

**Audit**



**Report**

OFFICE OF THE INSPECTOR GENERAL

**KIOWA WARRIOR MODIFICATION PROGRAM**

Report No. 94-192

September 19, 1994

**Department of Defense**

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### **Acronyms**

AMSAA	Army Materiel Systems Analysis Activity
ASARC	Army Systems Acquisition Review Council
ILS	Integrated Logistics Support
OSD	Office of the Secretary of Defense
PA&E	Program Analysis and Evaluation
PEO	Program Executive Officer



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

September 19, 1994

**MEMORANDUM FOR AUDITOR GENERAL, DEPARTMENT OF THE ARMY**

**SUBJECT: Audit Report on the Kiowa Warrior Modification Program  
(Report No. 94-192)**

We are providing this report for the Army's review and comment. The report discusses acquisition planning for the fielding and support of the Kiowa Warrior aircraft. The Assistant Secretary of the Army (Research, Development, and Acquisition) forwarded comments prepared by the Program Executive Officer, Aviation, and the Kiowa Warrior Program Manager that discussed matters pertaining to the body of the report. The Program Executive Officer nonconcurred with the finding but agreed with the general thrust of the report regarding the Kiowa Warrior. We do not consider the Army's comments to be fully responsive; however, we made changes in the report we considered appropriate based upon the comments. The Commanding General, U.S. Army Materiel Command, did not provide comments on the draft.

DoD Directive 7650.3 requires that all audit recommendations be resolved promptly. Recommendations are subject to resolution in accordance with the Directive in the event of nonconcurrence or failure to comment. Therefore, we request the Army to comment on the recommendation in this report by November 18, 1994.

We appreciate the courtesies extended to our audit staff. If you have questions on this audit, please contact Mr. James Koloshey, Program Director, at (703) 604-8961 (DSN 664-8961) or Mr. Eddie Ward, Project Manager, at (703) 604-8967 (DSN 664-8967). Appendix B lists the distribution of this report.

A handwritten signature in cursive script that reads "Robert J. Lieberman".

Robert J. Lieberman  
Assistant Inspector General  
for Auditing

## Office of the Inspector General, DoD

Report No. 94-192  
Project No. 3AG-0068

September 19, 1994

### KIOWA WARRIOR MODIFICATION PROGRAM

#### EXECUTIVE SUMMARY

**Introduction.** DoD Instruction 5000.2 requires program managers of new or modified major weapon systems to conduct the necessary analyses and assessments to ensure these systems meet performance requirements and are supportable. In the Army, this objective is accomplished, in part, by the Army Systems Acquisition Review Council evaluations and Materiel Release for Issue process.

**Objective.** The audit objective was to determine whether Integrated Logistics Support planning is adequate for attack and armed reconnaissance helicopter systems that transitioned from the weapon system developers to operational commands. We modified our original objectives to evaluate the acquisition process for approval of the Kiowa Warrior modification program. We limited our evaluation to the Apache and the Kiowa Warrior aircraft.

**Audit Results.** The Army proceeded with the modification and fielding of 269 Kiowa Warrior aircraft although the aircraft did not fully meet performance specifications. The Army has spent about \$1.3 billion through FY 1994 on the modification program; however, further expenditures will be required to correct shortcomings. (Finding, Part II). Also, Army aviation unit and intermediate-level maintenance organizations responsible for maintaining attack and armed reconnaissance aircraft did not have sufficient support equipment and experienced personnel to maintain the assigned aircraft adequately. The Army has undertaken several studies to assess what corrective actions are needed to improve maintenance shortfalls. As a result of ongoing Army actions, we are making no recommendation for this area (Other Matters of Interest, Part I).

**Internal Controls.** The audit indicated that internal controls in the form of Army acquisition procedures were adequate, but those procedures were not followed to ensure that proper risk analyses and risk planning were done before program approval. Controls assessed are discussed in Part I.

**Potential Benefits of Audit.** The benefit of implementing the audit recommendation is improved Kiowa Warrior system performance.

**Summary of Recommendation.** We recommended that the Commander, U.S. Army Materiel Command, include the Kiowa Warrior's navigational system deficiency in its Full Materiel Release Get-Well Plan.

**Management Comments.** The Assistant Secretary of the Army (Research, Development, and Acquisition) forwarded comments prepared by the Program Executive Officer, Aviation, and the Kiowa Warrior Program Manager that discussed matters pertaining to the body of the report. The Program Executive Officer nonconcurred with the finding but agreed with the general thrust of the report that "many things" on the Kiowa Warrior need fixing. The Army's comments were not fully responsive since the recommendation on the content of the Get-Well Plan was not

addressed. Appropriate changes were made in this report based on those comments. We also deleted the draft recommendation to the Assistant Secretary of the Army (Research, Development, and Acquisition). We request the Army to comment on the recommendation in this report by November 18, 1994.

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This report was prepared by the Acquisition Management Directorate, Office of the Assistant Inspector General for Auditing, Department of Defense.

## **Part I - Introduction**

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## Background

**Acquisition Policies.** DoD Instruction 5000.2 "Defense Acquisition Management Policies and Procedures," February 23, 1991, requires that Military Departments' acquisition programs include integrated logistics support (ILS) planning. Using ILS planning and risk assessments for major weapon systems modification programs, management analyzes actions needed to ensure that effective and economical support of a materiel system is accomplished before and after fielding the system. ILS planning generally starts early in the acquisition process of new or upgraded weapon systems. The Army Systems Acquisition Review Council (ASARC) evaluation is part of this process.

**Materiel Release for Issue.** Materiel release is an ILS process by which a system is transferred from the materiel developer to the user, as provided in Army Regulation 700-142, "Materiel Release, Fielding, and Transfer," April 27, 1988. The two types of materiel releases are:

- o A full release, granted when a system has met all performance and safety requirements and is suitable for fielding, and
- o A conditional release, provided when a system has not met all performance requirements and the user has an urgent need for the system.

Two objectives of the materiel release process are:

- o ensure that critical test issues have been resolved or provision made for the resolution before full release of the system and
- o control and monitor all conditional releases until full release is obtained.

## Objectives

The audit objectives were to determine whether ILS is adequate for attack and armed reconnaissance helicopter weapon systems that transitioned from acquisition program managers to the operational commands and to evaluate system supportability planning accomplished during the acquisition process. We modified our original audit objectives to evaluate the acquisition process for the Kiowa Warrior and Apache modification programs. We also reviewed the applicable internal controls related to this process.



## Scope and Methodology

This economy and efficiency audit was conducted from June 1993 through March 1994 in accordance with auditing standards issued by the Comptroller General of the United States, as implemented by the Inspector General, DoD, and accordingly included necessary tests of internal controls. We reviewed program documentation dated from September 1985 through February 1994 that was used to assist program managers in their ILS planning processes for attack and armed reconnaissance helicopter systems in development, rebuild, or fielded modes. We concentrated on the Army's Apache and Kiowa Warrior Aircraft. Only continental United States-based aviation maintenance activities were visited during the audit, as listed in Appendix A. We did not rely on computer-generated data during the audit.

## Internal Controls

We reviewed internal controls applicable to Army officials' approval and oversight of major weapon system modification programs. We evaluated these officials' compliance with Army acquisition policies and procedures relative to the upgrading of existing weapon systems. The audit indicated that internal controls in the form of Army acquisition procedures were adequate, but those procedures were not followed to ensure that proper risk analyses and risk planning were done before program approval. We did not review implementation of DoD Directive 5010.38, "Internal Management Control Program," April 14, 1987, due to the high number of organizations involved in the acquisition and fielding process. Copies of the final report will be provided to senior level officials responsible for internal controls within the Office of the Secretary of Defense and the Army.

## Prior Audits and Other Reviews

The General Accounting Office; the Department of Defense, Office of the Inspector General; and the Military Departments' audit agencies have not assessed system developers' ILS planning for the Apache and Kiowa Warrior aircraft within the last 5 years.

## Other Matters of Interest

Army aviation unit and intermediate-level maintenance activities responsible for maintaining the Apache and other assigned attack and reconnaissance rotary wing aircraft did not have sufficient support equipment and experienced

## Introduction

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personnel to maintain assigned aircraft adequately. The problem was attributed to the Apache Program Office using obsolete and inappropriate data and the Army Training and Doctrine Command's methodology for developing requirements. While we only evaluated the requirement determination process in the Apache Program Office, cognizant officials indicated the condition was prevalent throughout the Army's rotary wing community.

We determined that current maintenance support deficiencies were based on requirement information that had been developed more than 12 years ago. As a result of this lapse of time, the precise role that the Apache Program Office played in developing the requirements was not clear; further, the Army has undertaken several studies to assess what corrective actions are needed to improve maintenance shortfalls. Therefore, we do not believe any useful purpose would be served by making recommendations to the Army at this time. We conclude that the Army should vigorously pursue finalizing the implementation of corrective actions.

## **Part II - Finding and Recommendation**

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## Kiowa Warrior

The Army proceeded with the modification and fielding of the Kiowa Warrior aircraft although the aircraft did not fully meet performance specifications. The Assistant Secretary of the Army (Research, Development, and Acquisition) did not conduct a formal ASARC for the modification decision. Further, the Kiowa Warrior Program Manager did not perform timely risk analyses and operational assessments of the aircraft's performance capabilities. Finally, the Conditional Materiel Release process did not address a pertinent performance issue. Although the Army has spent about \$1.3 billion through FY 1994 on the modification program, further expenditures will be required to correct these performance shortcomings.

### Background

**Original Program.** The Army began a major modification effort in 1981 on the Kiowa rotary wing aircraft that included adding an advanced targeting acquisition system. At that time, the Kiowa, designated OH-58 A/C, was an element of the Army's artillery force, serving as an unarmed field artillery aerial observer for ground and air units. Under the Army Helicopter Improvement Program, the modified Kiowa was redesignated OH-58D and classified as an Acquisition Category I(D)<sup>1</sup> program. In October 1985, the Defense Systems Acquisition Review Council conducted a Milestone III review of the program and recommended its advancement to the production phase. Fielding of the OH-58D was initiated in April 1986. Production was terminated due to funding constraints in the President's FY 1988 budget. At that time, 104 aircraft had been produced at a cost of \$1.5 billion.

**Program Restart.** In response to congressional concerns as to what aircraft could be used in place of the terminated OH-58D to perform scout missions, the Office of the Secretary of Defense (OSD) reevaluated previous studies that showed the OH-58D was the best aircraft to perform these missions. Based on this reevaluation, Congress reinstated the program in the FY 1988 budget. On January 8, 1990, the Secretary of the Army approved a program restart; however, this program was significantly different from the terminated program. When the program restarted, it was categorized as an Acquisition Category I(C)<sup>2</sup> program.

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<sup>1</sup>The decision authority for Category I(D) programs is the Under Secretary of Defense for Acquisition and Technology.

<sup>2</sup>The decision authority for I(C) programs is the Service Acquisition Executive. The Army Service Acquisition Executive is the Assistant Secretary of the Army (Research, Development, and Acquisition).

All OH-58Ds would be retrofitted by fully arming these aircraft with Hellfire and Stinger missiles, rockets, and 0.50-caliber machine guns. This configuration was based on a decision in 1987 when 15 OH-58Ds were equipped with these weapons for a special mission in the Persian Gulf. The retrofitted OH-58D was renamed "Kiowa Warrior." Thus, the Kiowa Warrior role changed from an unarmed field artillery aerial observer to an air cavalry role that included armed reconnaissance missions as well as spotting for artillery and performing patrol duties. The Army plans to use the Kiowa Warrior as the interim armed reconnaissance rotary wing aircraft until the proposed Comanche aircraft is produced and fielded, currently scheduled for about FY 2003. We estimate the Army will have spent about \$1.3 billion through FY 1994 to modify 269 aircraft.

## Performance Capabilities

**Independent Assessments.** Several significant performance limitations were disclosed in assessments conducted by the U.S. Army Safety Center, U.S. Army Materiel Systems Analysis Activity (AMSAA), and the U.S. Army Aviation Test Center. These evaluations raised concerns relative to the Kiowa Warrior's autorotational landing characteristics, simulated engine failure, and low-speed flight characteristics.

**Autorotation.** The U.S. Army Safety Center reported in an independent safety assessment dated March 3, 1989, that autorotational characteristics of the Kiowa Warrior, with a 1,000-pound increase in the maximum gross weight and the additional drag of weapon stores, will not be the same as the original OH-58D. The added weight would have a detrimental effect on its performance. The Safety Center recommended that this performance issue be addressed at the start of the program since it was a critical hazard. The Aviation Test Center reconfirmed the autorotational problem in March 1992 as did AMSAA in December 1992. Both activities stated that safe autorotational landings would be difficult for the Kiowa Warrior with the gross weight increase.

**Additional Performance Shortcomings.** The Aviation Test Center and AMSAA also concluded that the Kiowa Warrior engine failure characteristics, with very high yaw rates<sup>3</sup> and sideslips<sup>4</sup>, did not exhibit a smooth transition to autorotative flight. In addition, the two evaluators concluded that the Kiowa Warrior failed to meet the specification requirements for low-speed flight characteristics, which further impacted the aircraft's performance capability.

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<sup>3</sup>Yaw rate is the instantaneous speed at which the aircraft rotates around its vertical centerline (axis of rotation).

<sup>4</sup>Sideslip is the lateral movement of the aircraft in relation to the ground.

## Kiowa Warrior

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**Operational Assessment.** Since no operational testing was done on the Kiowa Warrior, the Director, Operational Test and Evaluation, directed the Army to conduct a force development experimentation and test before the issuance of a full materiel release for the Kiowa Warrior. These operational assessments, conducted from February 10 through 26, 1993, and October 1 through November 3, 1993, did not address the previously mentioned performance shortcomings; however, concerns over the aircraft's navigational system were raised. The test assessment concluded that the current Kiowa Warrior navigational system is inadequate for most reconnaissance missions. To remain reliable, the system requires frequent information updates when the aircraft is flown in an unfamiliar area. Missions that require the crew to deviate from preplanned routes and areas cause position errors in the navigation system because of inaccurate update points.

The Kiowa Warrior Program Manager had previously recognized the navigational system shortcomings. In a briefing to the Program Executive Officer (PEO) for Aviation during the FY 1993 budget review, the program manager reported that some aspects of the aircraft's navigational system were based on 1970's technology and lacked the ability to effectively interface with other systems. Recognizing these limitations, the program manager attempted to fund an upgrade to the system in FY 1993 but was rejected by the PEO due to more pressing needs.

## Program Decision

**Preliminary ASARC.** The Military Deputy to the Assistant Secretary of the Army (Research, Development, and Acquisition) chaired a preliminary ASARC on August 8, 1989. He recommended that the formal ASARC scheduled for September 8 not be held and that the Service Acquisition Executive approve the \$0.9 billion Kiowa Warrior Modification Program. Although the Safety Center's assessment of the Kiowa Warrior was available, we found no indication that the assessment was considered at the preliminary ASARC meeting. Minutes of this meeting were not available. This decision contradicted Army policies then in effect, Army Regulation 15-14, "Systems Acquisition Review Council Procedures," May 1, 1981, which clearly stated that preliminary ASARC reviews should not be used in lieu of a formal review for major program decisions.

**Risk Analyses and Assessments.** We identified no indication that risk analyses were performed before the Kiowa Warrior program decision. DoD Instruction 5000.2, "Defense Acquisition Program Procedures," September 1, 1987, and the current revision dated February 23, 1991, require that program decisions to undertake major system modification efforts be based on adequate assessment of risk and risk management planning. Exit criteria should be established to address program risks properly before the system advances to the next milestone. Finally, assessments by AMSAA and the Army Aviation Test Center, which would have been invaluable to the decisionmaking process, were not conducted until several years after the modification decision.

Based on the significant changes that were being made to the OH-58D, we believe a formal program review chaired by the Service Acquisition Executive should have been conducted before approval for the program to proceed with the production modifications. The program manager should have addressed critical issues affecting the system and met proper exit criteria before the system advanced to full-rate production and fielding.

## **Matériel Release**

The Commander, U.S. Army Materiel Command, granted the Kiowa Warrior a conditional matériel release in July 1992 pending the program manager's satisfactory resolution of issues disclosed during the release process. The most significant issues identified during the matériel release assessment were the Kiowa Warrior's air worthiness, unsatisfactory autorotative landings, and slow recovery following simulated engine failures.

The Kiowa Warrior Program Manager prepared a get-well plan in October 1993, which addressed discrepancies identified during matériel release assessments. The get-well plan details the corrective actions needed and timeframe for resolving discrepancies before the Full Materiel Release is granted. Our review of the get-well plan disclosed it did not address the operational concerns related to navigational system shortcomings. Also, we do not believe the conditional matériel release should have been granted until results from operational assessments were available.

## **Mission Effects**

The Office of the Director, Program Analysis and Evaluation (PA&E), expressed concern regarding the Kiowa Warrior's performance capabilities during the Secretary of Defense's Bottom Up Review process in FY 1993. The Office questioned the aircraft's operational shortcomings that were evident in joint exercises and during Operation Desert Storm. PA&E noted deficiencies including the aircraft's vulnerability during penetration of hostile airspace; its limited air-to-air combat capability; and shortfalls in integrated observation, detection, and targeting. Further, PA&E does not believe the aircraft's engine problem that affects autorotational landing, simulated engine failure, and low-speed flight characteristics can be resolved without total engine replacement. Although the program office believed the problems were attributed the aircraft's aerodynamics, not the engine - we believe that if it is eventually determined to be the engine, the cost of replacing the Kiowa Warrior's engine would be substantial since it would most likely require other modifications to the aircraft, such as its frame.

## **Recommendation, Management Comments, and Audit Response**

**We recommend that the Commanding General, U.S. Army Materiel Command, include the Kiowa Warrior navigational system deficiency as an action item in the Full Materiel Release Get-Well Plan.**

**Management Comments:** The Office of the Assistant Secretary of the Army (Research, Development, and Acquisition) forwarded comments prepared by the Program Executive Officer, Aviation, and the Kiowa Warrior Program Manager that discussed matters pertaining to the body of the report. The Program Executive Officer nonconcurred with the finding but agreed with the general thrust of the report that many things on the Kiowa Warrior need fixing and that the aircraft falls short of meeting the Army's armed reconnaissance needs. The Commanding General, U.S. Army Materiel Command, did not provide comments to the draft. The full text of the Army's comments are in Part IV of this report.

**Audit Comments:** We do not consider the Army's comments to be fully responsive although we did make changes in the report based upon those comments we considered appropriate. We deleted the draft recommendation to the Assistant Secretary of the Army (Research, Development, and Acquisition) after further considering whether circumstances similar to the Kiowa Warrior Modification Program would occur. We request the Army to address the recommendation concerning the navigational system deficiency in comments to this report by November 18, 1994.



## **Part III - Additional Information**

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## **Appendix A. Organizations Visited or Contacted**

### **Office of the Secretary of Defense**

Office of the Under Secretary of Defense for Acquisition and Technology, Washington, DC  
Director, Operational Test and Evaluation, Washington, DC  
Director, Program Analysis and Evaluation, Washington, DC

### **Department of the Army**

Assistant Secretary of the Army (Research, Development, and Acquisition), Washington, DC  
Director, Program Analysis and Evaluation, Washington, DC  
Office of the Deputy Chief of Staff for Logistics, Washington, DC  
Office of the Deputy Chief of Staff for Operations and Plans, Washington, DC  
U.S. Army Force Integration Support Agency, Fort Belvoir, VA  
U.S. Army Forces Command  
Fort Bliss, TX  
Fort Bragg, NC  
Fort Carson, CO  
Fort Hood, TX  
Fort McPherson, GA  
U.S. Army Training and Doctrine Command  
Fort Monroe, VA  
Fort Leavenworth, KS  
Fort Lee, VA  
Fort Rucker, AL  
Fort Eustis, VA  
U.S. Army Aviation and Troop Command, St. Louis, MO  
U.S. Army Operational Test and Evaluation Command, Alexandria, VA  
U.S. Army Test and Experimentation Command, Fort Hood, TX  
U.S. Total Army Personnel Command, Alexandria, VA  
U.S. Army Depot, Corpus Christi, TX  
U.S. Army Materiel Analysis Activity, Aberdeen, MD

### **Department of the Navy**

Headquarters, U.S. Marine Corps, Arlington, VA  
Naval Air Systems Command, Arlington, VA

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Comptroller of the Department of Defense  
Assistant to the Secretary of Defense (Public Affairs)

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Assistant Secretary of the Army (Research, Development, and Acquisition)  
U.S. Army Deputy Chief of Staff for Operations and Plans  
Commanding General, U.S. Army Forces Command  
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Senate Subcommittee on Defense, Committee on Appropriations  
Senate Committee on Armed Services

## **Appendix B. Report Distribution**

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House Committee on Appropriations  
House Subcommittee on Defense, Committee on Appropriations  
House Committee on Armed Services  
House Committee on Government Operations  
House Subcommittee on Legislation and National Security, Committee on  
Government Operations

## **Part IV - Management Comments**

# Department of the Army Comments



REPLY TO  
ATTENTION OF

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



SARD-SA

MEMORANDUM FOR INSPECTOR GENERAL, DEPARTMENT OF DEFENSE  
(AUDITING)

SUBJECT: Comments on Draft Audit Report on Kiowa Warrior Modification  
Program (Project No. 3AG-0068)

1. PEO Aviation's response to the subject report is enclosed.
2. Point of contact is Major Kimberly, ext. 41969

Encl

*for Howard Rimmer*  
COLBERT T. GAUTREUX  
COL, GS  
Director for Aviation, Intelligence  
and Electronic Warfare



REPLY TO  
ATTENTION OF

SFAE-AV

DEPARTMENT OF THE ARMY  
OFFICE OF THE PROGRAM EXECUTIVE OFFICER, AVIATION  
4300 GOODFELLOW BOULEVARD, ST LOUIS, MO 63120-1798



10 AUG 1994

MEMORANDUM FOR INSPECTOR GENERAL, DEPARTMENT OF DEFENSE  
(AUDITING)

SUBJECT: Comments on Draft Audit Report on Kiowa Warrior Modification  
Program (Project No. 3AG-0068)

1. I agree, in general, with the comments provided by the Kiowa Warrior PM regarding the specific draft report on the Kiowa Warrior modification program. However, I think it is important to recognize that the Kiowa Warrior effort was used as a short term, low cost, interim effort to bridge the Army's serious armed reconnaissance deficiencies.
2. I do not disagree with the fundamental thrust of the DODIG report that identifies many things on the Kiowa Warrior that need fixing, nor that the aircraft falls far short of meeting the Army's armed reconnaissance needs (enclosure). It is at best a stop gap, quickly assembled to fill a void. Major investments in further upgrades do not appear prudent. The OH-58D remains a single engine helicopter of basically commercial design with little survivability, no pilot night vision system, and marginal performance. It requires a major upgrade to the mission processor to remain abreast of the digital battlefield and an engine upgrade to enhance reliability.
3. My view is that it has reached its growth potential. We need to invest only those funds essential to sustain the system until Comanche arrives.

Encl

DEWITT T. IRBY, JR.  
Major General, USA  
Program Executive Officer, Aviation

# Department of the Army Comments



REPLY TO  
ATTENTION OF

DEPARTMENT OF THE ARMY  
PROJECT MANAGER, KIOWA WARRIOR  
4300 GOODFELLOW BOULEVARD, ST. LOUIS, MO 63120-1798



SFAE-AV-ASH-P (70-17b)

*24 Aug 94*

MEMORANDUM THRU PROGRAM EXECUTIVE OFFICER, AVIATION  
TO IG, DOD (AUDITING)

SUBJECT: Comments on Draft Audit Report on Kiowa Warrior Modification Program (Project No. 3AG-0068)

1 Executive Summary, paragraph 3. The Army proceeded with the modification and fielding of the Kiowa Warrior Aircraft although the aircraft did not fully meet performance specifications. The Kiowa Warrior falls significantly short of achieving required operational parameters and will require further expenditures to correct shortcomings.

Response: Nonconcur. The Secretary of the Army, in a Memorandum dated 8 January 1990, authorized procurement of the Kiowa Warrior prior to the initiation of any technical or operational testing. Subsequent testing, however, did verify achievement of all Kiowa Warrior Required Operational Capability (ROC) requirements with the following exception:

The only ROC parameter that the Kiowa Warrior failed to meet was reported in the Preliminary Airworthiness Evaluation (PAE) as "Insufficient Lateral cyclic margin to land on 10 degree side slopes with greater than 2.9 inch lateral center of gravity (C.G.) out of balance on the down slope side". The Kiowa ROC simply states capability to land on slopes up to 10 degrees (direction optional) is required. This situation only occurs at the extremes of the operational envelop when the aircraft is asymmetrically loaded and confined to land in one direction, which is an abnormal situation. However, it has been corrected by changes to the aircraft controls rigging procedure and providing a list of authorized weapons configurations which precludes extreme lateral C.G.s. This correction has been verified during contractor flight testing and will be validated during the Airworthiness and Flight Characteristics test which is scheduled to complete in third quarter FY95.

2. Executive Summary, paragraph 3. Army aviation unit and intermediate level maintenance organizations responsible for maintaining attack and armed reconnaissance aircraft did not have sufficient support equipment and experienced personnel to maintain the assigned aircraft adequately. The Army has undertaken several studies to assess what corrective actions are needed to improve maintenance shortfalls.

Response: Nonconcur. In FY94 the Kiowa Warrior completed a 1000 hour Follow on Production Test at the Army Technical Test Center to evaluate the Reliability, Availability and Maintainability characteristics. The aircraft performed significantly better than ROC parameters and was commended by TECOM. All of the maintenance courses and training devices for the Kiowa Warrior are in place and courses are being offered to personnel. Support equipment is developed and fielded and is in accordance with the current Logistics Support Analysis Report (LSAR) and approved Support Equipment Recommendation Data (SERD). These qualities sum together to provide the Kiowa Warrior a Readiness Rate that continually exceeds the DOD Standard and leads the rotary wing fleet.

3. Page 6, paragraph 1. The Assistant Secretary of the Army (Research, Development, and Acquisition) did not conduct a formal ASARC for the modification decision.

Response: The Army did conduct a formal ASARC for the modification decision. On August 8, 1989, LTG Donald S. Pihl chaired a preliminary ASARC review of the Armed AHIP program. Each member of the ASARC had complete documentation packages well in advance of the pre-ASARC and were briefed prior to the meeting. The



SFAE-AV-ASH-P

SUBJECT: Comments on Draft Audit Report on Kiowa Warrior Modification Program (Project No 3AG-0068)

pre-ASARC determined that there were no major impediments to fielding the Armed AHIP, save funding shortfalls. The pre-ASARC agreed it was senseless to waste time reconvening to reach the same conclusion. The pre-ASARC directed the PEO to assume approval, subject to ratification of the Army Acquisition Executive and contingent on availability of funds, to develop and field Armed AHIPs and to include the costs of this decision in the FY91 Budget Estimate Submittal. The Army Acquisition Executive ratified this decision on August 25, 1989 and the program was authorized by the Secretary of the Army in a Memorandum dated 8 January 1990.

4 Page 6, paragraph 1 The Kiowa Warrior Program Manager did not perform timely risk analyses and operational assessments of the aircraft's performance capabilities.

Response: Nonconcur. Based on the 6 January 1990 Secretary of the Army memorandum, the Army was not in agreement (i.e., PMO, OTEA, and TSM) on the scope of operational testing required since we had 10,000 hours of Operational time in Prime Chance aircraft. The testers argued that the mission was different, however, all agreed that a Formal Operational Test was not warranted. When the Project Manager's Office and OTEA could not come to an agreement the USDA(OT) was called to arbitrate a position. On 24 October 1990, the DUSA(OR) convened a meeting and decided the Army would conduct a Force Development Test and Experimentation (FDTE). The results of this test would be the basis of an operational assessment. The FDTE was conducted in two phases occurring in March and October 1993 and was extremely successful and met all Critical Operational Issues and Criteria (COIC).

5. Page 6, paragraph 1. The Conditional Materiel Release process did not address a pertinent performance issue.

Response: The Project Manager's Office addressed every issue highlighted in the AMSAA safety conformance letter which was based on all technical testing. This office is unclear as to the implied "pertinent performance issue".

6 Page 6, paragraph 2, Original Program. The Army began a major modification effort in 1981 on the Kiowa rotary wing aircraft that included adding an advanced targeting acquisition system.

Response: the model designation OH-58A/C should be added prior to Kiowa

7. Page 6, paragraph 2, Original Program. The Kiowa was an element of the Army's artillery force, serving as an unarmed field artillery aerial observer for ground and air units.

Response: The OH-58A/C is also an element of the Army's cavalry and attack force as well as artillery.

8. Page 6, paragraph 2, Original Program. The modified Kiowa was redesignated OH-58D and classified as an Acquisition Category I(D) program.

Response: The descriptor AHIP should be added after OH-58D

9. Page 6, paragraph 2, Original Program. Fielding of the OH-58D was initiated in April 1986.

Response: Fielding of the OH-58D AHIP was initiated in April 1986.

10. Page 6, paragraph 3, Program Restart. In response to congressional concerns as to what aircraft could be used in place of the terminated OH-58D to perform scout missions, the Office of the Secretary of Defense (OSD) reevaluated previous studies that showed the OH-58D was the best aircraft to perform these missions.

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Response: The Army conducted the Army Aerial Scout Test (AAST) to show DOD that the AHIP was the best aircraft for the scout job and the Army returned the AHIP to the budget with DOD concurrence

11 Page 7, On January 8, 1990, the Secretary of the Army approved a program restart; however, this program was significantly different from the terminated program. When the program restarted, it was categorized as an Acquisition Category I(C) program.

Response: The Secretary of the Army Memorandum approved a program to **Modify** existing AHIP aircraft to the Armed Kiowa Warrior configuration. The program was already ACAT IC.

12 Page 7, paragraph 2. This configuration was based on a decision in 1987 when 15 OH-58Ds were equipped with these weapons for a special mission in the Persian Gulf. The retrofitted OH-58D was renamed "Kiowa Warrior". Thus, the Kiowa Warrior role changed from an unarmed field artillery aerial observer to an air cavalry role that included armed reconnaissance missions as well as spotting for artillery and performing patrol duties.

Response: This armed configuration was the Prime Chance aircraft. The Prime Chance was a Joint Chiefs directed program. Prime Chance was not the action which changed the aircraft roles. The previously conducted AAST said the OH-58D was the best aircraft in the Air Cavalry role as well as the Aerial Field Observer role. All Prime Chance did was to make the aircraft capable of singularly doing the Armed Reconnaissance mission.

13 Page 7, paragraph 2. We estimate the Army will have spent about \$1.3 billion through FY94 to modify 135 OH-58Ds and produce 231 additional aircraft.

Response: The Army will have spent about \$1.3 billion through FY 94 to retrofit 104 AHIPs to Kiowa Warriors and to modify an additional 165 OH-58A/C to Kiowa Warriors.

14 Page 7, paragraph 3 Autorotation. The U.S. Army Safety Center reported in an independent safety assessment dated March 3, 1989, that autorotational characteristics of the Kiowa Warrior, with a 1,000 pound increase in the maximum gross weight and the additional drag of weapon stores, will not be the same as the original OH-58D. The added weight would have a detrimental effect on its performance. The Safety center recommended that this performance issue be addressed at the start of the program since it was a critical hazard. The Aviation Test Center reconfirmed the autorotational problem in March 1992 as did AMSAA in December 1992. Both activities stated that safe autorotational landings would be difficult for the Kiowa Warrior with the gross weight increase.

Response: Nonconcur. The March 1992 TECOM PAE report states, "The unsatisfactory autorotative landing characteristics using the approved Army technique" is a deficiency. While we do not dispute that autorotations at higher gross weights are more difficult, we believe that the discussion of autorotation must be conducted in context of the entire spectrum of operation. Autorotation is an emergency condition and seldom required. Aviators in all Army rotary wing aircraft are prohibited from practicing autorotations in the field. Thus the aviator is trained at the Aviation Center using a somewhat unrealistic but safe technique and left to his best judgment and skill upon the occurrence of a realistic situation. The TECOM comment addresses the technique, not necessarily the aircraft. Aerodynamically, the Kiowa Warrior provides better autorotative parameters than other first line aircraft, albeit they have dual engine capability. TECOM will explore alternative techniques during the Airworthiness and Flight Characteristics test to be completed in third Quarter FY 95.

Further, the normal combat flight altitude is well below the safe autorotative environment of any helicopter. The operational safety data for the OH-58D supports the PM contention that although the Autorotative

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Characteristics may be a test deficiency, the tradeoffs offered by agile performance and mission performance outweigh the risks associated with the deficiency.

15 Page 8, paragraph 1. The Aviation Test Center and AMSAA also concluded that the Kiowa Warrior engine failure characteristics with very high yaw rates and sideslips, did not exhibit a smooth transition to autorotative flight. In addition, the two independent evaluators concluded that the Kiowa Warrior failed to meet the specification requirements for low-speed flight characteristics, which further impacted the aircraft's performance capability

Response: Nonconcur. First, the Aviation Test Center is not an Independent Evaluator for the Kiowa Warrior. They are a test agency. AMSAA is the Independent Evaluator. Close attention to the PAE Report reveals that the "specification requirements" which were failed were those of **ML-H8501A, Helicopter Flying and Ground Handling Qualities; General Requirements for**, which provides general design guidance and which TECOM used as an evaluation standard. There is no contractual specification failure, but simply a tradeoff common in all designs. These comments are made by TECOM in support of their overall conclusion regarding the aircraft's autorotational characteristics as a deficiency. They should not be afforded a separate paragraph implying that they affect any other aircraft performance condition. Please note that the footnotes defining Yaw Rate and Sideslip are erroneous and should be rewritten to provide accurate information to the reader. Yaw rate is the instantaneous speed at which the aircraft rotates around its vertical centerline (axis of rotation). Sideslip is the lateral movement of the aircraft in relation to the ground.

16. Page 8, paragraph 2. The test assessment concluded that the current Kiowa Warrior navigational system is inadequate for most reconnaissance missions.

Response: The Kiowa Warrior navigation system meets the ROC as well as the contracted performance specifications which are significantly more stringent. The navigational system has not been classified as a deficiency or shortcoming by any TECOM technical test report, AMSAA Independent Evaluation Report, or the operational assessment by OPTEC. In fact, the operational assessment states on page 4-5 . the current navigation system is adequate for its reconnaissance missions... The report does state that large Doppler shift errors renders the current navigation system unacceptable. This is inherent to any Doppler navigation system and is accommodated procedurally by routine updates of the system by the crew. During Operation Desert Shield/Storm a Global Positioning System (GPS) navigation system was introduced which provided even greater accuracy than the existing navigational system and did not require crew assistance to routinely update current position. In comparison to the GPS technology, the older Doppler system is clearly less desirable now. The PMO has initiated efforts to incorporate that technology in the form of the Embedded GPS/Inertial Navigation System (EGI).

17. Page 9, paragraph 4 The Commander, U.S. Army Materiel Command, granted the Kiowa Warrior a conditional materiel release in July 1992 pending the program manager's satisfactory resolution of issues disclosed during the release process. The most significant issues identified during the materiel release assessment were: the Kiowa Warrior's air worthiness, unsatisfactory autorotative landings, and slow recovery following simulated engine failures.

Response: In a discussion by the Commander, U.S. Army Materiel Command, granting the Kiowa Warrior a conditional release, the report implies that the air worthiness of the Kiowa Warrior is in question. This paragraph presents an incorrect connotation of the airworthiness issue, in fact, the issue was that the Final Statement of Airworthiness has not been issued. U.S. Army Aviation and Troop Command's Directorate of Engineering will not issue a Final Statement of Airworthiness until the Airworthiness and Flight Characteristics qualification test is completed. This test is scheduled for completion during third quarter FY95.

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18 Page 9, paragraph 5. The Kiowa Warrior Project Manager prepared a get well plan in October 1993, which addressed discrepancies identified during materiel release assessments. The get-well plan details the corrective actions needed and time frame for resolving discrepancies before the Full Materiel Release is granted. Our review of the get-well plan disclosed it did not address the operational concerns related to navigational system shortcomings.

Response: The get-well plans reviewed by the audit team were part of a Conditional Material Release request written prior to the receipt of this operational concern in March 1994

19. Page 10, Mission effects. The Office of the Director, Program Analysis and Evaluation (PA&E) expressed concern regarding the Kiowa Warrior's performance capabilities during the Secretary of Defense's Bottom Up Review process in FY 1993. The office questioned the aircraft's operational shortcomings that were evident in joint exercises and during Operation Desert Storm. PA&E noted deficiencies including the aircraft's vulnerability during penetration of hostile airspace; its limited air-to-air combat capability; and shortfalls in integrated observation, detection, and targeting. Further, PA&E does not believe the aircraft's engine problem that affects autorotational landing, simulated engine failure, and low-speed flight characteristics can be resolved without total engine replacement. We believe the cost of replacing the Kiowa Warrior's engine would be substantial since it would most likely require other modifications to the aircraft, such as its airframe.

Response: This office is unaware of the Office of the Director, Program Analysis and Evaluation concerns, nor any operational shortcomings during joint exercises or during Operation Desert Storm. The Kiowa Warrior is the ONLY Army aircraft with ANY air-to-air combat capability and we are unaware of any shortfalls in integrated observation, detection, and targeting since none have been reported by any test agency. The conclusion that an engine replacement would resolve the "problem that affects autorotational landing, simulated engine failure, and low-speed flight characteristics" is totally erroneous. These are conditions which occur due to the aerodynamic design of the Kiowa Warrior aircraft. Autorotational characteristics is a function of the rotor system, not the engine. A total engine replacement would not affect these reported problems.

  
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