Audit Report

FINANCIAL MANAGEMENT OF THE RAH-66
COMANCHE HELICOPTER PROGRAM

Report Number 98-185 August 6, 1998

Office of the Inspector General
Department of Defense

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Acronyms

ACWP	Actual Cost of Work Performed
CPR	Cost Performance Report
BCWP	Budgeted Cost of Work Performed
BCWS	Budgeted Cost of Work Scheduled
EVMS	Earned Value Management System
WBS	Work Breakdown Structure

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

August 6, 1998

MEMORANDUM FOR AUDITOR GENERAL, DEPARTMENT OF THE ARMY

SUBJECT: Audit Report on Financial Management of the RAH-66 Comanche Helicopter Program (Report No. 98-185)

We are providing this report for your information and use. This is the second in a series of reports on the acquisition of the RAH-66 Comanche helicopter.

The Program Manager for the Comanche Program implemented action plans that adequately addressed the issues identified in this report. We commend the Program Manager for his prompt actions. Management comments conform to the requirements of DoD Directive 7650.3. We require no further response to the recommendations.

We appreciate the courtesies extended to the audit staff. Questions on the audit should be directed to Mr. Charles M. Santoni at (703) 604-9051 (DSN 664-9051) or Mr. William D. Van Hoose at (703) 604-9034 (DSN 664-9034). See Appendix C for the report distribution. The audit team members are listed inside the back cover.

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Office of the Inspector General, DoD

Report No. 98-185 **August 6, 1998**
(Project No. 7AL-0012.01)

Financial Management of the RAH-66 Comanche Helicopter Program

Executive Summary

Introduction. This report is the second of a series of reports on the audit of the acquisition of the RAH-66 Comanche. This report addresses issues pertaining to the earned value management system, the award fee, and life-cycle costs. The Army spent $3.6 billion in research, development, test and evaluation funds through FY 1997 and is planning to spend and additional $4.3 billion through FY 2009. The Army plans to begin fielding the helicopter in 2006 for improved armed reconnaissance capability.

Audit Objective. The audit objective was to evaluate the overall management of the Comanche Program. The specific objective of this portion of the audit was to evaluate the financial aspects of program management. The previous report, Inspector General, DoD, Report No. 98-125, covered the protection of the Comanche helicopter against radio frequency weapons, and a subsequent report will cover acquisition issues. We also reviewed the adequacy of the management control program as it applied to the specific stated audit objective.

Audit Results. The Cost Performance Reports did not present an informative picture of the Comanche Program. Also, the process for determining the award fee was not fully documented. In addition, the life-cycle cost was underestimated.

To correct the problems, Comanche Program Office officials agreed to require the contractor for the Comanche to revise its procedures for preparing the Cost Performance Reports, and request the Defense Contract Management Command to perform more comprehensive reviews of the contractor's earned value management system. Those officials also agreed to fully document the process of determining the award fees. In addition, the officials agreed to include the costs associated with the use of hazardous materials and disposal costs related to the Comanche helicopter in its life-cycle-cost estimate prior to the next milestone review. When implemented, the agreed-upon action plans will correct the problems identified. See Part I for a discussion of the audit results. For a discussion of the management control program, see Appendix A.

Summary of Recommendations. We recommend that the Program Manager for the Comanche Program develop time-phased milestones to facilitate the completion of the agreed-upon plans of action.

Management Comments. The Program Manager for the Comanche Program stated that the plans of action were being implemented. See Part I for a summary of management comments and Part III for the complete text of the comments.

Audit Response. We considered the management comments to be fully responsive and commend the Program Manager for his positive actions. Therefore, we require no further response to the recommendations.

Table of Contents

Executive Summary i

Part I - Audit Results

Audit Background 2
Audit Objective 2
Finding A. Earned Value Management System 3
Finding B. Contract Performance Award Fee 10
Finding C. Life-Cycle Cost 14

Part II - Additional Information

Appendix A. Audit Process
Scope 20
Methodology 20
Management Control Program Review 21
Summary of Prior Coverage 22
Appendix B. Earned Value Management System 23
Appendix C. Report Distribution 25

Part III - Management Comments
Department of the Army Comments 28

Part I - Audit Results

Audit Background

This report on the financial management of the Comanche Program is the second of a series of reports on the audit of the acquisition of the RAH-66 Comanche (Project No. 7AL-0012). In April 1991, the acquisition program for the Comanche helicopter entered the program definition and risk reduction phase. The program is scheduled to enter the engineering and manufacturing development phase in FY 2002. The Program Manager for the Comanche, under the Program Executive Officer for Aviation, manages the Comanche acquisition program. The contractor for the Comanche helicopter is the Boeing Sikorsky RAH-66 Comanche Team (Contractor). The Army spent $3.6 billion in research, development, test and evaluation funds through FY 1997 and is planning to spend an additional $4.3 billion through FY 2009.

The Comanche is the first Army helicopter specifically developed to provide the Army with an improved armed reconnaissance capability. It will expand the capability of the Army to conduct reconnaissance operations in all battlefield environments. The Comanche will replace three helicopters (AH-1, OH-58, and OH-6) that currently perform the armed reconnaissance mission. The Army plans to begin fielding the Comanche during 2006.

Audit Objective

The overall audit objective was to evaluate the management of the Comanche Program. The specific objective of this portion of the audit was to evaluate the financial management of the Comanche Program. A previous report covered the protection of the Comanche helicopter against radio frequency weapons, and a later report will cover technical issues. We also reviewed the adequacy of the management control program as it applied to the specific objectives of the audit. See Appendix A for a discussion of the audit scope and methodology, the organizations visited and contacted during the audit, and our review of the management control program.

Finding A. Earned Value Management System

The Cost Performance Reports (CPRs) for the Comanche Program are not an informative indicator of cost and schedule performance. This condition resulted from adjustments made to the Earned Value Management System (EVMS) at the various times the Comanche Program was restructured, from combining the contract performance data for the period prior to the January 1997 restructure with the contract performance data for the period after the January 1997 restructure, and from the Contractor's questionable practice in operating the EVMS. Therefore, the CPRs deprive DoD managers of specific information for making decisions pertaining to the Comanche Program.

Purpose of an Earned Value Management System

Earned value is a management technique that relates resource planning to schedules and performance. The Contractor plans, budgets, and schedules work in time-phased increments constituting a performance measurement baseline. In the EVMS, the sum of all budgets for the work scheduled is the Budgeted Cost of Work Scheduled (BCWS). The Contractor earns the work on the same basis as planned, in dollars or other quantifiable units such as labor hours. In the EVMS, the sum of budgets for completed work is called the Budgeted Cost of Work Performed (BCWP), also known as earned value. Planned value, BCWS, compared with earned value, BCWP, thus measures the work planned versus the equivalent work accomplished. Any difference is called a schedule or accomplishment variance. Earned value compared with the actual cost incurred for the work performed, called Actual Cost of Work Performed (ACWP), provides an objective measure of cost performance. Any difference is called a cost variance. Therefore, an EVMS properly implemented and effectively operated would preclude management from suddenly realizing that it spent 90 percent of the budgeted funds but that the project is only 60 percent complete. See Appendix B for a detailed description of an EVMS.

Cost Performance Reports

The CPRs for the Comanche Program have not presented an informative picture of its cost and schedule performance. For example, the CPR as of December 31, 1996, shows that the Comanche Program was 99 percent complete and generally on schedule and within cost. However, the actual status of the Comanche Program was not what one would expect if the program was 99 percent complete.

The Army awarded the contract for the program definition and risk reduction phase of the Comanche Program in April 1991. The contract required the Contractor to accomplish all tasks associated with this phase and deliver six prototype helicopters to the Army at a target cost of $1.8 billion by

August 8, 1995. In January 1993, due to budget limitations, the Comanche Program Office extended the period of performance for the contract to September 1997, reduced the quantity of prototypes from six to three, and increased the target cost to $2 billion. On March 23, 1994, the Comanche Program Office reduced the quantity of prototypes from three to two. On August 23, 1996, the Comanche Program Office further modified the contract requiring the Contractor continue design and fabrication of the two prototypes. By the January 1997 restructure, the Comanche Program Office had spent 99 percent of the contract funds, but the Contractor had not completed 99 percent of the work for the program definition and risk reduction phase. When asked, neither the officials of the Comanche Program Office nor the Contractor officials could determine which tasks were 99 percent complete. Modifying contract requirements to coincide with the Contractor's accomplishments up to the January 1997 restructure resulted in CPRs that indicated that the work was about 99 percent complete; however, this is not a useful statistic.

The January 1997 restructure increased the budget-at-completion for the contract from $1,849.8 million to $3,400.5 million, increased the deliverable aircraft from two to eight, and extended the delivery date to 2002. As a result, after the January 1997 restructure, the data in the EVMS showed that the Comanche Program was 53 percent complete. At that point, the Comanche Program Office had spent 53 percent of the total contract funds, but it is questionable whether the Contractor had completed 53 percent of the contract tasks. The Comanche Program Office and the Contractor did not have documentation showing that the contractor had completed 53 percent of the tasks.

Measuring Cost and Schedule Performance

The CPRs did not show an informative picture of the status of the Comanche Program because of adjustments made to the EVMS as a result of the restructures, contract performance data for the period prior to the January 1997 restructure being combined with the contract performance data for the period after the January 1997 restructure, and the Contractor's questionable practices in operating its EVMS.

Adjustments to the Earned Value Management System. The Contractor, with the consent of the Comanche Program Office, made adjustments to its EVMS because of changes to the performance requirements of the contract, which decreased the usefulness of the CPRs. During our review of work packages at the Contractor's Boeing facility for the contract period prior to the January 1997 restructure, we noted many instances in which the Contractor stopped work on discrete work packages before completing the required task. The Contractor transferred unused budgeted hours to other work packages or planning packages, and revised the BCWP to equal the BCWS. Therefore, the Contractor eliminated any schedule variance that had accumulated for closed work packages and did not reflect them in the CPRs.

Combining Contract Performance Data. The Contractor, with the consent of the Comanche Program Office, combined the contract performance data for the period before the January 1997 restructure with the performance data for the period after the January 1997 restructure for reporting in the CPRs. Combining the data decreased the usefulness of the CPRs. The Comanche Program Office instructed the Contractor to adjust BCWS and BCWP to make them equal the ACWP of $1,827.8 million. Those adjustments, made at both the Contractor's Boeing and Sikorsky facilities, eliminated the cost and schedule variances that existed at that time. The Contractor made the adjustments so that the evaluation of cost and schedule performance could have a new start with no variances.

After the January 1997 restructure, the Contractor calculated the cost and schedule variance percentages and the performance indices using the totals of the BCWS, BCWP, and ACWP since the beginning of the contract in April 1991. That method diluted the variance percentages and performance indices because the Contractor combined $1,827.8 million without any variance with the performance data following the January 1997 restructure that do contain variances. The January 1997 restructure increased the budget-at-completion for the contract from $1,849.8 million to $3,400.5 million. So, as of September 1997, the percentage schedule variance was a negative 0.4 percent when calculated using the BCWS and the BCWP for the total contract period. However, we calculated a negative 6.4 percent variance in the BCWS and BCWP for the period of the contract after the January 1997 restructure. The schedule variance occurred after January 1997 and should be evaluated against the BCWS and BCWP for that same period, not the total period of the contract. Similarly, the percentage of cost variance was a negative 0.1 percent based on the total contract period. However, it was a negative 1.6 percent based on the period of the contract in which the cost variance occurred.

The Contractor, in its November 1997 CPR, states that the Comanche Program continues to be well above the standards of most programs in its cost and schedule performance. The Contractor further states that, at 78 months into the contract, the cumulative unfavorable schedule variance is a negative 0.4 percent, and the cumulative unfavorable cost variance is a negative 0.1 percent. A person reading the CPR, who was unfamiliar with the Comanche Program, would never know that the cumulative variances were eliminated at the beginning of the January 1997 restructure, and that the percentages of schedule and cost variance after the beginning of the January 1997 restructure were a negative 4.7 and 1.6 percent, respectively. Also, combining contract performance data affects the calculation of the estimate-at-completion, which is the total cost of the project at completion. Calculation of the estimate-at-completion requires using the schedule variance percent, the cost variance percent, the schedule performance index, and the cost performance index. For example, using the contract performance data as of November 30, 1997, to calculate an estimate-at-completion results in a projected cost overrun of $10.5 million based on the data for the total contract, but it results in a projected cost overrun of $97.8 million when it is based on the short 11-month period since the January 1997 restructure.

The Comanche Program Office recognized the effect that combining the performance data had on the performance statistics. Therefore, during the October 28, 1997, program review meeting, Comanche Program Office officials briefed both sets of data. However, the Contractor's CPRs should also show the cost and schedule variance percentages based on the performance data for the contract after the January 1997 restructure.

Contractor Operation of the Earned Value Management System. The Contractor's CPRs did not reflect the status of the Comanche Program accurately because the Contractor established an excessive number of level-of-effort work packages. Also, the Contractor established some discrete work packages that were actually level-of-effort work packages, and the tasks related to the planning packages were too broad.

Level-of-Effort Work Packages. The Contractor established an excessive quantity of level-of-effort work packages, which reduced the reliability of the results obtained from the EVMS. The official responsible for the EVMS stated that the Contractor's policy was that level-of-effort work packages should not exceed 20 percent of the total work packages. Therefore, we used the 20-percent criterion for our evaluation.

At the Contractor's Boeing facility, we reviewed all 54 work packages containing labor hours within the Work Breakdown Structure (WBS) 1.1.E, 1.1.5 and 1.1.7 covering 27,608 hours of work from January 1997 through September 1997. We judgmentally excluded material and subcontractor work packages from our review. Our review showed that Boeing classified 35 of the 54 work packages as level-of-effort work, approximately 65 percent. The 35 level-of-effort work packages accounted for 18,523 of the 27,608 hours, which amounted to 67 percent. In addition to our review, the Cost Performance Monitor of the Defense Contract Management Command office at Boeing Helicopters reported on June 6, 1997, that 62 percent of the hours planned for the Comanche Program from June 1997 through September 1997 period were in level-of-effort work packages. The use of level-of-effort work packages results in the calculation of earned value or BCWP based on the performance of continuing functions with no direct relationship to specific accomplishments. Therefore, BCWS is always equal to BCWP and the program is on schedule. A large quantity of level-of-effort work packages dilutes the data from the discrete work packages and diminishes the behind-schedule and over-cost conditions in the CPRs.

At the Contractor's Sikorsky facility, we reviewed all 35 work packages with labor hours within WBS 1.1.1.1.1. covering 10,451 hours of work from January through October 1997. Sikorsky classified 1 of the 35 work packages as level-of-effort that accounted for 1,070 of the 10,451 hours, which amounted to 10 percent and was well within the 20-percent criterion of the total work packages.

Discrete Work Packages. We noted that work packages established as discrete work packages were, in some cases, being managed as level-of-effort work packages.

At the Contractor's Boeing facility, we reviewed all 54 work packages that included labor hours, accounting for 27,608 hours. Boeing classified nine of those work packages, amounting to 8,058 hours, as discrete work packages. We reviewed the work packages and concluded that eight work packages that accounted for 7,956 of the 8,058 hours were not for discrete tasks having a valid milestone. Based on our review of milestone descriptions and interviews with responsible officials, the event for obtaining credit for work performed was the occurrence of September 30, 1997, not the completion of specific tasks. In addition, a member of the Comanche Program Office staff noted the same condition in other elements of the WBS at the Contractor's Boeing facility. The staff member reported the condition to the management of the Comanche Program Office in a memorandum dated September 4, 1996, which stated that, "This review was initiated after the discovery of discrete milestones in the Contractor Flight Test Program set at such a general level to yield little accurate earned value insight into the performance measurement baseline."

At the Contractor's Sikorsky facility, we reviewed all 35 work packages that included labor hours, accounting for 10,451 hours. Sikorsky classified 34 work packages for 9,381 hours as discrete work packages. We reviewed the 34 work packages and concluded that 3 work packages that accounted for 1,429 hours were not discrete tasks having a valid milestone. We based the conclusion on review of the descriptions of the work package tasks. For the three work packages, the description indicated an ongoing function rather than completion of a specific task.

Planning Packages. The planning packages for each WBS did not include adequate details of the tasks to be accomplished; they only consisted of the total budgeted funds allotted to that WBS with the funds being apportioned, by month, over the contract period. Planning packages should contain a brief description of the tasks to be accomplished. This helps to prevent the Contractor from using funds from a planning package to establish a work package beyond the scope of the planning package, and depleting the available funds in the planning package before the Contractor completes all the tasks.

Surveillance of Earned Value Management System

The Defense Contract Management Command office at Sikorsky Aircraft and the Defense Contract Management Command office at Boeing Helicopters are responsible for the surveillance of the Contractor's EVMS and for preparation of the monthly surveillance reports. Although the surveillance report at Boeing Helicopters, dated June 6, 1997, commented on the excessive quantity of level-of-effort work packages, its other surveillance reports did not comment on the work-package or planning-package levels. Surveillance should include reviews to ensure that work packages that are classified as discrete are completed before the Contractor can take the earned value for the work package.

Comanche Program Office staff members survey the Contractor's EVMS. A September 1996 trip report of a staff member's visit to Boeing Helicopters to review its EVMS identified about seven problems that would affect its reliability. The Comanche Program Office's comprehensive review was an outstanding effort.

Summary

The Contractor's CPRs do not show an informative picture of the status of the Comanche Program. Before January 1997, the condition resulted from the many instances in which the Contractor stopped work on discrete work packages before completing the related task. The Contractor transferred the unused budgeted hours to other work packages or planning packages, and made the BCWP equal the BCWS. Those actions eliminated any cost or schedule variance that accumulated for the work packages closed. After January 1997, the Contractor combined performance data for the period before the January 1997 restructure with the performance data for the period after the January 1997 restructure, which diluted the percent variances and performance indices.

Also, review of the operation of the EVMS since the January 1997 restructure disclosed problems that affect the creditability of the EVMS data. The problems include an excessive quantity of level-of-effort work packages, work packages that are improperly classified as discrete work packages, and an inadequate description of tasks related to planning packages.

Management Action

Comanche Program Office representatives acknowledged that combining the contract performance data diluted the performance indicators and made the CPRs less informative, but commented that they wished to see both sets of data. The representatives also acknowledged that excessive level-of-effort work packages resulted in less informative CPRs, but commented that there is no DoD criterion for the quantity of level-of-effort work packages. In addition, they agreed that planning packages should contain a brief description of the scope of the work. The Comanche Program Office representatives agreed to implement the following plan of action:

1. Require the Boeing Sikorsky RAH-66 Comanche Team to report in its CPRs the percentages of schedule and cost variances based on the work scheduled, work performed, and actual cost incurred since the January 1997 restructure of the contract for the program definition and risk reduction phase of the Comanche Program.

2. Request the Defense Contract Management Command Sikorsky Aircraft and the Defense Contract Management Command Boeing Helicopters to perform more comprehensive reviews of the EVMS used for managing the Comanche Program to ensure the maintenance of system discipline. Specifically, those reviews must ensure that:

a. Work packages classified as discrete have valid milestones, and that earned value is claimed only upon the satisfactory completion of the milestone.

b. Level-of-effort work packages do not exceed approximately 20 percent of the total work packages.

c. Planning packages contain a brief description of the work-related tasks.

These actions will correct the problems identified. However, the Comanche Program Office did not develop time-phased milestones to implement the plan of action.

Recommendation and Management Comments

A. We recommend that the Program Manager for the Comanche Program develop time-phased milestones to implement the plan of action to improve the usefulness of the Cost Performance Reports for the Comanche Program.

Management Comments. The Program Manager for the Comanche Program concurred and stated that the implementation of the recommended changes has begun. The full text of the Program Manager's comments is in Part III.

Finding B. Contract Performance Award Fee

The process of evaluating the Contractor's performance and determining the amount of award fee was not well documented because Comanche Program Office personnel did not place adequate emphasis on the need to fully document award fee decisions. Consequently, through December 1997, the Comanche Program Office awarded the Contractor $84 million in award fees for which documentation that contractual evaluation criteria were adhered to was incomplete.

Award Fee Process

The contract award fee is a procurement technique used to award the Contractor for good performance. The contract requires that the Comanche Program Office establish criteria for evaluating the Contractor's performance. Therefore, the Comanche Program Office established evaluation criteria in three areas and assigned weights to those areas in accordance with their significance. The three evaluation areas and their weights were: (1) technology weighted at 40 percent, (2) supportability weighted at 25 percent, and (3) cost and program management weighted at 35 percent. The Comanche Program Office established specific tasks under each of the three areas. Each of the tasks was of equal weight.

The award fee board performed an annual evaluation for award fee Period Six and then changed the award process for award fee Period Seven. For award fee Period Seven, the award fee board reviewed the Contractor's progress toward meeting the evaluation criteria quarterly. Based on the quarterly reviews, the award fee board determined the quarterly award fee payments.

The contract defines the level of performance required to obtain various percentages of the available award fee. Those definitions changed between award fee Periods Six and Seven. Those definitions are as follows:

- The Contractor's performance clearly meets acceptable levels. Appropriate corrective actions where necessary were implemented in a timely manner. Receive 100 percent of the available award fee. Changed to 96 - 100 percent for Period Seven.

- The Contractor's performance meets acceptable levels. Certain levels should be improved, but all are minor. Appropriate corrective actions are in place. Receive 90 percent of the available award fee. Changed to 91 - 95 percent for Period Seven.

- The Contractor's performance meets acceptable levels in some areas. Appropriate corrective actions are in place for areas requiring improvement. Although there are areas that can be improved, most are minor and are offset by excellent or outstanding performance in other areas. Receive 80 percent of the available award fee. Changed to 86 - 91 percent for award fee Period Seven.

Each task is given a score in accordance with the above definitions. For each of the three evaluation areas, the arithmetic mean of the scores is determined and is then multiplied by the weight given to the evaluation area. The three results are totaled for the percentage of the available award fee that is due to the Contractor.

Award Fee Period Six Decision

The Comanche Program Office evaluated the Contractor's performance for award fee Period Six during February 1997. As a result of that evaluation, the Comanche Program Office awarded the Contractor 98.2 percent of the available award fee of $37,921,159 or $37,238,578. The Comanche Program Office rolled over the unawarded amount of $682,581 to Period Seven. Comanche Program Office officials stated that the Contractor had generally done an outstanding job in performing the necessary effort to maintain the Comanche development program on track. Representatives of the Comanche Program Office stated that examination of performance in the areas of emphasis revealed that the majority of the tasks evaluated in the technical, supportability, and cost and program management areas were 100 percent complete. The Period Six final award fee notice stated that it assessed slight reductions in fees for several incomplete technical areas, plus a small overall reduction for failure to complete effort scheduled and budgeted.

Audit Evaluation of Award Fee Period Six Decision

The Comanche Program Office did not have adequate documentation to show that the scores given to the individual tasks in the evaluation criteria were in accordance with the scoring instructions stated in the contract. The three areas of emphasis, which are technical, supportability, and cost and program management, had 47 major tasks. Review of the available documentation indicated that the Contractor did not fully meet the criteria for at least 13 tasks. Further, documentation to determine whether the tasks were not completed because of changes in the priorities of the Comanche Program was not always available. Additionally, Comanche Program Office personnel did not always document when they moved tasks originally required in award fee Period Six to a future period and percentages of the uncompleted tasks that the Contractor had completed. As a result, documentation to support the outstanding rating and award fee given to the Contractor for award fee Period Six was unavailable.

Technical Area of Emphasis. The Contractor rescheduled or did not fully complete 8 of 25 tasks, which was 32 percent of the technical area. Little or no documentation was available to determine whether the Contractor had

completed any portion of those eight tasks or whether the priorities of the Comanche Program had changed. As a result, there was no objective basis to determine whether the 98-percent award fee for the technical area was appropriate.

Supportability Area of Emphasis. The Contractor did not fully complete 3 of 12 tasks, which was 25 percent of the supportability area. Little or no documentation was available to determine whether the Contractor had completed any portion of those three tasks or whether the priorities of the Comanche Program had changed. As a result, there was no objective basis to determine whether the 100-percent award fee for the supportability area was appropriate.

Cost and Program Management Area of Emphasis. The Contractor did not fully complete 2 of 10 tasks, which was 20 percent of the cost and program management area. Little or no documentation was available to determine whether the Contractor had completed any portion of those two tasks or whether the priorities of the Comanche Program had changed. As a result, there was no objective basis to determine whether the 97-percent award fee for the cost and program management area was appropriate.

Comanche Program Office representatives viewed the award fee process as an incentive for the Contractor to aggressively address key issues. In the course of the award fee period, changing budgetary constraints or evolving technical issues often mandate a change in program priorities. The Comanche Program Office uses the award fee process to achieve the mid-course program corrections that are needed. Comanche Program representatives acknowledged that, as a result of using the award fee process as a part of the routine management process, actions and decisions were not always sufficiently documented.

Award Fee Period Seven Decision

The Comanche Program Office evaluated the Contractor's performance for award fee Period Seven during January and February 1998. As a result of that evaluation, the Comanche Program Office awarded the Contractor 98 percent of the available award fee of $11,563,335 or $11,332,068. The Comanche Program Office rolled over the unawarded amount of $231,267 to Period Eight. The Comanche Program Office awarded scores for the areas of technical, supportability, and cost and program management of 97, 100, and 97 percent, respectively.

Audit Evaluation of Award Fee Period Seven Decision

Generally, the same conditions existed in award fee Periods Six and Seven. In some cases, Comanche Program Office officials appeared to exert less effort to document award fee decisions. This was especially true in relating the scores awarded to the scoring instructions stated in the contract. For example, the technical area of emphasis required a scale model and test plan for wind tunnel

tests to be completed. Even though the Contractor did not complete the model, the Contractor received a score of 95 percent for this task. With the available documentation, we could not relate the score of 95 percent to the scoring instructions.

Summary

Comanche Program Office personnel did not fully document their decisions when they evaluated the Contractor's performance to determine the award fee amount. The available documentation did not relate the scores given to the scoring instructions as stated in the contract. Also, changes in program priorities that would affect the evaluation were not always adequately documented. As a result, documentation was not available to support the award fees.

Management Action

The Comanche Program Office representatives acknowledged that the award fee process needed to be better documented, and they agreed to implement improved procedures that will require the documentation to clearly relate the evaluation criteria to the Contractor's actual accomplishments and scoring instructions, as stated in the contract. These planned actions will correct the problems identified. The Comanche Program Office did not develop time-phased milestones to implement the action plan.

Recommendation and Management Comments

B. We recommend that the Program Manager for the Comanche Program provide the implementation date for his plan of action to fully document the process for evaluating the Contractor's performance and award fee determination.

Management Comments. The Program Manager for the Comanche Program concurred and stated that the detailed documentation of the award fee process will be reflected in the July 1998 quarterly award fee determination. The full text of the Program Manager's comments is in Part III.

Finding C. Life-Cycle Cost

The Comanche Program Office underestimated the life-cycle cost for the Comanche helicopter. The life-cycle-cost estimate did not include the cost of acquiring, handling, using, and disposing of hazardous materials or the disposal cost for the Comanche helicopters at the end of their useful lives. As a result, the life-cycle-cost analysis for the Comanche helicopter weapon system did not provide management with accurate information to determine whether the Comanche was affordable in the context of long-range investment plans.

Life-Cycle-Cost Requirements

DoD Regulation 5000.2-R, "Mandatory Procedures for Major Defense Acquisition Programs (MDAPs) and Major Automated Information System (MAIS) Acquisition Programs," (the Regulation) March 15, 1996, requires that, by program initiation, each Acquisition Category I program manager shall have established life-cycle cost objectives through consideration of projected out-year resources, recent unit costs, parametric estimates, and technology trends. Upon approval of a mission need statement, an approach shall be formulated and set to refine cost. The Regulation also requires that life-cycle-cost estimates shall be comprehensive in character and identify all elements of cost that would be entailed by proceeding with development, production, and operation of the system regardless of funding source or management control. The Regulation requires that, at each subsequent milestone review, cost objectives and progress toward achieving them shall be reassessed. In addition, the Regulation states that the life-cycle-cost estimate of a program is used by milestone decision authority to determine the acquisition program baseline cost estimate and the affordability of the program. Department of Army Pamphlet 70-3, "Army Acquisition Procedures," February 28, 1995, requires the program office to identify the handling, treating, and disposing of hazardous waste, personal protective gear and practices, and legal protection costs to the program over the life cycle at Milestone 0, "Approval to Conduct Concept Studies."

Life-Cycle-Cost Estimate of the Comanche Helicopter

The Comanche Program Office underestimated the life-cycle cost for the Comanche helicopter. The Comanche Program Office reported a total estimated program cost of $101.3 billion in the 1996 Comanche Life-Cycle-Cost Estimate; however, the estimate did not include the life-cycle cost of environmental issues for hazardous materials and for disposing of Comanche helicopters at the end of their useful lives as required by the Regulation. On the basis of life-cycle-cost estimates for other Army weapon systems, the cost could range from 18 percent to more than 30 percent of the total program cost, or $18 billion to more than $30 billion over the life of the Comanche helicopter.

Preparing Life-Cycle-Cost Estimates

In preparing the life-cycle-cost estimate, the Comanche Program Office did not include the cost of acquiring, handling, using, and disposing of hazardous materials because:

- officials of the Comanche Program Office believed that the Comanche helicopter production design would reduce or eliminate many of the hazardous materials currently being used in the design, and

- the Army did not provide a model for preparing life-cycle cost for environmental issues associated with hazardous material.

Production Design. The Comanche Program Office said that it can provide a more realistic life-cycle-cost estimate by waiting for a final design to compute the life-cycle cost for hazardous materials. However, DoD Directive No. 4210.15, "Hazardous Material Pollution Prevention," July 27, 1989, requires that economic analyses of hazardous materials begin at the earliest possible stage of the life cycle and that the analyses are modified as better information becomes available. Department of Army Pamphlet 70-3, "Army Acquisition Procedures," February 28, 1995, requires the program office to identify the costs to the program over the life-cycle (handling, treating, and disposing of hazardous waste, personal protective gear and practices, and legal protection) in Phase 0, "Concept Exploration." Army Pamphlet 70-3 also requires the Comanche Program Office to identify resource requirements for life-cycle-cost analysis, and to prepare or update other environmental analyses at Milestone 1, "Approval to Begin a New Acquisition Program."

Army Model. The Army is currently developing procedures and a model for computing life-cycle-cost estimates for hazardous materials. Because the Comanche Program Office did not have an Army model to compute the life-cycle-cost estimate for hazardous materials, it attempted to use an Air Force model. Those estimated costs were extremely high. Comanche Program Office personnel stated that because they could not validate the accuracy of the Air Force model, they did not include the life-cycle-cost estimate for hazardous materials in the life-cycle-cost estimate for the Comanche helicopter.

The Comanche Program Office also did not include the life-cycle cost for disposing of the Comanche helicopter at the end of its useful life in the 1996 Comanche Life-Cycle-Cost Estimate. The Comanche Program Office needs to determine the timeframe that the Comanche helicopter will be in service and whether there will be extraordinary costs associated with disposing of the Comanche helicopter at the end of its useful life. The Comanche Program Office should include the hazardous material costs and disposal costs to provide decisionmakers with a more accurate estimate of the Comanche Program costs.

Life-Cycle Cost of Hazardous Materials for Other Army Weapon Systems

The Army System Readiness Center has calculated life-cycle-cost estimates including those for environmental issues for many Army weapon systems, such as the Crusader and Sense and Destroy Armor. Because the Army has not developed a life-cycle-cost model for hazardous material, they use the model developed by the Air Force. The cost relative to environmental issues usually ranges from between 18 percent to more than 30 percent of the total program cost. The normal costs of acquiring, handling, using, and disposing of hazardous materials also include costs for environmental issues such as the following:

- training for using, handling, transporting, storing, and maintaining hazardous materials;
- handling necessary for hazardous materials;
- effects on insurance premiums; and
- potential contamination of surrounding areas and depot maintenance areas.

Life-Cycle-Cost Estimates for Making Management Decisions

The life-cycle-cost estimate for the Comanche helicopter weapon system did not provide management with accurate information to determine whether the Comanche is affordable in the context of long-range investment plans. The Comanche Program Office needs to compute the cost for acquiring, handling, using, and disposing of hazardous materials and the disposal cost of the Comanche helicopter for inclusion in the Comanche life-cycle cost estimate. Department of Army Pamphlet 70-3, "Army Acquisition Procedures," February 28, 1995, states that Task 303, "Evaluation of Alternatives and Trade-off Analysis," requires the Program Office to provide specific guidance and procedures for bringing the results of the hazard risk assessments and approvals together with life-cycle-cost estimates. The cost estimates are to be included in the decision process. A complete life-cycle-cost analysis will provide a more realistic estimate of the program costs and provide management with better information to determine whether the program is affordable for DoD. It will also provide information to better forecast the budget fund needs of the DoD.

Management Action

Comanche Program Office officials agreed to incorporate the disposal cost of hazardous material and disposal cost of the Comanche helicopter into the Comanche life-cycle-cost estimate before the next milestone review. The Comanche Program Office planned actions will correct the problems identified. Therefore, this issue is resolved and this finding does not include a recommendation.

Management Comments

The Program Manager for the Comanche Program stated that the total life-cycle-cost estimate from cradle to grave, for environmental areas, will be completed over the next several months. He provided a target date for the end of 1998 for completion of all actions. The full text of the Program Manager's comments is in Part III.

Part II - Additional Information

Appendix A. Audit Process

Scope

Work performed. We evaluated the financial management of the Comanche Program. Our evaluation included a review of the Contractor's EVMS to determine whether it was being operated in accordance with DoD Regulation 5000.2-R. We reviewed 54 work packages covering 27,608 hours of work during the period of January 1997 through September 1997. We also evaluated the Comanche Program Office award fee process for Award Fee Period Seven and Award Fee Period Six, to determine whether it was reasonable and was in compliance with the contract for the Comanche Program. Award Fee Period Seven encompassed the time from January 1, 1997 through December 31, 1997, with an available $11.6 million award fee pool. Award Fee Period Six encompassed the time from October 1, 1997 through December 31, 1996, with an available $37.9 million award fee pool. In addition, we evaluated the Comanche Program Office's December 15, 1997 life-cycle costs estimate of $101.3 million to determine whether all applicable costs were included.

Dod-wide Corporate Level Government Performance and Results Act Goals. In response to the Government Performance Result Act, the Department of Defense has established 6 DoD-wide corporate-level performance objectives and 14 goals for meeting these objectives. This report pertains to achievement of the following objective and goal.

Objective: Fundamentally reengineer DoD and achieve a 21st century infrastructure. **Goal:** Reduce costs while maintaining required military capabilities across all DoD mission areas. (DoD-6)

DoD Functional Area Reform Goals. Most major functional areas have also established performance improvement reform objectives and goals. This report pertains to achievement of the following functional area objectives and goals.

<u>Acquisition Functional Area.</u>

Objective: Deliver great service. **Goal**: Deliver new major defense systems to the users in 25 percent less time. **(ACQ-1.1)**

Objective: Internal reinvention. **Goal:** Minimize cost growth in major defense acquisition programs to no greater than 1 percent annually. **(ACQ-3.4)**

General Accounting Office High Risk Area. The General Accounting Office has identified several high risk areas in the Department of Defense. This report provides coverage of the Defense Weapons Systems Acquisition high-risk area.

Methodology

Use of Computer-Processed Data. We used data from the CPRs that were generated by the Contractor's computer systems. We also used life-cycle-cost data generated by the Comanche Program Office computer systems. Any inaccuracy in these data could result in inaccuracies in this report.

Audit Period and Standards. We performed this economy and efficiency audit from December 1996 through March 1998, in accordance with auditing standards issued by the Comptroller General of the United States, as implemented by the Inspector General, DoD.

Contacts During the Audit. We visited or contacted individuals and organizations within DoD and the Contractor for the Comanche helicopter. Further details are available upon request.

Management Control Program Review

DoD Directive 5010.38, "Management Control (MC) Program," August 26, 1996, requires DoD organizations to implement a comprehensive system of management controls that provides reasonable assurance that programs are operating as intended and to evaluate the adequacy of the controls.

Scope of Review of Management Control Program. In accordance with DoD Regulation 5000.1 "Defense Acquisition," March 15, 1996, and DoD Regulation 5000.2-R, "Mandatory Procedures for Major Defense Acquisition Programs (MDAPs) and Major Automated Information System (MAIS) Acquisition Programs," March 15, 1996, acquisition managers are to use program cost, schedule, and performance parameters as control objectives to implement the requirements of DoD Directive 5010.38. Accordingly, we limited our review to management controls directly related to financial management systems.

Adequacy of Management Controls. The Comanche Program Office had management controls to ensure the proper operation of the Contractor's earned value management system, documentation of the award fee process, and preparation of the life-cycle cost estimate. There was material weaknesses in management controls because the Comanche Program Office did not follow the controls as stated in Army Regulation 70-1, "Systems Acquisition." If management implements all report recommendations, the Comanche Program Office will be assured of having an acceptable process for the operation of the Contractor's earned value management system, documentation of the award fee process, and computation of the life-cycle-cost estimate.

Adequacy of the Comanche Program Office Self-Evaluation. The Comanche Program Office identified the earned value management system, award fee process, and calculation of the life-cycle cost as part of its assessable unit, and, in our opinion, correctly identified the risk associated with the areas.

However, in its evaluation, Comanche Program Office officials did not identify the specific material management control weakness identified by the audit. Consequently, we believe that the self-evaluation was inadequate.

Summary of Prior Coverage

During the last 5 years, two audits involved the Comanche Program.

General Accounting Office (GAO/NSIAD) Audit No. 95-112 (OSD Case No. 9877), "Comanche Helicopter - Testing Needs to be Completed Prior to Product Decisions," May 1995.

Inspector General, DoD, Report No. 98-125, "Protection of the Comanche Helicopter Against Radio Frequency Weapons," April 28, 1998.

Appendix B. Earned Value Management System

Earned value is a management technique that relates resource planning to schedules and to performance. All work is planned, budgeted, and scheduled in time-phased increments constituting a performance measurement baseline. In the EVMS, the sum of all budgets for the work scheduled to be accomplished is called the Budgeted Cost of Work Scheduled (BCWS). As work is performed, it is earned on the same basis it was planned, in dollars or other quantifiable units such as labor hours. In the EVMS, the sum of budgets for completed work is called Budgeted Cost for Work Performed (BCWP), also known as earned value. Planned value, BCWS, compared with earned value, BCWP, thus measures the dollar volume of work planned versus the equivalent dollar volume of work accomplished. Any difference is called a schedule or accomplishment variance. Earned value compared with the actual cost incurred for the work performed, called Actual Cost of Work Performed (ACWP) in the EVMS, provides an objective measure of cost performance. Any difference is called a cost variance.

The BCWS is further divided into cost accounts that relate to the Work Breakdown Structure (WBS). The WBS is a product-oriented family tree division of hardware, software and services that organize and define the product and is the basis for correlating schedule, budget, cost, and performance measurement. Cost accounts are made up of planning packages and work packages. A planning package is a logical aggregation of work within a cost account, normally the far-term effort, that can be identified and budgeted in early baseline planning, but is not yet defined into detailed work packages. A work package is a detailed, short timespan job or material item identifying work required to complete a contact. It is a discrete unit of work having clear identification from all other work. The work package is within a single cost account and organizational identity, budgeted in measurable units, with scheduled start and completion dates, and a definable end result.

There are various types of work packages. The most desirable type is called a discrete work package, which contains specific measurable tasks that usually result in a physical end product. Examples include an engineering work package that results in a drawing release, or a material work package that shows the delivery of a part or parts. The start and end of these tasks are relatively easy to define. The least desirable type of work package is a level-of-effort work package. Level-of-effort activity is more general or supportive in nature. It is neither discretely measurable in terms of end products nor is it directly related to the accomplishment of a primary discrete work effort. Level-of-effort activities contain no reporting milestones other than the passage of time.

When a discrete work package is established, the tasks to be accomplished within the work package are defined. A schedule is established for the start and completion of the work package tasks and a budget is established for the cost of the work scheduled (the BCWS). When the work package tasks are completed, earned value is taken. For example, if the BCWS was $1000, when the work package tasks were completed, $1000 of BCWP would have been earned.

The sum of the budgets for the scheduled work packages is the BCWS and represents where the contractor planned to be by a certain date. The sum of the budgets for the work actually completed is called the budgeted cost of work performed (BCWP). A comparison of the BCWS to the BCWP indicates whether more or less work was performed than was planned and reveals, in terms of dollar differences, whether work is ahead of or behind schedule.

Therefore, an EVMS that has been properly implemented and operated would preclude management from suddenly realizing that 90 percent of the budgeted funds are spent but that the project is only 10 percent complete. The CPR, which shows the cost and schedule status of a contract, is prepared from data contained in the EVMS.

Appendix C. Report Distribution

Office of the Secretary of Defense

Under Secretary of Defense for Acquisition and Technology
  Deputy Under Secretary of Defense (Environmental Security)
  Director, Defense Logistics Studies Information Exchange
  Director, Strategic and Tactical Systems
Under Secretary of Defense (Comptroller)
  Director, Program Analysis and Evaluation
Assistant Secretary of Defense (Public Affairs)

Department of the Army

Assistant Secretary of the Army (Research, Development, and Acquisition)
Commander, U.S. Army Aviation and Missile Command
Program Executive Officer for Aviation
  Program Manager for the Comanche Program
Auditor General, Department of the Army

Department of the Navy

Assistant Secretary of the Navy (Financial Management and Comptroller)
Auditor General, Department of the Navy

Department of the Air Force

Assistant Secretary of the Air Force (Financial Management and Comptroller)
Auditor General, Department of the Air Force

Other Defense Organizations

Director, Defense Contract Audit Agency
Director, Defense Logistics Agency
  Commander, Defense Contract Management Command
    Defense Contract Management Command, Boeing Helicopters
    Defense Contract Management Command, Sikorsky Aircraft
Director, National Security Agency
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Office of Management and Budget
Technical Information Center, National Security and International Affairs Division, General Accounting Office

Chairman and ranking minority member of each of the following congressional committees and subcommittees:

Senate Committee on Appropriations
Senate Subcommittee on Defense, Committee on Appropriations
Senate Committee on Armed Services
Senate Committee on Governmental Affairs
House Committee on Appropriations
House Subcommittee on National Security, Committee on Appropriations
House Committee on Government Reform and Oversight
House Subcommittee on Government Management Information and Technology, Committee on Government Reform and Oversight
House Subcommittee on National Security, International Affairs, and Criminal Justice, Committee on Government Reform and Oversight
House Committee on National Security

Part III - Management Comments

Department of the Army Comments

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
RESEARCH DEVELOPMENT AND ACQUISITION
103 ARMY PENTAGON
WASHINGTON DC 20310-0103

REPLY TO
ATTENTION OF

SARD-SA (36-2B)

21 Jul 98

RE 27 Jul 98

MEMORANDUM THRU U.S. ARMY AUDIT AGENCY, ATTN: SAAG-PMO-L, 3101 PARK CENTER DRIVE, ALEXANDRIA, VIRGINIA 22302-1596

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

SUBJECT: Audit Report on Financial Management of the RAH-66 Comanche Helicopter Program (Project No. 7AL-0012.01)

1. References:

a. U.S. Army Audit Agency Memorandum, 1 June 1998, SAB.

b. Department of Defense Inspector General Memorandum, 26 May 1998, SAB.

2. This memorandum responds to your request for comments on the draft report. The enclosed response was prepared by the Program Manager, Comanche and has been coordinated with the Audit Project Manager.

3. Point of contact for this action is Mrs. Alice Hartman, (703) 604-7054.

PETER C. FRANKLIN
Major General, GS
Deputy for Systems Management and
Horizontal Technology Integration

Encl

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DEPARTMENT OF THE ARMY
OFFICE OF THE PROGRAM EXECUTIVE OFFICER, AVIATION
REDSTONE ARSENAL, AL 35898-8000

REPLY TO
ATTENTION OF

16 JUL 1998

SFAE-AV-P

MEMORANDUM FOR Inspector General, Department of Defense, 400 Army Navy Drive (Room 801), Arlington, Virginia 22202-2884

SUBJECT: Audit Report on Financial Management of the RAH-66 Comanche Helicopter Program (Project No. 7AL-0012.01)

1. Reference memorandum, Inspector General, Department of Defense, 26 May 98, subject as above.

2. Enclosed is the response from the Program Manager, Comanche Program Office.

3. Point of contact in Program Executive Office, Aviation, is Carole Lang, DSN 897-4028, Commercial (256) 313-4028 and point of contact in the Comanche Program Office is Sally Ramey, DSN 897-4321, Commercial (256) 313-4321.

Paul Bogosian

Encl

PAUL BOGOSIAN
Deputy Program Executive, Aviation

DEPARTMENT OF THE ARMY
PROGRAM MANAGER, COMANCHE
BLDG. 5681, REDSTONE ARSENAL, AL 35898-5010

REPLY TO
ATTENTION OF

SFAE-AV-RAH

MEMORANDUM FOR Inspector General, Department of Defense
400 Army Navy Drive (R00m 801)
Arlington, Virginia 22202-2884

SUBJECT: Audit Report on Financial Management of the RAH-66 Comanche Helicopter Program (Project No. 7AL-0012.01)

1. Reference your memorandum, 26 May 98, subject as above.

2. Response to DoDIG Draft Audit Report. Recommendations are as follows:

Finding A: Earned Value Management System

General comments—

The Cost Performance Reports (CPRs) for the Comanche Program are not informative indicators of cost and schedule performance. This condition resulted from adjustments made to the Earned Value Management System (EVMS) at the various times the Comanche Program was restructured, from combining the contract performance data for the period prior to the January 1997 restructure with the contract performance data for the period after the January 1997 restructure, and from the Contractor's questionable practice in operating the EVMS. Therefore, the CPRs deprive DoD managers of informative information for making decisions pertaining to the Comanche Program.

Response—

A reconciliation of IPT to WBS adjustments made as of 31 Dec 96 has been completed. We have requested DCMC Boeing Helicopters and Sikorsky Aircraft (Control Account) planning to review milestones and earned value techniques. Boeing Helicopters and Sikorsky Aircraft are continuing to reduce the total amount of level of effort work packages. They have been working to improve work descriptions of planning packages. We are continuing to get reports for the total period of the program, but are also reporting only the data covered by the current contract so the managers can more correctly evaluate the current performance since Jan 97.

Target Date— Implementation of the recommended changes has begun.

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Finding B: Contract Performance Award Fee

General Comments—

The process of evaluating the Contractor's performance and determining the amount of award fee was not well documented because Comanche Program Office personnel did not place adequate emphasis on the need to fully document award fee decisions. Consequently, through December 1997, the Comanche Program Office awarded the Contractor $84 million in award fees for which documentation was incomplete.

Response—

The Comanche Program Office has implemented the DoDIG's recommendation for detailed documentation of award feel criteria changes. Documentation procedure supporting award fees has been strengthened. Sufficient detail will be included in future award fee determinations to fully document decisions.

Target Date—

This detailed documentation will be reflected in the next quarterly award fee adjustment (July 98).

Finding C: Life-Cycle Cost

General Comments—

The Comanche Program Office underestimated the life-cycle cost for the Comanche helicopter. The life-cycle cost estimate did not include the cost of acquiring, handling, using, and disposing of hazardous materials or the disposal cost for the Comanche helicopters at the end of their useful lives. As a result, the life-cycle-cost analysis for the Comanche helicopter weapon system did not provide management with accurate information to determine whether the Comanche was affordable in the context of long-range investment.

Response—

The AMCOM Command Analysis Directorate will provide analytical support to the Comanche Program Office to perform research of other services' experience and data

2

SFAE-AV-RAH
SUBJECT: Audit Report on Financial Management of the RAH-66 Comanche Helicopter Program (Project No. 7AL-0012.01)

relating to environmental costs. A study plan is being developed to identify the process, resources, and time frames needed for data collection, data analysis, cost estimating relationship development and estimating Comanche environmental costs. The Army Environmental Center, in response to a request from the Army's Cost and Economic Analysis Center will focus on the Comanche as a test case program for developing environmental cost methodologies and documentation. The Comanche Program Office cost analysts have identified costs for environmental related elements included in the estimate. Known environmental costs that have been excluded will be addressed through the aforementioned research efforts then included in the estimate. The program office has obtained reasonable costs for environmental research and development concerns. In addition, the environmental costs for Comanche after fielding have been identified and included in our Life Cycle Cost (LCC) estimate, except for disposal costs of attrited aircraft, which are currently being established. The total LCC estimate from cradle to grave for environmental areas will be completed over the next several months.

Target Date—

It is planned to resolve this finding by the end of 1998.

Management Controls: The Comanche Program Manager's Office has taken efforts to implement all report recommendations and thoroughly reviewed AR 70-1, Systems Acquisition, concerning management controls. The Program Manager's Office is confident that our Management Controls are in compliance with AR 70-1 and adequately address the areas of EVMS, award fee documentation, and LCC estimating. The Comanche PMO self-evaluation process will be strengthened to cover management controls more adequately.

3. Point of contact for Findings A and C is Mr. Gary Luker, DSN 897-4078 or (256) 313-4078; POC for Finding B is Mr. Rick Ramey, DSN 897-4315 or (256) 313-4315; POC for Management Controls is Ms. Sally Ramey, DSN 897-4321 or (256) 313-4321.

JOSEPH L. BERGANTZ
Brigadier General, U. S. Army
Program Manager
Comanche Program

3

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The Acquisition Management Directorate, Office of the Assistant Inspector General for Auditing, DoD, produced this report.

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