guidance concerning waivers and deviations and engineering change proposals for the Paladin Program.

Management Control Program

Requirement for Management Control Review. DoD Directive 5010.38, "Internal Management Control Program," April 14, 1987, requires DoD managers to implement a comprehensive system of management controls that provides reasonable assurance that programs are operating as intended and to evaluate the adequacy of those controls.

Scope of Review of Management Control Program. We limited our review because of relevant coverage in Inspector General, DoD, Report No. 96-028, "Implementation of the DoD Management Control Program for Major Defense Acquisition Programs," November 28, 1995. The report discussed the effectiveness of the management control program that the Defense Acquisition Executive and the Component Acquisition Executives used for major Defense acquisition programs. The report concluded that the acquisition community had not effectively integrated DoD Management Control Program requirements into its management assessment and reporting processes. As a result of the report recommendations, the Under Secretary of Defense for Acquisition and Technology integrated DoD Directive 5010.38 requirements into the March 15, 1996, revision to DoD Directive 5000.1, "Defense Acquisition," and DoD Regulation 5000.2, "Mandatory Procedures for Major Defense Acquisition Programs (MDAPS) and Major Automated Information System (MAIS) Acquisition Programs." Acquisition managers are now to use program cost, schedule, and performance parameters as control objectives to implement the DoD Directive 5010.38 requirements. The managers are to identify material weaknesses through deviations from approved acquisition program baselines and exit criteria in the Defense Acquisition Executive Summary report. Consequently, we limited our review to management controls of the functional and physical configuration audit process at the Paladin Program Office and DCMC United Defense. The DCMC United Defense provides contract administration responsibilities for the Paladin Program.

Adequacy of Management Controls. At the Paladin Program Office and DCMC United Defense, we did not identify any material management control weakness applicable to our primary audit objective.

Program Office. The Paladin Program Office conducted annual management control evaluations in accordance with Army Regulation 11-2, "Management Control," August 1, 1994. The Program Office determined that management controls were in place and working effectively; however, the evaluations did not specifically cover functional and physical configuration audits as part of an assessable unit. Even though the Program Office did not evaluate functional and physical configuration audits, we did not identify a material management control weakness for configuration audits.

Defense Contract Management Command. The DCMC United Defense conducted management control reviews based on assessable units specified in the Defense Logistics Agency Management Control Plan. However, the Plan did not include functional and physical configuration audits as part of an assessable unit. Even though the DCMC United Defense did not assess functional and physical configuration audits, we did not identify a material management control weakness for configuration audits.

Prior Audit Coverage

During the last 5 years, the General Accounting Office; Office of the Inspector General, DoD; and the Army Audit Agency have not issued reports addressing the adequacy of the functional and physical configuration audit process for the Paladin Program.

Definitions of Technical Terms

Acquisition Category. Categories established to provide decentralized decisionmaking and execution and compliance with statutorily imposed requirements. The categories include I, major Defense acquisition programs; IA, major automated information systems; II, major systems; and III, all other acquisition programs.

Action Item. A document requiring correction of a deficiency in the functional characteristics or technical documentation associated with a configuration item resulting from a functional or physical configuration audit.

Configuration Identification. The process of establishing and describing the contractual baselines and related configuration items.

Configuration Item. An aggregation of hardware, firmware, or computer software or any of their discrete portions that satisfies an end use function and that the Government designated for separate configuration management.

Configuration Management. Technical and administrative direction and surveillance actions taken to identify and document functional and physical characteristics of an item, to control changes to a item and its characteristics, and to record and report change processing and implementation status.

Data-Source-Matrix Line Item. Configuration item derived from the Paladin Program's system specification requirements.

Deviation. A written authorization, granted before the manufacture of an item, to depart from a particular performance or design requirement of a specification, drawing, or other document for a specific number of units or a specified period.

Engineering Change Proposal. A contractor document describing and justifying a proposed engineering change and applicable costs that is submitted to the Government for approval or disapproval.

Functional Configuration Audit. A formal examination of functional characteristics of test data for configuration items to verify that the item has achieved the performance specified in its functional or allocated identification. If the item was developed at Government expense, the functional configuration audit must be performed before acceptance of the item. The functional configuration audit must be performed on a prototype or the configuration to be released for production of the operational quantities.

Physical Configuration Audit. A formal examination to verify that the configuration item "as built" conforms to the technical documentation that defines the item. The physical configuration audit includes a detailed audit of engineering drawings, specifications, technical data, and tests utilized in production of the item. The physical configuration audit may be conducted on the first full-rate production or the first low-rate initial production item.

Approval by the Government program office of the product specification and satisfactory completion of the physical configuration audit establishes the product baseline. A contractor is required to process all subsequent changes to the product baseline by the formal engineering change proposal process.

Product Baseline. The baseline established at the physical configuration audit that includes product, process, and material specifications and engineering drawings. Approval of the configuration item product specification by the Government program office and satisfactory completion of the physical configuration audit establish the product baseline.

Product Improvement. Effort to incorporate a configuration change involving an engineering and testing effort on other than developmental items to increase system or combat effectiveness or extend useful military life. Usually results from feedback from the users.

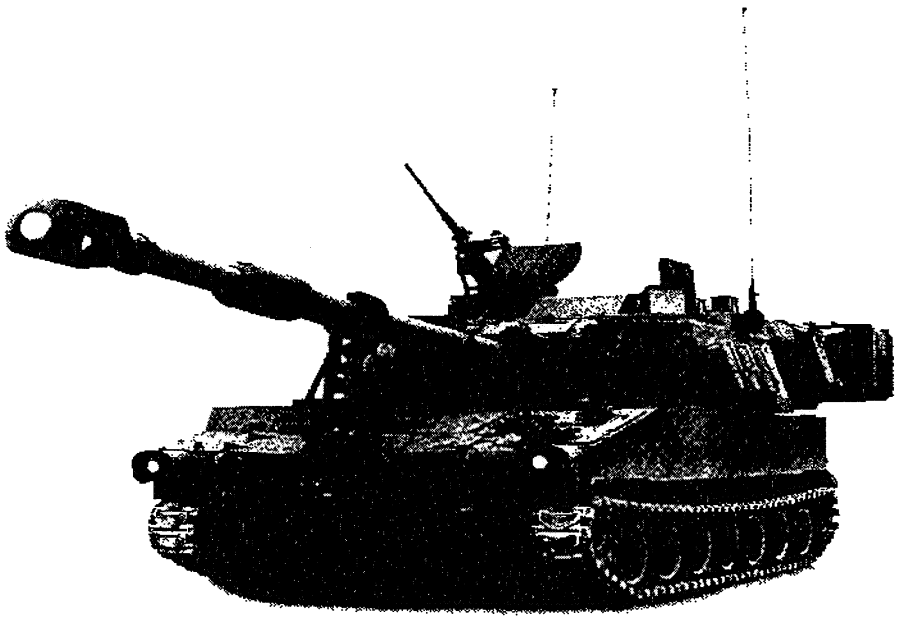
Prototype. An original or model on which a later item is formed or based.

Rework. Any corrections of defective work either before, during, or after inspection.

Specification. A document intended primarily for use in procurement that clearly and accurately describes the essential technical requirements for items, materials, or services, including the procedures for determining whether the requirements have been met.

Waiver. A written authorization to accept a configuration item that departs from specified requirements. The item may be considered suitable "as is" or after rework by an approved method.

Paladin (M109A6 Howitzer)



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