Audit Report

OFFICE OF THE INSPECTOR GENERAL

ARMY QUANTITATIVE REQUIREMENTS FOR ATTACK AND RECONNAISSANCE HELICOPTERS

Report No. 97-174

June 23, 1997

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Department of Defense

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Acronyms

CAA	Concepts Analysis Agency
COSAGE	Combat Sample Generator
GAO	General Accounting Office
MRC	Major Regional Contingency
TRADOC	Training and Doctrine Command

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

June 23, 1997

MEMORANDUM FOR AUDITOR GENERAL, DEPARTMENT OF THE ARMY

SUBJECT: Audit Report on the Army Quantitative Requirements for Attack and Reconnaissance Helicopters (Report No. 97-174)

We are providing this report for review and comment.

DoD Directive 7650.3 requires that all recommendations be resolved promptly. Therefore, we request that the Army provide official comments by July 24, 1997.

Management comments should indicate concurrence or nonconcurrence with the finding and the recommendation. Comments must describe actions taken or planned in response to the recommendation, if agreed upon, and provide the completion dates of the actions. State specific reasons for any nonconcurrence and propose alternative actions, if appropriate.

Please review this report for the proper security classification. Provide us the results of your review with your responses to the finding and recommendation.

We appreciate the courtesies extended to the audit staff. Questions on the audit should be directed to Mr. Brian M. Flynn, Audit Program Director, at (703) 604-9051 (DSN 664-9051) or Mr. Robert L. Shaffer, Audit Project Manager, at (703) 604-9043 (DSN 664-9043). See Appendix F for the report distribution. The audit team members are listed inside the back cover.

Robert J. Lieberman
Assistant Inspector General
for Auditing

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Office of the Inspector General, DoD

Report No. 97-174 **June 23, 1997**
(Project No. 5AL-0066.00)

The Army Quantitative Requirements for Attack and Reconnaissance Helicopters

Executive Summary

Introduction. During FY 1996, the Army had 2,630 attack and reconnaissance helicopters in its inventory. The Army inventory of attack and reconnaissance helicopters included the AH-64 (Apache) and the AH-1 (Cobra) attack helicopters and the OH-58 (Kiowa) reconnaissance helicopter. The Army planned to spend $14.9 billion to upgrade the Apache attack helicopter and to develop the RAH-66 (Comanche) reconnaissance and attack helicopter. Of the $14.9 billion, the Army planned to spend $4.7 billion from FYs 1997 through 2001.

Audit Objectives. The overall audit objective was to evaluate the reasonableness of quantitative requirements for attack and reconnaissance helicopters. We also evaluated the adequacy of management controls related to the audit objective.

Audit Results. The Army needs to reconsider and update its assumptions for determining the quantitative requirements for attack and reconnaissance helicopters. The currently estimated Army requirement for 2,676 attack and reconnaissance helicopters is questionable. As a result, the stated requirement is virtually unaffordable. Since the end of the cold war, the Army significantly reduced its force structure, revised the process for calculating munitions requirements, and reduced its requirements for munitions. However, the number of attack and reconnaissance helicopters has remained virtually the same. Also, the Army process for determining quantitative requirements for attack and reconnaissance helicopters did not consider the extent to which the Army would use attack and reconnaissance helicopters to defeat potential enemies. In addition, the Army process did not consider the effects that increased capabilities of the attack and reconnaissance helicopters would have on quantitative requirements for attack and reconnaissance helicopters.

The recommendation in this report, if implemented, will result in more realistic quantitative requirements for the Army attack and reconnaissance helicopters and should produce significant opportunities for reprioritization of procurement funding. However, we could not quantify the amount because the amount will depend on future management decisions after the requirements are revised. See Part I for a discussion of the audit results.

Recommendation. We recommend that the Commander, Army Training and Doctrine Command, revise the assumptions for determining the quantitative requirements for the Army attack and reconnaissance helicopters in combat units to include the extent of use of the attack and reconnaissance helicopters, technological advances in the helicopters, and the increased capability of precision-guided munitions.

Management Comments. We issued a draft of this audit report on March 7, 1997. The Army did not provide official comments on the draft. We request that the Army provide official comments on this report by July 24, 1997.

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Part I - Audit Results

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Audit Background

Attack and reconnaissance helicopters play an important role in the ability of the Army to conduct its mission. The Army uses the attack and reconnaissance helicopters in its corps; regimental aviation squadrons; and mechanized, armored, infantry, cavalry, airborne, and air assault divisions. Although the primary mission of the attack helicopter is to destroy threat armored targets, the Army uses the attack helicopters for other missions that include reconnaissance, security, escort, air assault, special operations, and command and control. During FY 1996, the Army had 2,630 attack and reconnaissance helicopters in its inventory. Table 1 shows the Army inventory of attack and reconnaissance helicopters.

Table 1. Army Inventory of Attack and Reconnaissance Helicopters
(FY 1996)

Helicopter	Total
Apache	755
Cobra	589
Kiowa	1,286
Total	**2,630**

The Army plans to make a substantial investment to develop, procure, and upgrade attack and reconnaissance helicopters. The Army plans to invest $6.9 billion ($2.7 billion in FYs 1997 through 2001) to upgrade the AH-64 (Apache) attack helicopter, the current Army attack helicopter, and $8 billion ($2 billion in FYs 1997 through 2001) to develop the RAH-66 (Comanche) reconnaissance and attack helicopter. The Army plans to replace the OH-58 (Kiowa) reconnaissance and the AH-1 (Cobra) attack helicopters with the Comanche reconnaissance and attack helicopter. Procurement of the Comanche reconnaissance and attack helicopter is programmed for beyond FY 2002 and estimated at $23 billion.

Audit Objectives

The overall audit objective was to evaluate the reasonableness of quantitative requirements for attack and reconnaissance helicopters. We also evaluated the adequacy of management controls related to the audit objective. See Appendix A for the coverage of the management control program and the audit scope and methodology. See Appendix B for a summary of prior coverage related to the audit objectives.

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Quantitative Requirements for Attack and Reconnaissance Helicopters

The Army needs to reconsider and update its assumptions for determining the quantitative requirements for attack and reconnaissance helicopters. The currently estimated Army requirement for 2,676 attack and reconnaissance helicopters is questionable. Although the Army significantly reduced its force structure, revised the process for calculating munitions requirements, and reduced its requirements for munitions since the end of the cold war, the number of attack and reconnaissance helicopters has remained virtually the same. The Army process for determining quantitative requirements for attack and reconnaissance helicopters did not consider the extent to which the Army would use attack and reconnaissance helicopters to defeat potential enemies. In addition, the Army process did not consider the effects that increased capabilities of the attack and reconnaissance helicopters would have on quantitative requirements for attack and reconnaissance helicopters. As a result, the stated requirement is virtually unaffordable.

The Army Process for Determining Helicopter Requirements

The Congressional Budget Office, "An Analysis of U.S. Army Helicopter Programs," December 1995, states that the Army assigned four primary missions to helicopters: attack, reconnaissance, support or utility, and medium lift. The total number of helicopters that the Army needs depends on how the Army has designed its forces. Attack battalions carry out the attack mission, and cavalry squadrons carry out the reconnaissance mission. Almost all divisions have attack battalions and cavalry squadrons assigned to them. The corps also have attack battalions and cavalry squadrons assigned directly to them, in addition to the attack and reconnaissance helicopters in their mechanized, armored, infantry, cavalry, airborne, and air assault divisions and regimental aviation squadrons.

The Army Training and Doctrine Command prescribes the structure, manpower, and equipment for the Army and, as a consequence, determines the number of helicopters needed. The Army Training and Doctrine Command used a bottom-up methodology to determine the total number of attack and reconnaissance helicopters needed in the Army. The basic building block in that requirements determination process for helicopters was the attack helicopter company in an attack battalion or a helicopter troop in a cavalry squadron. The total number of helicopters required to fill the units in the force structure becomes the combat requirement for attack and reconnaissance helicopters. In addition to the attack and reconnaissance helicopters that the Army required for the combat divisions, regimental aviation squadrons, and corps, the Army required additional helicopters to support training and testing, maintenance, and

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attrition. Appendix C provides a general description of how the Army calculated its requirements for attack and reconnaissance helicopters. Table 2 shows the total number of attack and reconnaissance helicopters that the Army Training and Doctrine Command determined that the Army requires in FY 2003.

Table 2. Army Requirement for Attack and Reconnaissance Helicopters for FY 2003

	Apache	Cobra	Kiowa	Total
Combat units	912	493	624	2,029
Training and testing	92	81	63	236
Maintenance	143	15	98	256
Attrition	92	--	63	155
Total	**1,239**	**589**	**848**	**2,676**

Audit Evaluation of the Army Process for Determining Quantitative Requirements for Attack and Reconnaissance Helicopters

A dichotomy exists between the requirements determination process for anti-armor munitions and the requirements determination process for the weapon platforms (in this case, the helicopters) that deliver the munitions. Since the end of the cold war, the Army significantly reduced its force structure, revised the process for calculating munitions requirements, and reduced its requirements for munitions. However, the number of attack and reconnaissance helicopters has not been significantly altered. Also, the Army process for determining quantitative requirements for attack and reconnaissance helicopters did not consider the extent to which the Army would use attack and reconnaissance helicopters to defeat potential enemies. In addition, the Army process did not consider the effects that increased capabilities of the attack and reconnaissance helicopters would have on quantitative requirements for attack and reconnaissance helicopters.

Force Structure. Since the end of the cold war, the Army has made significant reductions in the size of its force structure. During FY 1991, the Active Army had an end strength of 710 thousand, which provided a force structure of 5 corps and 18 Active divisions. Reserve components had an end strength of 745 thousand, providing 10 Reserve divisions. In FY 1996, the

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Active Army had an end strength of 495 thousand that provided a force structure of 4 corps and 10 Active divisions. Reserve components had an end strength of 603 thousand, providing 8 Reserve divisions.

Requirements Determination Process for Anti-Armor Munitions. As a result of deficiencies identified in the Inspector General, DoD, Report No. 95-157, "Army's Processes for Determining Quantitative Requirements for Anti-Armor Systems and Munitions," March 29, 1995, the Army established an Ammunition Requirements Working Group that revised the process that the Army used to calculate munitions requirements based on the number of munitions needed to defeat the Army portion of the specified threat. The Army used the revised process to calculate the Army munitions requirements in support of the Army FYs 1998 through 2003 Program Objective Memorandum. Those munitions requirements were valued at $18.6 billion, a reduction of $14 billion, or 42.9 percent, in the $32.6 billion in the prior munitions requirements that the Army calculated in support of the FYs 1996 through 2001 Program Objective Memorandum.

Requirements Determination Process for Helicopters. Unlike changes in the process to calculate its munitions requirements, the Army had not revised the process used to calculate quantitative requirements for attack and reconnaissance helicopters to reflect a threat-based process. The Army based its process for determining quantitative requirements for attack and reconnaissance helicopters on force structure. Although the Army significantly reduced its force structure and munitions requirements because of the end of the cold war, the number of attack and reconnaissance helicopters has remained virtually the same. The General Accounting Office Report No. GAO/NSIAD-96-177 (OSD Case No. 1175), "Combat Air Power: Joint Mission Assessments Needed Before Making Program and Budget Decisions," September 20, 1996, states that from 1991 through 1996, attack helicopter inventories had fallen only 4 percent. The report further states that many of the older helicopters in the 1991 inventory had been replaced by newer, more capable attack helicopters.

The Army process for determining its quantitative requirements for attack and reconnaissance helicopters did not consider the number of attack and reconnaissance helicopters needed to defeat the threat in the two major regional contingencies (MRCs). The Defense Planning Guidance for FY 1997 through FY 2001, May 9, 1995, clearly provides two scenarios that were to be used and directed the Services to plan their munition and force structure requirements to have a capability for defeating the threat in two nearly simultaneous MRCs. The Defense Planning Guidance also states that the munition and force structure requirements developed for the planning scenarios of the two nearly simultaneous MRCs should be sufficient for other lesser worldwide commitments.

The Army determined the most effective mix of helicopters for each type of division that was involved in an intense conflict as if an enemy force met our forces head on at full strength in a traditional ground war. The Army extended that requirement through the force structure of the Army. The warfighting strategy does not provide for such intensity in combat. The strategy for fighting future wars is to destroy enemy targets before they can be used against U.S.

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forces. Additionally, the Army did not fully examine the role of the attack helicopter in a joint, allied, warfighting environment that is geared to defeat a common enemy. The Army did not consider the fact that other U.S. and allied forces would be used to defeat a significant portion of the targets available for the helicopters to destroy.

Extent to Which the Army Uses Attack and Reconnaissance Helicopters. We identified three factors that indicated the extent that the Army would use attack and reconnaissance helicopters to defeat the threats. The Army should have considered factors such as the following in determining the quantitative requirements for attack and reconnaissance helicopters needed to defeat the threat in the two MRCs:

o simulated enemy threat targets that attack helicopters would defeat,

o simulated expenditures of Hellfire missiles, and

o simulated flying hours compared with the planned flying hours for attack and reconnaissance helicopters.

Officials in the Army Training and Doctrine Command and the Army Concepts Analysis Agency (CAA) disagreed that the Army should consider the extent of use of the helicopters in the Army requirements determination process. We believe that the Army should estimate the extent that it will use the attack and reconnaissance helicopters in the two MRCs and use the estimate in establishing its requirements before making investments of $14.9 billion ($4.7 billion in FYs 1997 through 2001) to upgrade the Apache attack helicopter to the AH-64D (Longbow Apache) Longbow configuration and to develop the Comanche reconnaissance and attack helicopter.

Simulated Enemy Threat Targets That Attack Helicopters Would Defeat in the Two MRCs. An Army CAA simulation showed that attack and reconnaissance helicopters would not play a major role in destroying high-valued enemy targets, such as aircraft, air-defense, and armored targets, in the two MRCs. As part of the Army munitions requirements determination process, the Army CAA simulation showed the percent of targets that each type of weapon platform would destroy in the two MRCs. The Army CAA simulation showed that attack helicopters would destroy 6.3 percent of the total armored targets in the MRC-West and 2.9 percent of the total armored targets in the MRC-East. In the Army CAA simulation, the Air Force and the United States and allied artillery would destroy the overwhelming majority of high-valued armored targets.

Army officials disagreed with the audit methodology and results and stated that using the amount of targets destroyed to determine the extent of helicopter use was not appropriate. The Army has expanded the primary mission for attack helicopters from destroying the enemy armored threat to coordinating and adjusting indirect fire and conducting reconnaissance and security operations. Although the Army expanded its mission, we believe that the portion of the total armored targets destroyed and the number of missiles fired from attack

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helicopters is an indicator of the extent of use of attack helicopters. Further, we consider the expanding role of attack helicopters to missions generally performed by the reconnaissance helicopters as another indicator that the Army did not fully use attack and reconnaissance helicopters.

The General Accounting Office (GAO) Report No. GAO/NSIAD-96-72 (OSD Case No. Case 1095), "U.S. Combat Air Power Reassessing Plans to Modernize Interdiction Capabilities Could Save Billions," May 13, 1996, also indicates that the Services had extensive and redundant firepower for defeating the threat. The report states that the Services had at least 10 ways to hit nearly 65 percent of the total ground targets, and 25 or more combinations of aircraft, missiles, bombs, or precision-guided munitions could hit those targets.

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Army officials stated that using the Army CAA data to determine the extent of use of the attack and reconnaissance helicopters was inappropriate because the Army CAA produced the data to determine the Army quantitative requirements for munitions, not weapon platforms to defeat the threat. We agree that the primary purpose of the Army CAA simulation was to estimate the quantity of munitions that the Army needs for the two MRCs, not to determine helicopter requirements. However, the Army CAA model does provide indications concerning Army-wide use of helicopters in the scenarios of the two MRCs, and Army officials did not provide us any alternatives for estimating the extent that attack and reconnaissance helicopters would be used in the two MRCs.

Simulated Flying Hours Compared With Planned Flying Hours for Attack and Reconnaissance Helicopters in the Two MRCs. Another indicator of the reasonableness of the quantitative requirements for attack and reconnaissance helicopters was the comparison of the flying hours for attack and reconnaissance helicopters that the Army CAA simulation showed for the two MRCs as a percentage of the planned flying hours. The average simulated flying hours of attack and reconnaissance helicopters in the two MRCs was less

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than 10 percent of the Army planned flying hours. To calculate the simulated flying hours, we used data that the Army CAA provided in support of its study for the determination of munition requirements for FY 2003. To calculate the Army planned flying hours for attack and reconnaissance helicopters, we multiplied the number of aircraft that the Army planned to have in theater each day by the operational readiness rate and by the wartime flying hour rate for combat missions for each helicopter type. The Army Aviation Center developed the wartime flying hour rates in a July 19, 1994, study. The wartime flying hour rate represented the Army planned equipment use requirements for the successful accomplishment of wartime operations. Appendix D describes, in greater detail, the method that we used to calculate the simulated flying hours of attack and reconnaissance helicopters in the two MRCs. Table 3 shows the average percent of planned flying hours that each type of attack and reconnaissance helicopter will be flown in the two MRCs. Table 3 also shows the highest percent of planned flying hours for a 24-hour period and the number of helicopters in theater when the highest percent of planned flying hours occurred.

Table 3. Simulated Flying Hours Compared With Planned Flying Hours

	MRC-West			MRC-East	
	Apache	Apache Longbow	Kiowa	Apache	Kiowa
Average percent of simulated flying hours to planned flying hours (entire war)	4.9	3.7	5.3	4.0	0.0
Total helicopters in theater (entire war)	208.0	144.0	163.0	264.0	171.0
Highest percent of simulated flying hours to planned flying hours (24-hour period)	23.9	38.7	51.8	19.3	1.8
Helicopters in theater at highest percent of planned use (24-hour period)	48.0	48.0	31.0	48.0	16.0

Note: The percent of planned use represents simulated flying hours divided by the planned flying hours.

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The Army simulation of its attack and reconnaissance helicopters in the two MRCs at less than 10 percent of the planned flying hours did not justify the Army requirement for attack and reconnaissance helicopters. Similarly, we considered the highest percent of simulated flying hours to planned flying hours in a 24-hour period of 52 percent unreasonable justification for the Army requirement. The commander should have the option of holding a portion of the attack helicopters in a tactical reserve. However, we cannot accept as reasonable the commander holding back the attack helicopters in the percent of planned flying hours that the Army CAA simulation showed.

Hellfire Missiles Fired and Helicopter Flying Hours During Operations Desert Shield and Desert Storm. Actual expenditures of Hellfire missiles and actual helicopter flying hours during Operations Desert Shield and Desert Storm support the results of the Army CAA simulation.

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Attack Helicopter Flying Hours During Operations Desert Shield and Desert Storm. The actual hours flown during Operations Desert Shield and Desert Storm paralleled the low use of attack helicopters that the Army CAA simulation showed. Army officials told us that Operations Desert Shield and Desert Storm were not representative of how the Army would use attack helicopters in combat. However, the Army CAA simulation showed that the average flying hours were fewer than 10 percent of the planned flying hours for attack and reconnaissance helicopters in the MRC-East. That ratio was significantly less than the ratio for actual flying hours in Operations Desert Shield and Desert Storm. During Operations Desert Shield and Desert Storm (from October 1990 through March 1991), the Army flew its Apache attack helicopters an average of 12 to 22 flying hours per month, or 23.2 percent of the planned flying hours. Table 4 compares the flying hours per Apache attack helicopter during Operations Desert Shield and Desert Storm with the planned flying hours for the Apache attack helicopters during that period. Appendix E shows how we calculated the actual flying hours during Operations Desert Shield and Desert Storm and the planned flying hours for the comparison.

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Table 4. Comparison of Actual Flying Hours With Planned Use of Apache Attack Helicopters in Operations Desert Shield and Desert Storm

Month	Actual Flying Hours	Planned Flying Hours	Percent of Planned Use
October	2,596.0	8,559.7	30.3
November	2,144.2	9,968.4	21.5
December	2,175.4	10,590.8	20.5
January	2,427.8	14,435.5	16.8
February	3,822.6	18,149.0	21.1
March	5,699.2	19,876.0	28.7
Total	**18,865.2**	**81,579.4**	**23.2**

Increased Capabilities of Attack and Reconnaissance Helicopters. The Army process did not consider increased survivability and lethality of upgraded and new helicopters in determining the quantitative requirements for attack and reconnaissance helicopters. The Longbow Apache attack helicopter and the Comanche reconnaissance and attack helicopter would provide the increased capabilities.

Longbow Apache Attack Helicopter. The Longbow Apache attack helicopter is an upgrade to the Apache attack helicopter. The upgrade gives the Army a more survivable and capable attack helicopter; it represents a leap in lethality, massed firepower, and warfighting in adverse weather and battlefield obscurants. The Longbow Apache attack helicopters not only enhanced the capability of Apache attack helicopters but also reduced the technical risk associated with the integration of the Longbow weapon system on the Comanche reconnaissance and attack helicopters. The primary enhancement of the Longbow Apache attack helicopter was to provide a fire-and-forget capability, using a precision-guided missile to engage targets at standoff ranges. Although the General Accounting Office in Report No. GAO/NSIAD-96-72 (OSD Case No. 1095) did not specifically address Army use of precision-guided munitions, the report did make significant observations about the use of precision-guided munitions by the Air Force and the Navy. The GAO analysis shows that the Air Force and the Navy would require about 28 percent fewer flights to hit their targets because of the increased accuracy of precision-guided munitions. The GAO also noted that the Services did not plan to reduce the future force structure because of the greater use of precision-guided munitions. The GAO concluded that the use of precision-guided munitions may allow the Services to reduce some of their force structure without reducing overall capability. We found no indications that the Army planned to reduce its attack and reconnaissance helicopter forces as a result of the increased capability of the Longbow Apache attack helicopter.

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Comanche Reconnaissance and Attack Helicopter. The Army replacement of the Kiowa reconnaissance helicopter on a one-for-one basis with the Comanche reconnaissance and attack helicopter is another indicator that the Army has not taken increased capabilities into consideration. The Army plans to replace 24 Kiowa reconnaissance helicopters that the Army determined to be necessary for a light division with 24 Comanche reconnaissance and attack helicopters. The Comanche reconnaissance and attack helicopter is supposed to be a substantial improvement over the Kiowa reconnaissance helicopter. According to the Army, the Comanche reconnaissance and attack helicopter will provide substantial improvements in the areas of deployability, night and all-weather operations, navigation, survivability, lethality, reliability, and operation costs. The Comanche reconnaissance and attack helicopter is supposed to acquire and process battlefield information with stealth and speed, provide accurate and timely reports to decisionmakers using a digital data transfer, and respond immediately to tactical situations. In addition, the Army stated that the role of attack helicopters has been expanded into reconnaissance missions.

Army Investment in Aviation Assets

The Army plans to invest $14.9 billion to upgrade and modernize its aviation assets through FY 2009. Of that amount, the Army allocated $8 billion ($2 billion in FY 1997 through FY 2001) for the development of the Comanche reconnaissance and attack helicopter. Also, the Army plans to spend $6.9 billion ($2.7 billion in FY 1997 through FY 2001) on upgrades to the existing Apache attack helicopters to the Longbow configuration and on various small upgrades to the Kiowa reconnaissance helicopters until the Comanche reconnaissance and attack helicopter is fielded. The Army also spends $545.6 million each year to operate and maintain its fleet of attack and reconnaissance helicopters.

Conclusion

The Army does not believe that the extent of use of attack and reconnaissance helicopters should be a factor in determining the quantitative requirements for attack and reconnaissance helicopters. While we agree that the extent of use should not be the only, or even the primary, factor in determining the requirements for attack and reconnaissance helicopters, we do believe that the Army must consider how much it uses the helicopters before it invests significant amounts of money in upgrading and procuring helicopters. The number of aircraft needed to conduct successful operations, in accordance with prescribed tactical doctrine, should drive both force structure planning and

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procurement planning. Questionable quantitative requirements will result in unnecessary procurement and modification costs, as well as unnecessary operations and maintenance costs.

The Army Training and Doctrine Command has an opportunity to ensure that both the qualitative and quantitative requirements are justified. In March 1996, the Army Training and Doctrine Command initiated a "new way of doing business" in the determination of requirements by attempting to concentrate on desired Joint and Army capabilities. However, the new requirements determination process focused most of its emphasis on qualitative requirements, not quantitative requirements of system acquisitions. Using the extent of use of the attack and reconnaissance helicopters, technological advances in the helicopters, and the increased capability of precision-guided munitions will result in more realistic quantitative requirements for the Army attack and reconnaissance helicopters and should produce future monetary benefits. However, we could not quantify the amount because the amount will depend on future management decisions after the requirements are revised.

Recommendation for Corrective Action

We recommend that the Commander, Army Training and Doctrine Command, revise the Army assumptions for determining the quantitative requirements for the Army attack and reconnaissance helicopters in combat units to include the extent of use of the attack and reconnaissance helicopters in accordance with the direction provided by the applicable Defense Planning Guidance, technological advances in the helicopters, and the increased capability of precision-guided munitions.

Management Comments Required

We issued a draft of this audit report on March 7, 1997. The Army did not provide official comments on the draft. We request that the Army provide official comments on this report by July 24, 1997.

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Part II - Additional Information

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Appendix A. Audit Process

Scope

We reviewed records and supporting documentation concerning the Army process for determining and updating its quantitative requirements for the attack and reconnaissance helicopters. We reviewed records dated from April 1993 through October 1996. During the audit, we were unable to find studies or analyses that included all Services and allies and that showed the extent to which the Army would use attack and reconnaissance helicopters to defeat potential enemies in the planning scenarios or that showed the overall contribution that attack and reconnaissance helicopters would make in the scenarios of the two MRCs. The data from the Army CAA models came the closest to reflecting those data.

Methodology

Use of Computer-Processed Data. Army officials did not have data on the value of the intelligence information that attack and reconnaissance helicopters provided to commanders during Operations Desert Shield or Desert Storm, nor did they make any suggestions for estimating the extent that attack and reconnaissance helicopters in theater would be used in the two MRCs. Therefore, we used the Army CAA computer-processed data bases to determine flying hours of attack and reconnaissance helicopters. Although the Army CAA data are limited in many ways, they were the only information that the Army had that would accomplish the objective of the audit. We did not assess the reliability of computer-processed data that we used in evaluating the Army requirements for attack and reconnaissance helicopters. Therefore, any inaccuracies in those data would be reflected in the calculations of flying hours.

Audit Period and Standards. This economy and efficiency audit was made from September 1995 through February 1997 in accordance with auditing standards issued by the Comptroller General of the United States, as implemented by the Inspector General, DoD. We included tests of management controls considered necessary. Appendix B lists the prior audits and other reviews.

Contacts During the Audit. We visited or contacted individuals and organizations within the DoD; the Congressional Budget Office; the Center for Strategic and International Studies; the Institute for Defense Analyses; the RAND Corporation; and SysTeam, Inc. Further details are available on request.

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Management Control Program

DoD Directive 5010.38, "Internal Management Control Program," April 14, 1987,* 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 the Management Control Program. We evaluated management control procedures applicable to the quantitative requirements determination process for attack and reconnaissance helicopters. In assessing management controls, we reviewed the Army FY 1996 Annual Statement of Assurance. We did not assess the adequacy of management's self-evaluation applicable to the controls.

Adequacy of Management Controls. The audit did not identify material management control weaknesses as defined by DoD Directive 5010.38. The Army generally calculated its requirements for attack and reconnaissance helicopters based on established processes. However, we questioned the assumptions that the Army used for determining the quantitative requirements for attack and reconnaissance helicopters. As discussed in the finding, the Army needs to reconsider and update the assumptions to accurately estimate the requirements for attack and reconnaissance helicopters. We consider the shortfall in the assumptions to be a policy issue, not a material management control weakness.

*DoD Directive 5010.38 has been revised as "Management Control (MC) Program," August 26, 1996. The audit was performed under the April 1987 version of the directive.

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Appendix B. Summary of Prior Audits and Other Reviews

General Accounting Office

General Accounting Office Report No. GAO/NSIAD-96-177 (OSD Case No. 1175), "Combat Air Power: Joint Mission Assessments Needed Before Making Program and Budget Decisions," September 20, 1996. The General Accounting Office (GAO) reported that DoD had not adequately examined its combat air power force structure and its modernization plans and programs from a joint perspective. Therefore, the Secretary of Defense does not receive sufficient information to prioritize programs, objectively weigh the merits of new air power investments, and decide whether current programs should continue to receive funding. The GAO concluded that DoD was proceeding with major investments without clear evidence that the programs are justified. The GAO recommended that the Secretary of Defense, along with the Chairman of the Joint Chiefs of Staff, develop an assessment process that yields more comprehensive information in key mission areas. The process was to:

o assess total warfighting requirements in each mission area;

o inventory the aggregate service capabilities, including the full range of assets available to carry out each mission;

o compare aggregate capabilities with joint requirements to identify shortages or excesses, taking into consideration existing and projected capabilities of potential adversaries and the sufficiency of existing capabilities to meet joint requirements;

o determine the most cost-effective means to satisfy any shortages; and

o assess the relative merits of retiring alternative assets, reducing procurement quantities, or canceling acquisition programs.

The DoD partially concurred with the GAO recommendations but disagreed with many of the GAO findings. The DoD stated that it had taken many steps in recent years to improve the extent and quality of joint military advice and cited the joint warfighting capability assessment as an example. The DoD acknowledged that it could improve the quality of analytical support but stated that the support available had been sufficient for decisionmaking.

GAO Report No. GAO/NSIAD-96-72 (OSD Case No. 1095), "U.S. Combat Air Power Reassessing Plans to Modernize Interdiction Capabilities Could Save Billions," May 13, 1996. The GAO examined the Services' plans to spend $200 billion on aircraft and other interdiction weapons over the next

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15 to 20 years. The GAO reported that the DoD does not assess interdiction modernization proposals in terms of the adequacy of aggregate capability. As a result, without such an assessment, DoD has little assurance that its interdiction capabilities are properly sized to meet mission needs and does not know whether more cost-effective alternatives exist. The GAO was unable to determine the effect of the Army purchase of Comanche reconnaissance and attack helicopters and its upgrade to the Apache attack helicopter on interdiction capability. The GAO recommended that the Secretary of Defense routinely review the Services' modernization proposals based on how they will enhance the current aggregate ability of the U.S. military to perform the interdiction mission. The GAO recognized that some weapon systems, such as the Longbow Apache attack and the Comanche reconnaissance and attack helicopter, are multi-mission and that the assessment should consider the potential contribution to those missions. The DoD agreed with the GAO recommendation that the Secretary of Defense routinely review the Services' modernization proposals based on how they would enhance the current aggregate capability of the military to perform the interdiction mission. The DoD disagreed that it plans more interdiction capability at high cost despite the fact that it has ample forces to meet current and future interdiction needs. The DoD stated that the portion of the acquisition budget devoted to interdiction-capable assets is not excessive given their multi-role capabilities of the weapon systems.

GAO Report No. GAO/NSIAD-95-9 (OSD Case No. 9754), "Army Aviation Modernization Strategy Needs to be Reassessed," November 21, 1994. The report states that the Army estimated that it needs a higher quantity of helicopters than those that the DoD later identified. The GAO questioned the validity of the Army aviation modernization strategy for the following three reasons:

o The Army used a different force structure than that of DoD to determine the size of the Army attack and reconnaissance fleet.

o The Army overstated the expected benefits and understated technical risks associated with the major systems that comprise its modernization strategy.

o The Army did not consider alternative helicopters and weapon systems that could alter the mix and quantity of helicopters in the Army projected fleet.

The GAO recommended that the Secretary of the Army revise the Army aviation modernization strategy to consider the new force structure, the validated mix of helicopters, and an analysis of alternatives to satisfy the various aviation roles and missions. The DoD generally agreed with the GAO finding but stated that the Army strategy did incorporate user concerns and that the Army had adequately considered alternative aircraft in the development of the study.

GAO Report No. GAO/NSIAD-92-146 (OSD Case No. 8846), "Apache Helicopter Was Considered Effective in Combat, but Reliability Problems Persist," April 20, 1992. The report states that, overall, the Apache attack helicopter had proven its effectiveness by destroying 278 tanks and about 900 other targets and by providing the Army with timely intelligence data. During

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the air campaign, the Apache attack helicopter flew mostly armed reconnaissance missions, while during the 100-hour ground war, it flew mostly attack missions. The Apache attack helicopters flew a limited number of missions during the war, a total of 83. The Apache attack helicopters flew a limited number of missions because of the following four reasons:

o Army commanders perceived enemy air defense as a threat to low-flying helicopters during the air campaign.

o Ground commanders, who controlled the Apache attack helicopter, chose not to use it more.

o Before the start of the ground war, the use of Apache attack helicopters could have divulged the coalition ground units' initial deployments.

o The Army choice of locations where it could use the Apache attack helicopter was restricted because of agreements with the Air Force.

The GAO also reported that the Apache attack helicopter experienced subsystem reliability problems and logistical support problems, which resulted in the grounding of some Apache attack helicopters. The GAO made no recommendations in its report.

Inspector General, DoD

Inspector General, DoD, Report No. 95-157, "Army's Processes for Determining Quantitative Requirements for Anti-Armor Systems and Munitions," March 29, 1995. The report questioned the Army process for calculating its munitions requirements. The report states that the Army process for determining quantitative requirements for anti-armor munitions was not fully effective because the process was not based on the specific types and quantities of the anti-armor munitions needed to defeat the Army portion of the specified threat. As a result of that report, the Army established an Ammunition Requirements Working Group that concluded that the Army process for calculating its munitions requirements was not valid and established a revised process to calculate munitions requirements. The Army used the revised process to calculate the Army munitions requirements in support of the Army FYs 1998 through 2003 Program Objective Memorandum. Those munitions requirements were valued at $18.6 billion, a reduction of $14 billion, or a 42.9 percent reduction in the $32.6 billion in munitions requirements that the Army calculated in support of the FYs 1996 through 2001 Program Objective Memorandum.

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Appendix C. Army Process Used to Calculate Requirements for Attack and Reconnaissance Helicopters

The Army Training and Doctrine Command (TRADOC) prescribes the structure, manpower, and equipment for the Army. To determine the total number of attack and reconnaissance helicopters needed in the Army, TRADOC used a bottom-up methodology. The basic building block in the requirements determination process for helicopters was the attack helicopter company in an attack battalion or a helicopter troop in a cavalry squadron. The total number of helicopters required to fill the units in the force structure becomes the combat requirement for attack and reconnaissance helicopters. This appendix provides a general description of how the Army calculates its requirements for attack and reconnaissance helicopters.

Through studies and modeling, TRADOC determined that the optimum number of attack and reconnaissance helicopters for either an attack helicopter company or a helicopter troop was eight helicopters.

Attack helicopter companies or helicopter troops are generally used to build either attack battalions or cavalry squadrons in a division. TRADOC determined that the optimum number of attack helicopter companies in an attack battalion was three. That number was based on having continuous attack capability. One attack helicopter company would be engaged in the battle, one attack helicopter company would be returning from the battle, and one attack helicopter company would be prepared to go to the battle. Cavalry squadrons generally consisted of two helicopter troops.

The Army assigned attack battalions and cavalry squadrons to combat divisions. Two types of combat divisions existed: heavy and light. The TRADOC determined that the aviation requirements for attack and reconnaissance helicopters for each heavy division would generally require two attack battalions and one cavalry squadron.

Light divisions have one attack battalion and one cavalry squadron. Two divisions are exceptions to the normal division structure. Because those divisions are the first to arrive at a conflict, the cavalry squadron for the 82nd Airborne Division has three helicopter troops instead of two, and the 101st Air Assault Division has three attack battalions, and it has four helicopter troops in its cavalry squadron. In total, the Army has requirements for attack and reconnaissance helicopters in 18 combat divisions (10 Active Army and 8 Reserve divisions).

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Appendix C. Army Process Used to Calculate Requirements for Attack and Reconnaissance Helicopters

In addition to the 18 combat divisions, the Army used two heavy and one light regimental aviation squadron for deep reconnaissance missions. The heavy regimental aviation squadrons are generally composed of two attack helicopter companies and three helicopter troops of reconnaissance helicopters. The light regimental aviation squadron has four helicopter troops of reconnaissance helicopters.

The 18 combat divisions and the regimental aviation squadrons are divided among the 4 Army corps. In addition to the division and regimental aviation squadron requirements, each corps has its own requirements for attack and reconnaissance helicopters to accomplish the corps mission for deep-strike attacks, supporting combat divisions, and other corps tasks. The corps generally required three attack battalions to fulfill the corps missions.

The total number of helicopters required to fill the units in the force structure described becomes the combat requirement for attack and reconnaissance helicopters.

In addition to the attack and reconnaissance helicopters that the Army required at the combat division, regimental aviation squadrons, and corps, the Army required additional helicopters to support training and testing, maintenance, and attrition.

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Appendix D. Method Used to Calculate Simulated Flying Hours of Attack and Reconnaissance Helicopters

The following steps describe the method that we used to calculate the simulated flying hours of attack and reconnaissance helicopters in the two MRCs. Information on the number and types of weapon systems employed, the units that they came from, and when they arrived in theater is readily available in the Army CAA data. The Army CAA model employs forces according to the Commanders in Chief Operational Plans. Our analysis of helicopter use indicated that the Commanders in Chief did not choose to employ Army helicopters until enemy ground forces had been greatly attrited.

The Combat Sample Generator model (COSAGE) provided representative combat effectiveness, at the division level, that forms the building blocks for the number of helicopters later employed in the theater warfighting in the Concepts Evaluation Model. Army officials stated that our analysis of helicopter use represented a purely analytical approach that did not consider the tactical employment of helicopters. However, COSAGE does model tactics, techniques, procedures, and various weather conditions in detail. We believe that the model showed low use of helicopters because the Commanders in Chief Operational Plans do not use helicopters to a great extent. Therefore, we believe that the model is indicative of exactly the condition that we were addressing, the low use of helicopters. The following are the eight steps that we took to calculate the simulated flying hours of attack and reconnaissance helicopters in the two MRCs.

We determined the average number of flying hours for each of the six postures in COSAGE, for each theater, and for the two helicopter missions, on-call and cross-forward line of troops, that the Army CAA modeled in COSAGE.

o For the on-call mission, we took the flying hours from eight computer runs of COSAGE for each type of helicopter, for each posture, and for each theater. Because each computer run provided different results, we determined the average number of hours flown for the on-call mission by totaling the flying hours and dividing the totals by eight.

o For the cross-forward line of troops mission, we took the number of sorties flown from 20 computer runs of COSAGE for each type of helicopter, for each posture, and for each theater. Again, because each computer run provided different results, we determined the average number of sorties flown for the cross-forward line of troops mission by totaling the sorties and dividing the total sorties by 20. To convert the average number of sorties to the average number of hours flown for the cross-forward line of troops mission, we multiplied the average number of sorties flown by the comparable wartime flying hour rate. We used the Army "Wartime Flying Hour Study," July 19, 1994, to determine the wartime flying hour rate for attack missions.

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Appendix D. Method Used to Calculate Simulated Flying Hours of Attack and Reconnaissance Helicopters

We added the average number of hours flown for the on-call missions and the average number of hours flown for the cross-forward line of troops missions to get the total number of hours flown for each helicopter type, for each posture, and for each theater. Because the COSAGE data represented results for a 48-hour period, we divided the total number of hours flown by two to get the average number of hours flown for a 24-hour period.

We added the number of Hellfire missiles fired for each helicopter type, posture, and theater for the on-call and cross-forward line of troops missions. We divided the total hours flown for all missions by the total Hellfire missiles fired to get a ratio of hours flown for each Hellfire missile fired, for each helicopter type, for each posture, and for each theater. Again, because the COSAGE data represented results for a 48-hour period, we divided the total number of Hellfire missiles fired by two to get the average number of Hellfire missiles fired for a 24-hour period.

We needed to establish a ratio of hours flown to missiles fired from the postures to bridge the COSAGE data to the Concepts Evaluation Model at the theater level. We multiplied the average number of Hellfire missiles fired for each helicopter type, for each posture, and for each theater, and then by the ratio of hours flown per Hellfire missile fired, to get the average number of hours flown by each helicopter type per day.

We increased the average number of hours flown per day by a percent of the flying hours (for combat missions not included in the postures such as escort, security, etc.) to get the total hours flown per day by each type of helicopter. Because the Army CAA model did not adequately reflect missions in which the attack and reconnaissance helicopters would not fire missiles, we used the percents from the wartime flying hour study. We added the percent difference between the ratio of attack and reconnaissance missions to all other missions. The percents that we used were different for each theater and each helicopter type.

We multiplied the number of helicopters in theater per day by the operational readiness rate to get the number of helicopters in theater that were mission-capable. We then multiplied the number of helicopters in theater that were mission-capable by the comparable wartime flying hour rate in the Army Wartime Flying Hour Study to get the potential capability of the helicopters by day.

We divided the total hours flown each day by the potential capability of an aircraft type in theater to get the percent of capability used daily.

We summed the daily percent of capability used and divided the total by the number of days in the conflict to determine the average daily percent of capability used.

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Appendix E. Method Used to Calculate the Actual and Planned Flying Hours

Table E-1. Average Actual Flying Hours Flown per Apache Attack Helicopter per Month

Month	Aircraft in Theater	Total Flying Hours	Average Flying Hours per Aircraft
October	118	2,596.0	22.0
November	142	2,144.2	15.1
December	146	2,175.4	14.9
January	199	2,427.8	12.2
February	277	3,822.6	13.8
March	274	5,699.2	20.8
Total		**18,865.2**	

Table E-2. Army Planned Flying Hours for Apache Attack Helicopters Used

Month	Aircraft in Theater	Daily Wartime Flying Hour Rate	Planned Flying Hours	Average Flying Hours per Aircraft
October	118	2.34	8,559.7	72.5
November	142	2.34	9,968.4	70.2
December	146	2.34	10,590.8	72.5
January	199	2.34	14,435.5	72.5
February	277	2.34	18,149.0	65.5
March	274	2.34	19,876.0	72.5
Total			**81,579.4**	

Note: We multiplied the number of helicopters in theater for the month by the number of days in the month by the wartime flying hour rate for the Apache attack helicopter in the MRC-East scenario (operational readiness rate of 75 percent included in the wartime flying hour rate shown).

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Appendix F. Report Distribution

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Senate Committee on Armed Services
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House Subcommittee on National Security, Committee on Appropriations
House Committee on Government Reform and Oversight
House Committee on National Security

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