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# ARMY AVIATION

## Modernization Strategy Needs to Be Reassessed







United States  
General Accounting Office  
Washington, D.C. 20548

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**National Security and  
International Affairs Division**

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November 21, 1994

The Honorable Norman Sisisky  
Chairman  
The Honorable James B. Hansen  
Ranking Minority Member  
Subcommittee on Oversight  
and Investigations  
Committee on Armed Services  
House of Representatives

In response to your request, this report discusses the validity of the Army's plan for modernizing its aviation fleet and describes alternatives to the strategy's proposed armed reconnaissance and light attack helicopter. It also identifies funding issues surrounding the Army's decisions to acquire its aviation fleet.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after its issue date. At that time, we will send copies to the Secretaries of Defense and the Army and the Director, Office of Management and Budget. Copies of this report will also be made available to others on request.

This report was prepared under the direction of Louis J. Rodrigues, Director of Systems Development and Production Issues, who may be reached on (202) 512-4841 if you or your staff have any questions. Major contributors are listed in appendix II.

Henry L. Hinton, Jr.  
Assistant Comptroller General

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# Executive Summary

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## Purpose

Of the \$6.2 billion the Army plans to spend on aviation modernization during fiscal years 1995-1999, \$4.7 billion, or about 76 percent, will be spent on two helicopter programs—the Comanche and the Longbow Apache. However, significant changes have occurred in the threat environment and in the force structure that could substantially change the number and mix of helicopters the Army needs to buy.

The Chairman and Ranking Minority Member of the Subcommittee on Oversight and Investigations, House Armed Services Committee, requested that GAO review how the Army is modernizing its aviation force, in particular its attack and reconnaissance helicopters. GAO's objectives were to determine whether (1) the Army's plan for modernizing its aviation fleet is still valid, (2) there are alternative aircraft systems to the ones the Army plans to acquire, and (3) the Army's funding plans include all of the helicopter systems that it says it needs.

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## Background

The foundation of the Army's current aviation modernization strategy was originally documented in the Army's Aviation Modernization Plan approved by the Secretary of the Army on November 2, 1992, which was modified by the February 1993 Aviation Restructure Initiative prepared by the Army Aviation Warfighting Center. The objectives of the Army's modernization efforts were to (1) correct deficiencies in the Army's aviation force structure, particularly in its reconnaissance and attack capabilities; (2) reduce aviation maintenance and support requirements; (3) reduce aviation operating costs; and (4) retire old aircraft. These objectives were to be achieved within anticipated funding levels.

To carry out its modernization strategy, the Army intends to (1) procure about 1,300 Comanche helicopters, some with enhancements provided by the Army's Longbow program, (2) modify 761 existing Apaches with some or all of the Longbow upgrades, and (3) purchase approximately 350 Kiowa Warrior helicopters to use until the Comanche is introduced. The Army plans to use the Apache as an interim armed reconnaissance helicopter until the Comanche is fielded. Of the \$6.2 billion the Army plans to spend on aviation modernization during fiscal years 1995-1999, \$4.7 billion, or about 76 percent, will be spent on the Comanche and the Longbow Apache helicopters.

On September 1, 1993, the Secretary of Defense released the results of the Bottom-Up Review. This review, which evaluated the Department of Defense's (DOD) modernization efforts, supported the continuation of the

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Army's aviation modernization initiative but with a reduced force structure. The review recommended that the force be cut from 20 divisions to 10 active divisions and approximately 5 reserve divisions by the end of 1999.

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## Results in Brief

The Bottom-Up Review used different total force structure and unit composition data than the Army to determine the size of the Army's attack and reconnaissance fleet. The Army's estimates of the quantities of helicopters needed are higher than those subsequently identified by DOD. Therefore, the validity of the Army's aviation modernization strategy is now questionable.

In addition, the Army overstated expected benefits and understated technical risks associated with the major systems that comprise its modernization strategy. While the Army believes that it can accomplish its modernization objectives, some users—field commanders and pilots—are concerned that implementation of the current procurement plan could result in an inappropriate mix and quantity of helicopters and, therefore, adversely impact their operational effectiveness.

Additionally, DOD and Army studies have not fully considered alternative helicopters and weapon systems that could accomplish many of the planned roles and missions of the strategy's centerpiece—the Comanche. Decisions to use alternative helicopters could alter the mix and quantity of helicopters in the Army's projected fleet. The lack of full consideration of alternatives raises further doubts about the validity of the strategy.

For its aviation modernization strategy, the Army has chosen to use most of its available resources to procure Comanche helicopters and upgrade Apache helicopters while deferring or canceling funding of other Army helicopter modernization programs, such as medical evacuation and cargo helicopters, that the Army believes are important to the performance of its aviation missions. Further, the Army's Comanche program will be short about \$540 million through fiscal year 2004. To address this shortfall, the Army plans to streamline the developmental stages of the Comanche program, thereby increasing the risks associated with entering production before the program has been tested and shown to meet specifications.

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## Principal Findings

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### The Validity of the Strategy Is Now Questionable

The Army's aviation modernization strategy may no longer be valid. GAO found that:

- The Army's current aviation modernization strategy may overstate helicopter quantities because (1) the size of the total force structure in the strategy used as a basis for computation does not reflect the Bottom-Up Review's recommended reduced force structure and (2) unit force structure data used by the Army to calculate helicopter quantities for air cavalry units is much higher than data used in DOD's Bottom-Up Review.
- The two major helicopter acquisitions under the strategy, the Comanche and the Longbow Apache are costly, face considerable technical risk, and may not provide the enhanced capabilities promised. For example, some DOD officials and Army aviation users consider the Comanche's projected maintenance requirement unrealistic.
- Some users believe that decisions to implement the strategy may not reflect their views and may adversely impact the operational effectiveness of some units. For example, some users believe the decision to move an active attack battalion to the reserves will reduce the ability to effectively carry out rapid deployment missions.

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### Alternatives Not Adequately Considered

In addition, DOD and Army studies have not fully considered alternative helicopters and weapon systems that could accomplish many of the planned roles and missions of the strategy's centerpiece—the Comanche. The Army looked at some alternative helicopters and aircraft in developing past Comanche cost and operational effectiveness analyses; however, in developing its current aviation modernization strategy, the Army did not fully consider alternative aircraft that can meet the Army's aviation needs. Recent DOD reviews of force structure and roles and missions also failed to adequately explore the issue of alternative helicopters or weapon systems in meeting the Army's aviation needs. Decisions to use alternative helicopters could alter the mix and quantity of helicopters in the Army's projected fleet. The lack of full consideration of alternatives calls into question the validity of the strategy.

In light of the changing resource environment, the Deputy Secretary of Defense, in August 1994, directed the services to develop program options, including termination, to selected major defense acquisition programs, one

of which was the Comanche. GAO did not examine the pros and cons of terminating the Comanche, but it did identify three U.S.-built alternative helicopters that it believes could, if upgraded, perform many of the Comanche's roles and missions.

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### Army Aviation Strategy Focuses on Two Key Helicopter Programs

Declining budgets mean that the Army cannot afford to fund all of its modernization requirements, including those in its Aviation Modernization Plan. To implement its Aviation Modernization Plan, the Army has chosen to fund the Comanche procurement and Apache upgrade programs while deferring or canceling other helicopter modernization programs, such as medical evacuation and cargo helicopters, that the Army believes are important to the performance of its aviation missions. DOD maintains that the Army's modernization program reflects the tight budget environment and the priorities placed by the Army on all of its competing programs.

Further, the Army faces an estimated \$540 million shortfall in the Comanche program. To address this shortfall, the Army is proposing to streamline the Comanche acquisition program. According to Army officials, under its streamlining proposal, it plans to eliminate some testing, buy fewer prototypes, and shorten the developmental phase of the acquisition process by concurrently doing things that normally should be done sequentially, thereby increasing risks associated with entering production too soon. Concurrent development and production have caused DOD significant problems in the past on other systems. Problems found in developmental testing that have to be corrected in already produced or concurrently produced models significantly increase overall program costs.

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### Recommendation

GAO recommends that the Secretary of the Army revise the Army's aviation modernization strategy in order to consider (1) the revised force structure, (2) the validated mix and quantity of helicopters for each aviation unit, and (3) an analysis of appropriate alternative capabilities to satisfy the aviation mission's various roles. This could be done at the same time the next Aviation Modernization Plan is prepared.

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### Matters for Congressional Consideration

In reviewing the Army's revised Aviation Modernization Plan currently planned to be submitted in January 1995, the Congress should consider whether it adequately addresses the issues raised in this report. The Congress may also wish to consider requiring the Secretary of the Army to

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forego any acquisition streamlining initiatives for the Comanche program until the revised modernization strategy is submitted.

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## Agency Comments and GAO's Evaluation

DOD generally agreed with the thrust of GAO's findings; however, it asserted that the Army's strategy did incorporate user concerns and that the Army had adequately considered alternative aircraft in developing the strategy. DOD pointed out that the revised Army Aviation Modernization Plan should be issued in January 1995, and Army leadership intends to provide it to the Congress and the Secretary of Defense. Also, DOD noted that the Army intends to take another look at the streamlining proposal. Therefore, DOD did not believe GAO's recommendation and matters for congressional consideration were necessary.

GAO has revised the report to incorporate DOD's suggested technical corrections and to more fully explain the basis for the conclusions regarding user perceptions. However, after careful consideration of DOD's comments, GAO continues to believe that its recommendation and matters for congressional consideration concerning streamlining are still valid. Although the Army is revising its Aviation Modernization Plan, neither DOD nor the Army provided any indication of how the revised plan would address GAO's concerns. Moreover, DOD provided no analyses that alternative aircraft options had been studied in developing the Army's aviation modernization strategy. GAO has, therefore, revised the matters for congressional consideration to suggest that the Congress carefully review the Army's plan to ensure that it addresses the issues in this report.

GAO has consistently reported on its concerns with concurrent development and production of DOD's weapon systems. Therefore, GAO continues to believe that the Army should postpone any acquisition streamlining initiatives at least until the Aviation Modernization Plan is reviewed by the Congress and until the future of the Comanche program is determined by the Deputy Secretary of Defense's review of selected major acquisition programs and their alternatives.

DOD's comments are addressed in the body of this report where appropriate and are reprinted in their entirety in appendix I, along with GAO's evaluation.



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**Abbreviations**

COEA	cost and operational effectiveness analysis
DOD	Department of Defense
GAO	General Accounting Office

# Introduction

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The Army's current aviation modernization strategy was documented in the Army's Aviation Modernization Plan, which was modified by the February 1993 Aviation Restructure Initiative and validated by the September 1993 Department of Defense's (DOD) Bottom-Up Review. In determining its aviation requirements, the Army has designated the Comanche helicopter as the centerpiece of its aviation modernization strategy.

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## Army Aviation Modernization Strategy

The Army's latest biennial Aviation Modernization Plan, issued in January 1993, was to be the Army's aviation modernization guide into the 21st century. However, as the Army was developing the plan, the world situation was changing. Evolving national military strategy expanded the Army's roles in national assistance, humanitarian assistance, counter-drug activities, peacekeeping operations, and counterterrorism. The focus of the national warfighting doctrine changed from a major European war to regional conflicts. The dependence on foreign-based U.S. troops was replaced by one of rapidly deploying U.S.-based troops overseas.

The Army's total research, development, and acquisition budget declined by 36 percent for fiscal years 1990 through 1994. Army acquisition funding decreased about 50 percent during this time; however, research and development funding was more stable—remaining in the \$5 billion a year range.

Army officials realized before the 1993 update to the Aviation Modernization Plan was issued that it would not reflect the global and budgetary changes taking place. Therefore, the Aviation Center at Fort Rucker, Alabama, began an effort with the intent of redesigning the aviation force structure to resolve the problems associated with downsizing and affordability. The resultant Army's Aviation Restructure Initiative was issued February 3, 1993.

The current aviation modernization strategy is the product of the 1993 Aviation Modernization Plan and the Aviation Restructure Initiative. The objectives of the Army's modernization efforts were to (1) correct deficiencies in the Army's aviation force structure, particularly its reconnaissance and attack capabilities; (2) reduce aviation maintenance and support requirements; (3) reduce aviation operating costs; and (4) retire old aircraft. These objectives were to be achieved within anticipated funding levels. According to the Army, modern armed reconnaissance and attack helicopter capabilities are required to project a

force worldwide and achieve battlefield dominance. A modernized Apache fleet and the Comanche, when fielded, would provide those capabilities.

To carry out its modernization strategy, the Army intends to (1) procure about 1,300 Comanche helicopters, some with enhancements provided by the Army's Longbow program, (2) modify 761 existing Apaches with some or all of the Longbow upgrades, and (3) purchase approximately 350 Kiowa Warrior helicopters to use until the Comanche is introduced. The Army plans to spend \$6.2 billion in research, development, and acquisition funds to modernize its helicopter fleet during fiscal years 1995-1999. Of that amount, \$4.7 billion, approximately 76 percent, will be spent on the Comanche and the Longbow Apache helicopters, with which the Army intends to perform future reconnaissance and attack missions.

The implementation of the strategy is scheduled to begin in fiscal year 1995 and is split into two phases. Design goals have been established for the interim time frame—from initiation through the year 2015—and for the objective force—beyond the year 2015 when the Comanche is to be fully fielded. As of February 1993, the Army owned 7,914 helicopters, comprising 10 different types. The strategy calls for 4,965 helicopters, consisting of 5 types—the Chinook, Blackhawk, Apache, Comanche, and Light Utility Helicopter.

In its September 1, 1993, report, DOD's Bottom-Up Review concluded, among other things, that the Army should have 10 active and 5 reserve divisions in order to maintain the capability to win 2 nearly simultaneous major regional conflicts. Regarding the Army's attack and reconnaissance fleet, the review concluded that the Army's modernization plan provided significant improvements and a balanced, deployable, and sustainable fleet. A group of outside experts evaluated the review's analysis and concluded that the Army's plan to acquire the Comanche and the Longbow Apache would provide significant improvements in both reconnaissance and attack capabilities. According to the review, the life-cycle cost estimate of this option was \$75.6 billion. At the conclusion of the study, the Secretary of Defense endorsed the Army's aviation modernization strategy with the Comanche as its centerpiece. The current life-cycle cost estimate for the Comanche and the Longbow Apache helicopters, according to program officials and program documents, is about \$157 billion, of which about \$51.6 billion is for research, development, and acquisition.

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## Determining Army Aviation Requirements

The Army's process for determining its aviation requirements and consolidating them into its budget request involves varying degrees of analysis at three levels of the Army's organization. The Army Aviation Center at Fort Rucker, Alabama, drafts an aviation branch assessment. This assessment is developed following guidance in the National Military Strategy, the Defense Planning Guidance, and Field Manual 100-5 on Operations and incorporates input provided by Army aviation users. The branch assessment is a fiscally unconstrained prioritized list of requirements—perceived deficiencies in the force that need to be resolved.

The Center sends its assessment to the Training and Doctrine Command where it is combined with assessments from the Army's 16 other branches. The Command evaluates the branch assessments and develops a list of needs for the entire Army. Based on this analysis, the Command decides what the Army must have to be an effective fighting force and produces a list of Army-wide aviation requirements—the Warfighting Lens Analysis.

The Command sends this analysis to the Army's Deputy Chief of Staff for Operations and Plans and the Assistant Secretary of the Army for Research, Development, and Acquisition. After reviewing the analysis, they generate the Long-Range Research, Development, and Acquisition Plan—the Army's fiscally constrained 15-year strategic plan for procurement. This plan helps form the basis for the Army's portion of DOD's budget request.

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## Objective, Scope, and Methodology

The Chairman and Ranking Minority Member of the Subcommittee on Oversight and Investigations, House Armed Services Committee, requested that we review how the Army is modernizing its aviation force, in particular its attack and reconnaissance helicopters, which represent the major portion of the Army's aviation modernization investment. Our objectives were to determine whether (1) the Army's plan for modernizing its aviation fleet is still valid, (2) there are alternative aircraft systems to the ones the Army plans to acquire, and (3) the Army's funding plans include all of the helicopter systems that it says it needs.

We conducted the majority of our review at the U.S. Army Aviation and Troop Command, St. Louis, Missouri; the U.S. Army Aviation Center, Fort Rucker, Alabama; U.S. Army Training and Doctrine Command, Fort Monroe, Virginia; DOD and the Department of the Army, Washington, D.C. In addition, we visited Fort Campbell, Kentucky, and Fort Hood, Texas, to

obtain the aviation user's perspective on requirements. To obtain data on helicopter capabilities, we visited Bell Helicopter Textron, Fort Worth, Texas; Boeing Defense and Space Group, Helicopter Division, Philadelphia, Pennsylvania; McDonnell Douglas Helicopter Systems, Mesa, Arizona; and United Technologies, Sikorsky Aircraft, Stratford, Connecticut. We also visited the Comanche Joint Program Office in Trumbull, Connecticut.

To determine whether the Army's helicopter modernization plans were still valid, we interviewed cognizant Army officials involved in the aviation requirements setting process. The purpose of these interviews was to gain a balanced perspective on the requirements process from those at all organizational levels who are involved in its implementation. Officials that we talked to who were directly involved in the process of developing the requirement were located at the office of the Army's Deputy Chief of Staff for Operations and Plans; Assistant Secretary of the Army for Research, Development, and Acquisition; the offices responsible for developing requirements data for input to and preparation of the Warfighting Lens Analysis at the Army's Training and Doctrine Command; and offices responsible for preparing branch assessments, which reflect critical inputs to the requirements process such as threat analyses, doctrine, organizational structure, training, and equipment, at the Army Aviation Center at Fort Rucker, Alabama.

We also talked to active unit commanders, pilots, and aviation maintenance personnel at the brigade, battalion, and squadron levels who provide input to the process and eventually implement the decisions the process produces. These individuals represented Force Package I and Force Package II units. Commanders and pilots in Force Package I units are those that deploy first and, therefore, require the highest level of equipment support and training. Commanders and pilots of Force Package II units are those that immediately follow Force Package I units in a deployment.

Because these units are among the first to enter a conflict, we believed that they would be keenly aware of the advantages and disadvantages of the systems they use in the missions they perform. Therefore, they could provide valuable insights into the current mission deficiencies in the Army's aviation systems and how the Army's planned strategy would address those deficiencies. This approach was especially important in our assessment of the Comanche's capabilities to correct deficiencies in the reconnaissance and light attack missions as there are no production

representative prototypes to evaluate. We were able to obtain users' perceptions on how the requirements process responded to their observation on needed and unneeded capabilities in the Comanche helicopter.

We also obtained documentation on the roles, missions, and doctrinal employment of helicopters and the results of previously conducted studies or tests that evaluated a helicopter's performance or its requirement. In addition, we obtained the supporting data used in the Bottom-Up Review evaluation of force structure options for Army attack and reconnaissance helicopters. We used this data to perform our own analysis of aviation requirements for several force structure options, including the 16-division option considered in the Bottom-Up Review.

To determine if the Army considered alternative aircraft in developing its aviation modernization strategy, we interviewed key Army aviation officials and helicopter contractors involved in the aviation requirements setting and acquisition process. We developed a data collection instrument to obtain performance capabilities and specific mission information on various Army helicopters from both the Army and contractors, which we used for comparison purposes. We also obtained Army documentation and studies on various aircraft in the force structure and underdevelopment. Throughout the review, we attempted to obtain and evaluate copies of any studies that looked at alternative strategies. DOD and Army officials were unable to provide such studies.

To determine whether the Army's funding plans included all of the helicopters that it said it needs, we interviewed DOD and Army personnel involved in the budgetary process and responsible for establishing the short- and long-term funding estimates. We also interviewed representatives from the Congressional Budget Office, the Defense Budget Project, the Office of Management and Budget, and the Brookings Institution to discuss defense budget projections. We obtained and assessed funding estimates contained in the fiscal year 1995 President's Budget, the fiscal year 1995 Future Years Defense Program, Selected Acquisition Reports, and Research and Development and Procurement Cost Driver Reports. We compared this data to the Army's Aviation Modernization Plan to determine which systems the Army is funding. In addition, we interviewed Army aviation program management personnel and obtained data supporting cost estimates developed for future aviation requirements.



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**Chapter 1**  
**Introduction**

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We conducted our review from March 1993 through August 1994 in accordance with generally accepted government auditing standards.

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# Validity of the Army's Aviation Modernization Strategy Is Now Questionable

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The validity of the Army's aviation modernization strategy is now questionable. The Army's estimates of the quantities of helicopters needed are higher than those identified in the DOD's Bottom-Up Review. The Army's estimates were not based on the same total force structure and unit composition data as DOD's estimates. In addition, the Army overstated expected benefits and understated technical risks associated with the Comanche and the Longbow Apache programs that represent the bulk of its modernization strategy. While the Army believes that it can accomplish its modernization objectives, some users are concerned that their needs may not have adequately been considered and that implementation of the current procurement plan could result in an inappropriate mix and quantity of helicopters and, therefore, adversely impact operational effectiveness.

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## Strategy Does Not Reflect Anticipated Force Reductions

The total force structure used as the basis for computing requirements in the Army's aviation modernization strategy is higher than the force structure used in DOD's 1993 Bottom-Up Review assessment. While the Army's strategy is based on a force structure of 20 divisions, the Bottom-Up Review recommended reducing the number of Army divisions.

The Bottom-Up Review supported the continuation of the Army's aviation modernization initiative but with a reduced force structure. It recommended that the Army reduce its force structure to 10 active and approximately 5 reserve divisions by the end of fiscal year 1999. According to DOD, decisions regarding the structure of the reserve component have been left to the Army. The Army is currently basing its aviation modernization plans on an 18-division force—10 active and 8 reserve, according to Army Force Organization and Development officials. The aviation assets required to support the future force, whether it be 15 or 18 divisions, will be less than what is needed for the current 20-division structure.

According to Army officials, estimates of the number of helicopters needed to implement the strategy are very fluid. The overall total changes as program manager decisions on aspects of the modernization plan change. For example, estimates of the number of Blackhawks and Kiowa Warriors changed as program decisions under the Aviation Modernization Plan and Restructure Initiative changed. To show the impact of varying force structure assumptions on estimates of quantitative requirements for helicopters, we obtained and analyzed aircraft requirements data, including training and float requirements, for those Army organizational

units performing aviation missions. After we completed our analysis, the Army officials responsible for providing aviation data to the Bottom-Up Review validated our computations on the numbers of helicopters affected.

We estimated that the Army would need 4,696 aircraft in the fiscal years 1995-2015 time frame for a 20-division force. For the same time frame, 4,539 helicopters would be needed to fill an 18-division structure and 4,222 helicopters would be needed for a 15-division force structure.

Our analysis shows that the number of divisions will have little immediate impact on the helicopter fleet. However, it will eventually impact the Army's procurement plans for the Longbow Apache, the Comanche, and the Blackhawk programs as prescribed by the proposals in the aviation modernization strategy and, ultimately, estimates of the strategy's cost. Table 2.1 shows aircraft quantitative requirements for the interim and objective forces based on our projections.

**Table 2.1: Our Estimates of Interim and Objective Force Aircraft Requirements**

Number of divisions	Aircraft in the interim structure	Objective force aircraft (8 aircraft cavalry troop)	Objective force aircraft (12 aircraft cavalry troop)
20	4,696	4,669	4,956
18	4,539	4,512	4,777
15	4,222	4,195	4,428

The Aviation Restructure Initiative reduced the number of Longbow Apache, Blackhawk, and Comanche helicopters needed to fill the current 20-division force structure. Table 2.2 shows how additional division cuts—depending on the structure chosen—could further reduce the requirement for these systems in the objective force.

**Table 2.2: Our Analysis of Impact of Division Cuts on Selected Helicopter Requirements**

Helicopters	Helicopters needed for 20 division force	Helicopters needed for 18 division force	Helicopters needed for 15 division force
Longbow Apache	761	528	528
Blackhawk	2,252	2,171	2,016
Comanche	0 <sup>a</sup>	1,520	1,325

<sup>a</sup>The Comanche is not intended to be fielded until the year 2003.

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## Differences Exist in the Military About Strategy's Unit Force Structure

There are differences of opinion throughout DOD and the Army over the number of helicopters needed to perform the air cavalry troop role in the Army's objective force. The Office of the Army's Deputy Chief of Staff for Operations and Plans and the Army Aviation Center at Fort Rucker, Alabama, both document the requirement for the air cavalry troop to be 12 aircraft per troop. This is the basis used under the Aviation Restructure Initiative and, therefore, the Army's strategy. However, the Bottom-Up Review performed by the Office of the Secretary of Defense, which evaluated the continuation of the Comanche program, based its decisions on using eight aircraft in the cavalry troop in the objective force. The Comanche Training and Doctrine Command System manager's and program manager's offices also used eight aircraft in a cavalry troop to develop the Comanche's future tactics, techniques, and procedures. As table 2.1 shows, the difference between using 8 or 12 aircraft in the cavalry role in the Army's current 20-division force is 287 aircraft.

Although the Bottom-Up Review eventually recommended a 15-division force structure, it used a 16-division force structure for its computations. However, the 16-division structure included 2 more attack battalions than it should have. It also used 8 helicopters in a cavalry troop instead of the required 12. These inconsistencies resulted in DOD underestimating some of the helicopters it needs and overestimating others.

For example, our analysis shows that using a 16-division force structure with the required number of 12 helicopters in the cavalry troop and eliminating the 2 extra attack battalions, the Army would need 1,378 Comanches. This amount is 192 more than the Bottom-Up Review estimated the Army needed. The cost of the option would increase by approximately \$6.7 billion, which is the amount needed to procure the additional 192 Comanches at a unit cost of \$35 million.

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## Strategy Relies on Costly and High-Technical Risk Helicopter Development

DOD's Bottom-Up Review recommended that the Army continue on its course of developing the Comanche and the Longbow Apache despite this being the most costly option. According to the review, this option has a life-cycle cost estimate of \$75.6 billion and is more than \$23.6 billion higher than the lowest cost option, which would terminate the Comanche program but retain the Longbow Apache and procure additional Kiowa Warriors. The Bottom-Up Review report noted that this higher cost was "not a significant discriminator, given the improvements in capability both systems (the Comanche and the Longbow) provide." However, it also noted that "there were technical and cost-growth risks associated with this

option that need to be monitored and carefully managed, since both systems are on the cutting edge of technology . . . .” Since the Bottom-Up Review was issued, the life-cycle cost estimate has increased to \$157 billion, of which \$113 billion is for the Comanche and \$44 billion is for the Longbow Apache.

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### Comanche Maintenance Requirements Unlikely to Be Achieved

The Comanche helicopter, which is in the demonstration/validation phase of its development cycle, is designed to include advanced avionics and targeting, increased maneuverability, greater firepower, and cutting edge low observability features. One of the advantages intended by this advanced technology is that the Comanche will have a significantly lower maintenance man hours/flight hour requirement than existing helicopters. However, because this expected maintenance requirement is considered unrealistic, overall aviation operation and support costs may be significantly understated.

According to many active unit users, it is unlikely that a sophisticated aircraft, such as the Comanche, will achieve the required 2.6-maintenance man hours/flight hour. As a matter of comparison, DOD has determined the Apache has a 14.5-maintenance man hours/flight hour average and the less sophisticated Kiowa Warrior a 9.5-maintenance man hours/flight hour average. Realizing that the Army's requirement was not realistic, the Office of the Secretary of Defense increased its estimate of the Comanche's maintenance man hours/flight hour ratio to between 3.2 and 4.9 for the Bottom-Up Review analysis. In an April 1990 study, DOD's Cost Analysis Improvement Group developed an independent estimate of 9.0-maintenance man hours/flight hour for the Comanche.

If DOD's higher maintenance man hours/flight hour ratios were used in the most recent Comanche cost and operational effectiveness analysis (COEA), the Comanche may not have been ranked the most cost-effective system. The 1990 Comanche COEA ranked the Comanche third behind the Longbow Comanche and the Longbow Apache for operational effectiveness. However, once the Comanche's low maintenance ratio was applied, the Comanche was ranked first overall. The COEA noted that the maintenance man hours/flight hour estimates for each alternative helicopter was the principal support for determining system costs.

The extent to which the Comanche will be able to meet the planned 2.6-hour requirement will not be demonstrated until the year 2000, after a significant amount of money has been spent. If the Comanche is unable to

meet this ambitious requirement, the operation and support costs associated with this system will significantly increase. In addition, maintenance personnel levels are programmed based partially on the maintenance man hours/flight hour requirement for the system. If the actual maintenance man hours/flight hour ratio is higher than projected, a shortage of necessary maintenance personnel would result. While this potential shortage would impact operation and support costs, it would also negatively affect the effectiveness of units and the affordability of the strategy.

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### Longbow Technology Falls Short of Some Expectations

The Army plans to modify the Apache helicopter to improve its target acquisition capabilities by adding the Longbow technology enhancements. The Longbow Apache program includes: airframe improvements, radar modifications, and a Longbow compatible Hellfire missile with fire-and-forget capability.

The Longbow system being designed for the Apache helicopter falls short of achieving the capabilities the Army originally required for stationary target tracking. The Longbow Apache stationary target indicator requirements have been reduced.<sup>1</sup> In addition, the value of the current Longbow technology is questionable, according to an assessment performed by the Bottom-Up Review panel. The current Longbow system can detect (locate a target) and classify (determine whether it is a wheeled or tracked vehicle), but it cannot recognize (tank or armored personnel carrier) or identify (the type of tank—Soviet T-72) targets.

Longbow program officials believe that future Longbow developments could improve the ability of Army helicopters to recognize and identify targets through the integration of Longbow radar information with data from a second generation forward looking infrared system. Accordingly, the Longbow improvements increase the effectiveness and survivability of the Apache. Demonstration of the Longbow capability still involves high-technical risk.

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### Strategy May Not Reflect Users' Concerns

According to DOD, the requirements generation process is a complicated operation that serves as the basis for the modernization strategy. The process begins with recommendations from the users at the lower organizational levels. Those recommendations are then considered in

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<sup>11</sup>Acquisition of the Longbow Apache System (Report No. 94-015) DOD Inspector General, November 9, 1993.

relation to the overall mission of the Army, the emerging threat, national military strategy, and available resources. DOD advised us that while not all specific concerns may be incorporated, they are considered. DOD indicated that the Comanche capabilities, for example, were based on real user inputs of the operational requirements needed to successfully accomplish cavalry and attack missions within the anticipated combat, environmental, and geographic spectra. This is not consistent with the views of users we interviewed.

Although the Army's leadership believes that the current strategy will accomplish its modernization objectives, some active unit commanders, pilots, and aviation maintenance personnel at the brigade, battalion, and squadron levels who provide input to the requirements setting process are concerned that the process, and ultimately the resultant modernization strategy, may not have adequately considered lower level recommendations and users' views. Some users told us that requirements are often determined by advocates in the process. They also stated that implementation of the strategy will change the operational mix of some units and, therefore, reduce their operational effectiveness.

The difficulty in trying to reconstruct the evolution of decisions generated by the requirements determination process is that the principals involved do not document the decisions made. According to DOD and Army officials, the information exchanged between proponents at different levels of the process that influence decisions is not recorded, but can be significant. As DOD said, while the requirements process may consider all concerns, they may not be incorporated in the final decision.

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### Concerns on Capabilities Acquired Under the Strategy

Active unit helicopter users, the Army's Aviation Center, an Army test of scout helicopters, and the Warfighting Lens Analysis, in some instances, support different system procurements and capabilities than what the Army's aviation modernization strategy supports. For example, the strategy prescribes using the Apache attack helicopter as the scout in the attack battalion; however, a number of the attack battalion pilots and commanders we interviewed stated they preferred using the Kiowa Warrior in this role. According to some Army personnel, the fact that user's desires and lower level recommendations do not always agree with the Army's overall modernization strategy may be partially due to the advocacy driven nature and culture associated with the acquisition process.

According to numerous aviation users that we interviewed, they did not need all of the costly capabilities being designed into the Comanche to perform their assigned roles. For example, these aviation users told us that:

- The requirement that the Comanche self-deploy across the Atlantic, is a high-risk operation and, therefore, is not realistic. Examples of difficulties cited in performing such a mission include: pilot fatigue, inadequate or nonexistent training, and safety problems.
- The majority of Comanches are being procured to fill the cavalry scout role. However, the Comanche's 170-knot speed will be greater than what is needed by cavalry scout units that fly slow, nap-of-the-earth missions.
- The Comanche's low-observability requirement serves to increase the airframe and crew's survivability, while also increasing the aircraft's effectiveness in accomplishing its mission. However, when the Comanche is configured for the light attack mission, it requires the use of external wings. The external wings increase the radar cross section of the Comanche and, therefore, the Comanche will be more easily detected by enemy forces.

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### Concerns on Strategy's Impact on Operational Effectiveness

To reduce maintenance support costs, the strategy proposes limiting the type of helicopters in aviation attack battalions by taking Blackhawk helicopters out of these battalions and consolidating them in general support battalions. Many active users expressed concern that this will leave the aviation attack battalions without the ability to perform missions such as recovery of downed air crews without relying on a separate command structure to supply these aircraft. For example, active unit users told us that in conducting air crew rescue missions, the first 30 minutes are critical to the recovery of pilots and their helicopter. In this time critical operation, an attack battalion commander will have to request aircraft from a general support battalion and compete against other units' needs. In their opinion, obtaining the Blackhawks for an air crew rescue mission under these circumstances could take longer than 30 minutes. Also, they are concerned that, in the future, the attack battalions might be deployed without the maintenance support provided by the general aviation support battalions; thereby, limiting its ability to perform its assigned missions.

According to division officials, moving one of the 101st Air Assault Division's three currently active attack battalions to the reserves, as prescribed in the strategy, will reduce the division's ability to effectively



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train to carry out its mission. According to 101st Division's commanders, placing one of the active attack battalions in the reserve will make it nearly impossible for the division to maintain the necessary training and readiness required for it to perform its rapid deployment mission. According to the commanders, it is already very difficult to meet the current training demands of the division with three active attack battalions. It will become even more difficult to do so with one less attack battalion.

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## Agency Comments and Our Evaluation

DOD generally agreed with our findings concerning the strategy's (1) failure to consider force structure changes in computing helicopter requirements; (2) reliance on costly and high-technical risk helicopter development; and (3) potential adverse impact on operational effectiveness, the military's use of inconsistent unit force structure data in aviation studies, and that advocates influence the decision process. DOD questioned our estimates of helicopter quantities associated with a particular force structure, noting that such estimates need to be based on a detailed breakout allowing for training and float requirements. DOD asserted that the strategy did consider user concerns.

We realize that unit size, mission, training, and float affect the determination of helicopters needed by the Army. Our analysis is based on data developed at the unit level and was validated by those Army officials directly responsible for providing aviation data for the Bottom-Up Review.

As DOD has acknowledged, the requirements process is complicated; that is why we have described it in the introduction to the report. The purpose of our interviews was to obtain a balanced perspective on the requirements process and resultant strategy from those who are involved in the final decision and those who provide user input to the decision process—the pilots and maintainers. We have revised the introduction of the report to more fully describe the types of interviews we held and the purpose of those interviews. We have also modified those sections of the report that discuss these issues to present a more balanced description of user perceptions of the process and resultant strategy.

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# Aviation Modernization Strategy Did Not Adequately Consider Alternatives

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The Army looked at some alternative helicopters and aircraft in developing past Comanche COEAS; however, in developing its current aviation modernization strategy, the Army did not fully consider alternative aircraft that can meet the Army's aviation needs. Recent defense reviews of force structure and roles and missions also failed to adequately explore the issue of alternative helicopters or weapon systems in meeting the Army's aviation needs.

However, should the Comanche be delayed or not be produced, DOD has alternative attack and reconnaissance helicopters which, if upgraded, have the ability to conduct many of the Comanche's roles and missions. Alternatives may become more affordable and, therefore, may be more attractive in light of anticipated force structure changes; they could impact decisions regarding the mix and quantity of helicopters in the Army's projected fleet.

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## Army Plans Lack Full Consideration of Alternatives

The Army did not consider alternatives to the Comanche in either the 1993 Aviation Modernization Plan or the Aviation Restructuring Initiative. Army officials told us that they felt that the issue of alternatives had been sufficiently addressed in the Comanche's two COEAS and other earlier studies. While each of the two COEAS looked at some alternative helicopters and aircraft, they did not consider all alternative helicopters. Both supported the continued development of the Comanche. Also, DOD, in two recent force structure reviews, did not adequately consider alternative helicopters or weapon systems.

The 1987 Comanche COEA considered alternative aircraft—a tiltrotor aircraft and modifications to existing helicopters. It noted that while modifying existing helicopters will cost less, none will meet all of the Comanche's requirements. The 1990 Comanche COEA considered modifications to existing Army helicopters and two foreign helicopters. It noted that "the (Comanche) alternative provides the Army with the most cost and operationally effective way of modernizing its light (scout and attack) fleet." Neither analysis considered the Marine Corps Super Cobra, or alternative weapon systems, such as fixed-wing aircraft or tactical missile systems.

Two recent defense reviews, the Joint Chiefs of Staff Chairman's review of roles and missions and the Secretary of Defense's Bottom-Up Review, looked at force structure alternatives. Each failed to adequately explore the issue of alternative helicopters or weapon systems. For example, in

addressing the future course of theater air interdiction missions, the Chairman's review of military roles and missions focused on fixed-wing aircraft and did not fully acknowledge other interdiction capabilities such as the Army's Tactical Missile System or attack helicopters.

The Secretary's Bottom-Up Review of attack and armed reconnaissance helicopters was limited to three options—different helicopter force structures—and did not consider fixed-wing aircraft, tactical missiles, or unmanned aerial vehicles. The Marine Corps' Super Cobra and other non-Army helicopters were also excluded from consideration.

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### Possible Alternative Helicopters to Perform the Comanche's Missions

On August 18, 1994, the Deputy Secretary of Defense—noting the desire for a military pay increase and improvements in areas such as readiness, sustainability, and quality of life—directed the services to develop program options to selected major defense acquisition programs that he identified in his memorandum. One of those programs was the Comanche helicopter program. Specifically, the Deputy Secretary's memorandum stated, "The Army should develop a program alternative that terminates the Comanche."

We did not examine in detail the pros and cons of terminating the Comanche as part of this review. However, we have identified three U.S.-built alternative helicopters that we believe could, if upgraded, conduct many of the Comanche's roles and missions. Use of alternative helicopters could alter the mix and quantity of helicopters in the Army's objective force.

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### The Marine Corps' Super Cobra

The Marine Corps' Super Cobra, a substantially improved twin-engine version of the Army's Cobra helicopter, could perform armed reconnaissance or attack missions. It can carry several different weapons, including up to eight Hellfire missiles or two Sidewinder air-to-air missiles. The Marines are currently planning to upgrade the Super Cobra helicopter with, among other things, a four-blade rotor system that is expected to substantially improve flight performance. With this upgrade, the Super Cobra's maximum airspeed is expected to increase from 170 knots to 210 knots. Other expected advantages of the four-blade rotor are a 170-percent increase in vertical rate-of-climb, a 40-percent increase in payload, and a 70-percent reduction in rotor vibration levels.

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## The Army's Apache and Longbow Apache

The Army's Apache performs many of the missions the Comanche is being developed to perform. The Comanche is being developed as a multimission aircraft that can perform both armed reconnaissance and attack missions. The Apache, the Army's premier attack helicopter, has demonstrated, during Operation Desert Storm, that it can also perform armed reconnaissance missions. Also, the Army is planning to use the Apache as an interim armed reconnaissance helicopter until the Comanche is fielded. Both helicopters give the Army a lethal attack capability and vital armed reconnaissance capability.

The Army is currently testing improvements to the Apache, such as the Longbow fire control and radar system. These improvements will include greater reliability, fire-and-forget Hellfire missiles, and digitized electronics. If these technology enhancements are demonstrated, the Army plans to equip 227 Apaches with the Longbow radar. This technology is expected to improve combat effectiveness 16 fold over the current model. In addition, in the 1990 COEA, the Longbow Apache was ranked higher, for operational effectiveness, than the basic Comanche aircraft. Other planned improvements on aircraft carrying the Longbow radar include enhanced target acquisition and weapons accuracy, and the ability to hand over targets to other Apaches.

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## The Army's Kiowa Warrior

The Army's Kiowa Warrior is a much improved version of the early model Kiowas that can perform armed reconnaissance missions. The Kiowa Warrior incorporates a mast-mounted, stabilized sight that can be used day or night to laser designate targets, for itself or other armed helicopters. It is the Army's first helicopter capable of operating on the digitized battlefield—a capability to be incorporated into the Comanche. In an armed configuration it can carry several different weapons, including up to four Hellfire missiles. Possible upgrades to the Kiowa Warrior include, among others, a night flying system, integrated helmet display system, inertial navigation system, digital map display, engine upgrade for improved hot day performance, conformal auxiliary fuel tanks for increased range, an upgraded mast-mounted sight, and an improved data modem. Many users believe the lethality, low observability, deployability, and speed of the Kiowa Warrior when combined with certain upgrades or doctrinal changes would resolve many of the deficiencies the Comanche is expected to resolve.

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## Agency Comments and Our Evaluation

DOD disagreed with our assertion that the Army did not adequately consider alternative aircraft in the development of the strategy. DOD contends that the 1987 and 1990 Comanche COEAs looked at alternative aircraft.

Throughout our review of the Army's aviation modernization strategy, we asked DOD and Army officials to provide copies of studies that showed that DOD and the Army had looked at alternative aircraft in the development of the strategy. We have not been provided any such studies to evaluate. The fact that some aircraft were looked at in past Comanche COEAs does not address (1) the thrust of our finding or (2) the Deputy Secretary of Defense's August 1994 call for the Army to develop a program alternative that terminates the Comanche.

In our opinion, DOD's response reflects the approach that has previously prevented the Army from fully considering alternatives. The Army has established the Comanche's projected performance and capabilities as the baseline standard against which all alternative aircraft are judged. We continue to believe that in developing the strategy—especially in today's budget environment, the Army should, at least, seriously consider the capabilities of other aircraft to perform the attack and reconnaissance missions called for in the Aviation Modernization Plan.

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# Army Aviation Strategy Focuses on Two Key Helicopter Programs

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Declining budgets mean that the Army cannot afford to fund all of its modernization requirements, including aviation modernization. Therefore, the Army is faced with making major decisions on how to fulfill its mission in the face of reduced resources. To achieve its mission objectives, the Army has opted to modernize its force through the acquisition of weapon systems that it states would provide the necessary technological advantages on the battlefield.

For its aviation modernization strategy, the Army has chosen to use most of its available resources to procure the Comanche helicopter and upgrade the Apache helicopter and defer or cancel funding of other Army helicopter programs. The option the Army has chosen to modernize its aviation fleet has a life-cycle cost currently estimated at \$157 billion. This acquisition plan excludes an estimated \$15.7 billion in other Army helicopter programs that the Army's modernization plans have indicated are important to the performance of its aviation missions.

In addition, the Army is faced with an estimated \$540 million shortfall in the Comanche program. The Army is proposing to streamline this acquisition program in order to deal with the shortfall. However, DOD officials have expressed concerns about the risk associated with the Army's proposal. The Army's plan calls for eliminating some testing, buying fewer prototypes, and shortening the developmental phase of the acquisition process by concurrently doing things that normally should be done sequentially, thereby increasing risks associated with entering production too soon.

It should be noted that we reported in May 1992 and again in March 1994 that given real and probable development cost increases, an uncertain operating and support cost environment, and questions about the role of the Comanche compared to other Army helicopters, the Congress may wish to reconsider the need to purchase the Comanche.<sup>1</sup> Terminating the program could produce hundreds of millions in budget savings through fiscal year 1999.

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<sup>1</sup>Comanche Helicopter: Program Needs Reassessment Due to Increased Unit Cost and Other Factors (GAO/NSIAD-92-204, May 27, 1992) and Addressing the Deficit: Budgetary Implications of Selected GAO Work (GAO/OCG-94-3, Mar. 11, 1994).

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## Helicopter Programs Were Canceled or Deferred

According to DOD, the Army cannot fund all of its modernization programs, and the Army's aviation modernization program reflects the tight budget environment and the priorities placed by the Army on all of its competing programs. In deciding to fund the development of the Comanche and the Longbow Apache helicopters, Army officials indicated that they could not afford other aviation program requirements identified in the Army's Aviation Modernization Plan and Restructure Initiative. The Army's funding plans, therefore, defer or cancel about \$15.7 billion in other helicopter programs that its modernization plans indicate are important to the performance of its aviation missions.

Army officials provided the following examples of aviation programs that were included in the January 1993 Aviation Modernization Plan and the Army's Aviation Restructure Initiative but are excluded from the Army's current spending plans.

- The Chinook cargo helicopter will have to be modernized because the Army cannot afford to replace it with a new aircraft program in the near future. Although various degrees of modernization could be undertaken, a major modernization program could cost as much as \$6.8 billion.
- The Army's medical community needs modern medical evacuation capability to replace its current outdated fleet. The cost to modify each aircraft could be as much as \$1.9 million. The medical community needs about 400 of these aircraft. Therefore, total modification costs could be as much as \$760 million.
- The Army canceled production of the Blackhawk utility helicopter because of affordability concerns; therefore, there is no production funding after fiscal year 1996. Based on the Army's previous modernization plans, 605 aircraft were needed. At a production rate of 60 aircraft per year, a total of \$4.4 billion in funding would be needed to finish production of this aircraft.
- Depending on the modernization option chosen for the Huey utility helicopter, total program costs range from \$705 million to \$2.8 billion to modernize up to 1,000 helicopters.
- The Light Utility Helicopter was originally intended to replace the Vietnam era Huey and Blackhawk helicopters that are currently performing the light utility role. The Army's Aviation Modernization Plan shows a requirement for 491, and the Aviation Restructure Initiative shows a requirement of 131. No cost estimates for Light Utility Helicopter modernization options were available at the time of our review.
- The Congress usually provides funding for the Kiowa Warrior program as an add on to the Army's budget. If the Army had to fund the total Kiowa

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Warrior production requirement, it would need a total of \$881 million. Since the Kiowa Warrior retrofit program is a necessary companion to the production program, program officials plan to request \$89 million for fiscal year 1996 to retrofit 36 aircraft.

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## Future Funding of Deferred Programs May Be Difficult

Further declines in defense funding and predicted increases in funding for existing programs may have a significant impact on the Army's ability to fund canceled or deferred aviation programs. During fiscal years 1990-1994, the Army's budget declined from \$79 billion to \$61 billion, a 23-percent reduction. That compares to a 14-percent reduction in DOD's budget during the same time frame. During the same time frame, the Army experienced a 36-percent reduction to its research, development, and acquisition funding. DOD funding for these areas declined by 31 percent. Army officials told us they expect further reductions in the Army's budget.

Recently, DOD identified an unexpected \$20 billion shortfall for fiscal years 1996-1999. As a result, planning guidance reduced the Army's overall budget projection by \$2.5 billion for those years, according to Army officials. This \$2.5 billion reduction could have a significant impact on the Army's aviation modernization strategy.

DOD also predicted increases in Army funding requirements during the fiscal years 2000-2010 time frame in an April 1993 report<sup>2</sup> provided to the Congress on selected Army helicopter modernization programs. According to this report, aviation's share of the Army's research, development, and acquisition budget during the fiscal years 2000-2010 time frame may increase from the historical average of about 14 percent to about 28 percent. DOD's analysis assumed the Army budget would remain constant at the fiscal year 1999 level. Army officials we spoke with acknowledged that the Army faces increased funding requirements in this time frame. This is brought on by the procurement of major weapon systems such as the Comanche, Longbow Apache, Bradley Fighting Vehicle, Abrams Tank, and Advanced Field Artillery System.

Our recent report on DOD's Future Years Defense Program points out that more programs have been included in DOD's future years plans than spending plans will support.<sup>3</sup> As previously discussed, the Army has

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<sup>2</sup>Tactical Air (Helicopter Portion): Report to Congress Addressing Comanche Light Armed Scout Helicopter, Apache-Longbow, and Apache-C, April 1993.

<sup>3</sup>Future Years Defense Program: Optimistic Estimates Lead to Billions in Overprogramming (GAO/NSIAD-94-210, July 29, 1994).



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documented \$15.7 billion in aviation programs that it will not be able to support and, therefore, has decided to develop its spending plans for modernizing its aviation fleet around the procurement of the Comanche and upgrade of the Apache.

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## Streamlining Proposal Increases Risk

Despite the Army's effort to cancel or defer some aviation programs to afford its modernization strategy, the Army is faced with a current shortfall on the Comanche program estimated at \$540 million. This shortfall exists because of planned reductions in the Army's funding for fiscal years 1995-2004.

In December 1993, the Comanche's prime contractor team submitted an estimate of \$819 million to complete a streamlined engineering and manufacturing development phase. That estimate was revised downward to \$540 million when the contracting team "scrubbed" the estimate. In May 1994, the Army submitted its plan to "streamline" the Comanche program to the Secretary of Defense for approval. However, according to program officials, DOD expressed concern regarding the proposed reduction in prototypes and program schedule slippage that they believe would cause higher risk associated with the increased concurrency in the program. The plan proposed merging the prototype and engineering and manufacturing development phases into one development phase and having two developmental prototypes and three low-rate initial production helicopters instead of the original six developmental prototypes.

The Army acknowledges DOD's concerns that its plan to truncate the developmental phase will introduce concurrency into the Comanche acquisition program and, therefore, increase risks associated with entering production too soon. We have reported on problems associated with increased risks of concurrent development and production on other systems.<sup>4</sup> For example, we have reported on various programs that problems found in developmental testing, which have to be corrected in already produced or concurrently produced models, significantly increases overall program cost and may result in an aircraft that does not meet performance requirements. Therefore, we are also concerned that the Army's approach will lead to the same problems that DOD has experienced under those acquisition programs with concurrent development and production. As previously mentioned, we have

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<sup>4</sup>Acquisition Reform: Role of Test and Evaluation in System Acquisition Should Not Be Weakened (GAO/T-NSIAD-94-124, Mar. 22, 1994).

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specifically reported on our concerns about the affordability of the Comanche program.

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## **Agency Comments and Our Evaluation**

DOD agreed that the Army does not have adequate resources to implement all of its modernization programs. DOD also said it may have difficulty in obtaining sufficient future funds for its aviation programs and that streamlining the Comanche's developmental phase of acquisition will increase concurrency and its associated risks.

DOD indicated that it was in the process of formulating its fiscal year 1996 budget and, therefore, specific resource shortfalls for Army aviation programs cannot be substantiated at this stage. Likewise, DOD pointed out that the estimated \$540 million shortfall associated with the Comanche program represented the difference between the Army program manager's cost estimate and the contractor's rough order of magnitude estimate of the funds needed to execute the streamlined engineering and manufacturing development phase of the program through fiscal year 2004. According to DOD, the amount of the shortfall, if any, has not yet been validated.

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# Conclusions, Recommendation, Matters for Congressional Consideration, and Agency Comments and Our Evaluation

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## Conclusions

As it proceeds with its aviation modernization strategy, we believe the Army needs to resolve several inconsistencies and make a final decision regarding its total force structure and unit force composition. The total force structure the Army chooses—15 or 18 division—will have an impact on the number and mix of helicopters in the Army’s future helicopter fleet.

In light of anticipated reductions in future Army budgets and concomitant force structure changes, we believe alternatives to the Army’s current aviation modernization option may become more attractive. Should the Comanche be delayed or not produced, we believe alternative attack and reconnaissance helicopters exist that have the ability to conduct most, if not all, of the Comanche’s roles and missions.

Like the other services, the Army is faced with a major dilemma—how does it fulfill its mission in the face of reduced resources. To achieve its mission objectives, the Army has opted to modernize its force through the acquisition of weapon systems that it states would provide the necessary technological advantages on the battlefield. For its aviation modernization strategy, the Army has chosen to procure the Comanche helicopter and upgrade the Apache—an option that can only be funded at the expense of other aviation modernization programs that the Army’s modernization plans indicate are important to the performance of its aviation missions.

In addition to predicted future funding shortfalls, the Army is already faced with a funding shortfall in the Comanche program of about \$540 million and, therefore, wants to “streamline” the Comanche acquisition program. To us, this is just another name for introducing concurrency to the program and, therefore, increasing the risks associated with entering production too soon.

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## Recommendation

We recommend that the Secretary of the Army revise the Army’s aviation modernization strategy in order to consider (1) the agreed upon force structure, (2) the validated mix and quantity of helicopters for each aviation unit, and (3) an analysis of appropriate alternative capabilities to satisfy the aviation mission’s various roles. This could be done at the same time the next Aviation Modernization Plan is prepared.

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## Matters for Congressional Consideration

In reviewing the Army’s revised Aviation Modernization Plan currently planned to be submitted in January 1995, the Congress should consider whether it adequately addresses the issues in this report. The Congress may also wish to consider requiring the Secretary of the Army to forego

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any acquisition streamlining initiatives for the Comanche program until the revised modernization strategy is submitted.

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## Agency Comments and Our Evaluation

DOD pointed out that the Army's revised Army Modernization Plan, a subset of which is the Aviation Modernization Plan, should be out by January 1995, and Army leadership intends to provide it to the Congress and the Secretary of Defense. Therefore, DOD felt that our recommendation and the matters for consideration concerning the need for a revised strategy were not necessary. DOD also pointed out that since the Army now intends to take another look at the streamlining proposal in the third quarter of fiscal year 1995, our matters for congressional consideration concerning streamlining were unnecessary.

We have revised the report to incorporate DOD's suggested technical corrections and to more fully explain the basis for the conclusions regarding user perceptions. However, after careful consideration of DOD's comments, we continue to believe that our recommendation and matters for congressional consideration concerning streamlining are still valid. Although the Army is revising its Aviation Modernization Plan, neither DOD nor the Army provided any indication of how the revised plan would address our concerns. Moreover, DOD provided no analyses that alternative aircraft options had been studied in developing the Army's aviation modernization strategy. We have, therefore, revised the matters for congressional consideration to suggest that the Congress carefully review the Army's plan to ensure that it addresses the issues in this report.

We have consistently reported on our concerns with concurrent development and production of DOD's weapon systems. In fact, in our May 27, 1992, report on the need to reassess the Comanche program, we raised our concern about concurrency and recommended that the Secretary of the Army eliminate concurrency to the extent practicable. At that time, DOD agreed with our recommendation and noted that it planned to consider the issue in its next scheduled program review.

We continue to believe that Army "streamlining" initiatives should be postponed at least until the Aviation Modernization Plan has been reviewed by the Congress and until the future of the Comanche program is determined by the Deputy Secretary of Defense's review of selected major acquisition programs and their alternatives.

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# Comments From the Department of Defense

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



ACQUISITION AND TECHNOLOGY

## OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON  
WASHINGTON DC 20301-3000



20 SEP 1994

Mr. Frank C. Conahan  
Assistant Comptroller General  
National Security and International  
Affairs Division  
U.S. General Accounting Office  
Washington D.C. 20548

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "ARMY AVIATION: Modernization Strategy Needs to Be Reassessed," dated August 4, 1994 (GAO Code 707010), OSD Case 9754. The DoD partially concurs with the report.

While the Department agrees with much of the information contained in the draft report, there are several issues that require additional clarification and correction. The draft report generally portrays the broader issues quite accurately. However, the detailed discussion and examples cited are, in some cases, not well defined or are presented out of proper context. In that regard, the DoD specifically disagrees that (1) the Army Aviation Modernization strategy does not reflect user concerns, and (2) the Army Aviation Modernization Plan did not adequately consider alternatives.

With regard to the user concerns, the draft report tends to confuse requirements with acquisition objectives. The requirements definition process starts with the user who has a very strong voice in its formulation. The acquisition objective, on the other hand, is influenced strongly by the available resources. The fact that not every user desire is always reflected in the final modernization strategy, may also be the result of influences of tradeoffs, emerging threats, and the National Military Strategy. There may be unfulfilled requirements because of lack of funds, rather than advocacy.

The DoD also disagrees with the GAO assertion that the DoD did not consider alternative helicopters to the Comanche. In the various studies done on the Comanche, consideration has been given to a wide range of alternatives, to include the OH-58D, the Kiowa Warrior (armed OH-58D), the AH-64 (with and without Longbow), the A-129 Mangusta, the SP800 Panther, tilt-rotor, and the AH-1W.



See comment 1.

See comment 1.

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**Appendix I**  
**Comments From the Department of Defense**

Finally, because major changes in the strategic environment have invalidated parts of the previous Army Aviation Modernization Plan, the Army is currently in the process of revising that plan. The Army has established January 1995 as the date for completing the revision.

The detailed DoD comments on the draft report findings, recommendation, and matters for Congressional consideration are provided in the enclosure. The DoD appreciates the opportunity to comment on the draft report.

Sincerely,



George R. Schneiter  
Acting Director  
Tactical Warfare Programs

Enclosure a/s

Appendix I  
Comments From the Department of Defense

GAO DRAFT REPORT - DATED AUGUST 4, 1994  
(GAO CODE 707010) OSD CASE 9754

"ARMY AVIATION: MODERNIZATION STRATEGY  
NEEDS TO BE REASSESSED"

DEPARTMENT OF DEFENSE COMMENTS

\* \* \* \* \*

FINDINGS

- o **FINDING A: Modernization of the Army's Attack and Reconnaissance Helicopter Fleet.** The GAO reported that the Army plans to spend about \$51.6 billion in research, development, and acquisition funds to develop and modernize its attack and reconnaissance helicopter fleet, specifically the Comanche and Longbow Apache helicopters, into the next century. The GAO pointed out that, of the \$6.2 billion to be spent on aviation modernization during fiscal years 1995-1999, \$4.7 billion will be spent on those helicopters. However, the GAO noted that significant changes have occurred in the threat environment and the force structure that could reduce the total number of helicopters the Army needs to buy. (p. 2, pp. 9-12/GAO Draft Report)

**DOD RESPONSE:** Partially concur. While the threat environment has indeed changed, it has not become more benign as implied by the GAO. Today's threat is technologically sophisticated, lethal, and much more unpredictable. Sophisticated weaponry is proliferating worldwide.

The number of attack and reconnaissance helicopters needed to support the Army's reduced force structure depends upon the mission and the level of effectiveness required for the specific scenario. For example, the Army's contingency force depends more on helicopters because helicopters provide the force with a rapidly deployable anti-armor capability. The Army's acquisition objective (the number the Army buys) is determined during acquisition decisions to meet the Army's requirements which are developed based on National Military Strategy, Defense Planning Guidance, and doctrine.

- o **FINDING B: Army Aviation Strategy Not Fully Funded.** The GAO reported that declining budgets mean that the Army cannot afford to fund all of its modernization requirements. The GAO noted that the Army's plan for funding its stated Army aviation modernization strategy excludes helicopter programs it contends are required to meet its aviation mission. The GAO noted that to fund the modernization strategy, to include such things as the development of the Comanche helicopter,

Page 1 of 14

Now on pp. 2 and 10-11.

See comment 2.



**Appendix I**  
**Comments From the Department of Defense**

Army officials indicated that they could not afford all of their required programs. The GAO asserted that Army officials at the command and program level still maintain that those excluded program requirements are critical to the Army's ability to perform its aviation mission. The GAO noted that the unfunded requirements--amounting to as much as \$15.7 billion in program costs--include a number of programs, such as the modernized Blackhawk medical evacuation and Chinook cargo helicopters and continuing production of the Blackhawk utility helicopter. The GAO also observed that, according to program officials, those requirements will have to be funded in the future. The GAO pointed out that if additional funding is not available, the Army will need to decide whether to (1) terminate attempts to fund those requirements, (2) cancel or restructure programs in its current aviation modernization strategy, or (3) cancel or restructure non-aviation programs.

The GAO also observed that, in addition to programs excluded from funding in the plan, the Army is faced with an estimated \$540 million shortfall in the Comanche program. The GAO noted that the Army is proposing to streamline that acquisition program in order to deal with the shortfall. However, the GAO pointed out that DoD officials have expressed concerns about the risk associated with the Army's plan. The GAO noted that the plan calls for eliminating some testing, buying fewer prototypes, and shortening the developmental phase of the acquisition process by concurrently doing things that normally should be done sequentially, thereby increasing risks associated with entering production too soon. (pp. 17-18/GAO Draft Report)

**DOD RESPONSE:** Partially concur. The \$540 million Comanche program "shortfall" reported by the GAO is but one of a number of estimates that have been projected. However, none of those estimates have yet been validated. The specific amount cited by the GAO represents the difference between the Army's Program Manager's cost estimate and the Contractor's Rough Order of Magnitude estimate of funds required to execute one version of the proposed streamlined program strategy through FY 2004. The Department is in the process of reviewing the Comanche program, to include its acquisition strategy and possible funding shortfall.

- o **FINDING C: Helicopter Program Requirements Canceled and Deferred.** The GAO found that the Army has canceled and excluded as much as \$15.7 billion in aviation program requirements from its fiscal planning for the strategy because of its overall affordability concerns. The GAO also noted that Army program managers and user representatives believe the requirements are critical and should be funded within the next few years. The GAO observed that the following examples of deferred or canceled programs were included in the January

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Now on p. 28.

See comment 1.

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1993 Aviation Modernization Plan and the Army's Aviation Restructure Initiative:

- The Chinook cargo helicopter will have to be modernized because the Army cannot afford to replace it with a new aircraft program in the near future;
- The medical community needs modern medical evacuation capability to replace its current outdated fleet;
- The Army canceled production of the Blackhawk utility helicopter because of affordability concerns;
- The Huey utility helicopter will have to be modernized because its replacement--the Light Utility Helicopter--is not funded and production of the Blackhawk utility helicopter will end;
- The Light Utility Helicopter was originally intended to replace the Vietnam era Huey utility helicopter; and
- The Army does not include the Kiowa Warrior requirement in its fiscal planning or budget request because the Congress usually provides funding for that program as an add-on. (pp. 18-20/GAO Draft Report)

Now on pp. 29-30.

**DOD RESPONSE:** Partially concur. The Army does not have adequate resources to implement all of its desired modernization programs. Comparing, the 1993 Aviation Modernization Plan with current budget proposals ignores the implications of the budget drawdown that the Department--and the Army in particular--has experienced during this time period. Changes in the aviation modernization program reflect the tight budget environment and the priorities placed by the Service on all of its competing programs.

The average age of the CH-47D Chinook helicopter, however, is only 7 years (after the remanufacture that took place from 1982 to 1992). A replacement is not needed in the near future.

The GAO assertion that the "...Huey utility helicopter will have to be modernized...", is not supported by a recently completed UH-1 service life extension program study. The study indicated that if the service life of any of the Hueys is extended, they will comprise a small portion of the fleet for the light utility missions.

The GAO draft incorrectly states that the Light Utility Helicopter (LUH) is the replacement for the UH-1 Huey. The LUH is a concept under study. The UH-60 is the replacement for the UH-1.

See comment 3.

See comment 4.

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See comment 5.

The DoD also disagrees with the statement, "The Army does not include the Kiowa Warrior requirement in its fiscal planning...". The Army made a decision in the 1990 time frame to accept a fleet of only 289 as a near-term, interim scout while awaiting fielding of the Comanche.

- o **FINDING D: Future Funding of Deferred Needs May Be Difficult.** The GAO asserted that further declines in defense funding and predicted increases in funding for existing requirements may have a significant impact on the Army's ability to fund aviation programs. For example, the GAO observed that the Army budget declined from \$79 billion to \$61 billion during fiscal years 1990-1994--a 23-percent reduction as compared to a 14-percent reduction in the DoD budget--and that the Army experienced a 36-percent reduction to its research, development, and acquisition funding, while the DoD funding for those areas declined by 31 percent.

The GAO also noted that Army officials expect further reductions in the Army budget, and that the DoD recently identified an unexpected \$20 billion shortfall for fiscal years 1996-1999. Consequently, the GAO observed that the planners reduced the overall Army budget projection by \$2.5 billion for those years, and that the \$2.5 billion reduction could have a significant impact on the Army aviation modernization strategy. In addition, in an April 1993 report provided to the Congress on selected Army helicopter modernization programs, the GAO noted that the DoD has predicted increases in Army funding requirements during fiscal years 2000-2010. (pp. 20-21/GAO Draft Report)

Now on pp. 30-31.

**DOD RESPONSE:** Concur. The Department is in the process of formulating its FY 1996 budget. Therefore, specific shortfall amounts at this stage in the process cannot be substantiated.

- o **FINDING E: Streamlining the Proposal Increases Risk.** The GAO asserted that, despite the Army efforts to cancel or defer some aviation programs to afford its modernization strategy, the Army is faced with a current shortfall on the Comanche program estimated at \$540 million. The GAO concluded that the shortfall exists because of planned reductions in Army funding for fiscal years 1995-2004.

The GAO noted that, in December 1993, the Comanche's prime contractor team submitted an estimate of \$819 million to complete a streamlined engineering and manufacturing development phase. The GAO pointed out that the estimate was revised downward to \$540 million when the contracting team "scrubbed" the estimate. The GAO also noted that the Army submitted its plan to "streamline" the Comanche program to the Secretary of Defense for approval in May 1994. The GAO

Now on pp. 31-32.

indicated that DoD officials asserted the proposed reduction in prototypes and program schedule slippage would result in higher risk associated with the increased concurrency in the program. The GAO pointed out that the plan proposed merging the prototype and engineering and manufacturing development phases into one development phase, and having two developmental prototypes and three low-rate initial production helicopters, instead of the original six developmental prototypes. The GAO indicated that DoD officials believe the proposed plan increases the use of simulators, eliminates some testing, and could cause some program schedule slippage. (pp. 21-23/GAO Draft Report)

**DOD RESPONSE:** Concur. However, as discussed in the DoD response to Finding D, the specific amount of the funding shortfall, if any, in the Comanche program will have to await the completion of the program streamlining effort currently in progress.

- o **FINDING F: The Strategy Does Not Reflect the Anticipated Force Reductions.** The GAO concluded that the total force structure used to compute requirements in the Army aviation modernization strategy is higher than the force structure used in the DoD 1993 Bottom-Up Review assessment. The GAO asserted that, while the Army strategy is based on a force structure of 20 divisions, the Bottom-Up Review recommended reducing the number of Army divisions.

The GAO observed that the Bottom-Up Review recommended the Army reduce its structure to a force of 10 active and approximately 5 reserve divisions by the end of fiscal year 1999. The GAO also observed that decisions regarding the structure of the reserve component were left to the Army, and that the Army is currently planning for an 18 division force-- 10 active and 8 reserve. The GAO also indicated that the assets required to support the future force, whether it be 15 or 18 divisions, will be less than what is needed for the current 20 division structure. The GAO also noted that, for fiscal years 1995-2015, the Army needs 4,696 aircraft for 20 divisions, 4,539 helicopters for 18 divisions, and 4,222 helicopters for 15 divisions.

The GAO concluded that the number of divisions will have little immediate impact on the helicopter fleet, but will eventually impact the Army procurement plans for the Longbow Apache, Comanche, and Blackhawk programs as prescribed by the proposals in the aviation modernization strategy. The GAO also noted that the Aviation Restructure Initiative reduced the number of Longbow Apache, Blackhawk, and Comanche helicopters needed to fill the current 20 division force structure. (pp. 24-26/GAO Draft Report)

Now on pp. 16-17.

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**DOD RESPONSE:** Partially concur. The Army Aviation Modernization strategy that preceded the Bottom-Up Review was predicated on a Base Force that specified a 20-Division Army. Part of the Bottom-Up Review examined the force structure and recommended a 10 Division active force and a 575,000-man Reserve Component for the Army. The structure of the Reserve Component is still being definitized to meet the stated end strength. The Attack/Reconnaissance Helicopter portion of the Bottom-Up Review was conducted in parallel with the force structure deliberations. Therefore, the helicopter portion of the review examined a range of force structure options--from a high of the Base Force of 20 Divisions to a low of 12 Divisions--in order to highlight the effect of force structure on the helicopter modernization options.

Aircraft assets at the Division differ widely between light, heavy, and assault divisions. In addition, the Army maintains an aviation structure at the Corps and Theater levels, as well as aircraft for training and float (maintenance and operational) to sustain the force. Identifying a specific number of helicopters (such as 4696 for 20 Divisions) without a detailed breakout is meaningless. The Department maintains that the GAO estimated numbers of helicopters required greatly underestimates the real requirement.

- o **FINDING G: Differences Exist in the Military About the Strategy's Unit Force Structure.** The GAO found that there are differences of opinion throughout the DoD and the Army over the number of helicopters needed to perform the air cavalry troop role in the Army objective force. The GAO observed that the Office of the Army Deputy Chief of Staff for Operations and Plans and the Army Aviation Center at Fort Rucker, Alabama, both documented the requirement for the air cavalry troop to be 12 aircraft per troop--the basis used under the Aviation Restructure Initiative--and, therefore, the Army strategy. However, the GAO found that the Bottom-Up Review, which evaluated the continuation of the Comanche program, based its analysis on using eight aircraft in the cavalry troop in the objective force. The GAO also observed that the Comanche Training and Doctrine Command System and Program Managers also used eight aircraft in a cavalry troop to develop the Comanche's future tactics, techniques, and procedures. The GAO concluded that the difference between using 8 or 12 aircraft in the cavalry role in the Army's current 20-division force is 287 aircraft. (pp. 27-29/GAO Draft Report)

**DOD RESPONSE:** Partially concur. The Bottom-Up Review recommended that the Army reduce its active force structure to 10 active divisions and a 575,000-man reserve force. While mentioning 15 enhanced readiness brigades and "about 5 divisional headquarters" (for training), the Bottom-Up Review

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allowed the Army to organize the reserve component. The Bottom-Up Review did not specify the exact number of divisions or brigades in the reserve component.

The GAO draft identifies precise numbers of aircraft needed for 20, 18 and 15 divisions, but does not explain the basis used to determine those numbers. The GAO estimates do not accurately reflect the composition of Army aviation assets, the requirements which are based on the mission to be performed (i.e., heavy attack, light attack, air assault) and contain aircraft for training, float, and attrition. After considering affordability constraints, a procurement objective is set. The report can be misleading when it simplifies the process to identify the exact numbers (i.e., 4539 helicopters for 18 divisions).

The Army's Air Cavalry Organization Analysis is currently examining various numbers of aircraft to use in cavalry units. Organizations of 8, 10, 12, and 16 aircraft are under consideration. Due to resource constraints, the Army is fielding eight OH-58Ds to a Cavalry Troop. Emerging analysis, however, indicates that twelve or more aircraft may be the optimal number. Once that number and the size of divisional units are settled, the number of armed reconnaissance aircraft needed will be determined.

- o **FINDING H: Strategy Relies on Costly and High Technical Risk Helicopter Development.** The GAO observed the DoD Bottom-Up Review recommended that the Army continue on its course of developing the Comanche and the Longbow Apache, despite that being the most costly force structure alternative. The GAO also observed that the Comanche-Longbow Apache option has a life-cycle cost estimate of \$75.6 billion, and is more than \$23.6 billion higher than the lowest cost option, which would terminate the Comanche program, but retain the Longbow Apache and procure additional Kiowa Warriors. The GAO also noted that, according to the Bottom-Up Review, the higher cost was "not a significant discriminator, given the improvements in capability both systems (the Comanche and the Longbow) provide." However, the GAO also observed that the Bottom-Up Review report indicated "there were technical and cost-growth risks associated with this option that need to be monitored and carefully managed, since both systems are on the cutting edge of technology and have significant developmental time remaining." The GAO pointed out that, since the Bottom-Up Review, the cost has increased to \$157 billion, of which \$113 billion is for the Comanche and \$44 billion is for the Longbow Apache. (p. 29/GAO Draft Report)

**DOD RESPONSE:** Partially concur. The Department cannot validate the cost figures noted by the GAO. The costs cited in the Bottom-Up Review were life-cycle costs in FY 1994

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dollars and associated with a strict set of assumptions which are changing as the downsizing of forces proceeds. Sunk costs were excluded, as were all operating and support costs beyond the selected time frame.

- o **FINDING I: Comanche Maintenance Requirements Unlikely to be Achieved.** The GAO observed that the Comanche helicopter, which is in the demonstration/validation phase of its development cycle, is designed to include advanced avionics and targeting, increased maneuverability, greater firepower, and cutting edge low observability features. The GAO also observed that one of the advantages intended by the advanced technology is that the Comanche will have a significantly lower maintenance man hours/flight hour requirement than existing helicopters. However, the GAO found that, because the expected maintenance requirement is considered unrealistic, overall aviation operation and support costs may be significantly understated. In addition, the GAO concluded that a shortage of necessary maintenance personnel could also negatively affect the effectiveness of units and the affordability of the strategy. (pp. 30-31/GAO Draft Report)

**DOD RESPONSE:** Partially concur. The DoD agrees that achieving the desired low maintenance for the Comanche is challenging. It should be recognized, however, that the Army is placing much greater emphasis on achieving that low maintenance level for the Comanche than has been done for any other helicopter development program in history. Therefore, the DoD does not agree that the Comanche maintenance requirements are unlikely to be achieved. Starting from source selection and proceeding to current design efforts, maintainability has enjoyed an unprecedented emphasis in the Comanche program:

- almost half of the aircraft surface area is dedicated to access panels to ease maintenance tasks.
- Necessary work platforms are built into the airframe.
- Virtually all components are "one deep", negating the need to remove a good part to gain access to a failed part (as is the case with current aircraft.)
- Avionics components are functionally partitioned and packaged in line replaceable modules and line replaceable units instead of "black boxes", a design feature that facilitates quick removal/replacement.
- Bearingless and fluidless main rotor system design lessens maintenance burden.
- Fantail requires no off-aircraft balancing or servicing.

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- Boresighting of weapons is done automatically on-board the aircraft.
- Use of cotter pins and safety wire has been virtually eliminated.
- Intermediate level maintenance tasks are being designed away.

- o **FINDING J: Longbow Technology Falls Short.** The GAO observed that the Army plans to modify the Apache helicopter to improve its target acquisition capabilities by adding the Longbow technology enhancements. The GAO noted that the Longbow Apache program includes airframe improvements, radar modifications, and a Longbow compatible Hellfire missile with fire and forget capability.

The GAO found that the Longbow system being designed for the Apache helicopter falls short of achieving the capabilities the Army originally required for stationary target tracking. The GAO also found that the Longbow Apache stationary target indicator requirements have been reduced, and that the value of the current Longbow technology is questionable. The GAO observed that the current Longbow system can detect (locate a target) and classify (determine whether it is a wheeled or tracked vehicle), but it cannot recognize (tank or armored personnel carrier) or identify (the type of tank--T-72) targets. The GAO indicated the Longbow program officials believe the future Longbow developments could improve the ability of Army helicopters to recognize and identify targets through the integration of Longbow radar information with data from a second generation forward looking infrared system. Nevertheless, the GAO concluded that the demonstration of Longbow capability still involves high technical risk. (p. 32/GAO Draft Report)

**DOD RESPONSE:** Partially concur. Although the Longbow has not yet achieved the complete level of performance originally planned, the GAO did not accurately describe the value of the Longbow technology already achieved. Even with the reduced stationary target capability, Longbow provides a vast improvement in target detection and engagement capability of the Apache. The Longbow radar can see targets when visual systems are impaired by battlefield smoke or obscurants. The Hellfire missile seeker can achieve lock-on and engage targets obscured to the naked eye and infrared sensors. Combined, those subsystems give the Apache a fire-and-forget capability. The bottom line of these improvements is that they increase the effectiveness and survivability of the Apache. Future integration with the forward looking infrared targeting system promises an even greater payoff--the ability to identify targets at extended ranges.

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Now on p. 20.

See comment 9.



o **FINDING K: The Strategy May Not Reflect User Concerns.** The GAO concluded that the process used to determine aviation requirements in the strategy may not reflect lower level recommendations and what the active unit users desire. The GAO also asserted that requirements are often determined by advocates in the process, and that the users believe implementation of the strategy will change the operational mix of some units and, therefore, reduce their operational effectiveness. The GAO found that active unit helicopter users, the Army Aviation Center, an Army test of scout helicopters, and the Warfighting Lens Analysis, in some instances, support different system procurement and practices than those that the Army aviation modernization strategy supports. For example, the GAO noted that the strategy prescribes using the Apache attack helicopter as the scout in the attack battalion; however, the GAO indicated the attack battalion pilots and commanders interviewed stated they preferred using the Kiowa Warrior in that role.

The GAO also found that some of the costly capabilities being designed into the Comanche, such as (1) the requirement that the Comanche fly 1,260 nautical miles, (2) the Comanche being procured to fill the cavalry scout role, and (3) the Comanche's low-observability requirement, exceed the capabilities needed to perform those assigned roles. In addition, the GAO found that the aviation center at Fort Rucker, Alabama, has established requirements for many key systems that were not forwarded to the next level of the requirements process or were dropped at higher levels. For example, as discussed earlier, the GAO explained that additional Kiowa warriors and medical evacuation model Blackhawk requirements were dropped in the process before the budget request was submitted to Training and Doctrine Command headquarters officials. (pp. 33-35/GAO Draft Report)

**DoD Response:** Nonconcur. The DoD does not agree that the Comanche acquisition strategy does not reflect user concerns. While individual exceptions to established requirements can be found for most systems, that does not mean user concerns have not been adequately addressed. The requirements generation process is a complicated operation that serves as the basis for modernization strategy. The process begins with recommendations from the users at the lower organizational levels. Those recommendations are then fully considered in relation to the overall mission of the Army, the emerging threat, National military strategy, and available resources. While not all specific concerns may be included in the system, they are considered in developing system requirements. The Comanche capabilities were based on real user inputs of the operational requirements needed to successfully accomplish cavalry and attack missions within the anticipated combat, environmental, and geographic spectra.

Now on pp. 20-21.

See comment 1.

- o **FINDING L: Advocates and Culture Influence Requirements.** The GAO concluded that the fact that user desires, lower Army recommendations, and the overall Army modernization strategy do not always agree may be due, in part, to the advocacy-driven nature and culture associated with the acquisition process. The GAO observed that the Army commissioned a study that looked at why some acquisitions take a very long time and others get done fairly "rapidly." The GAO indicated the study found that the successful systems all had a fairly continuous institutional proponent, usually a Training and Doctrine Command school, and all had a strong, well-placed advocate, such as the Chief of Staff, a Commander-in-Chief, or another "four-star" General.

The GAO also observed that higher level Army officials tend to favor weapon systems that have firepower over those that do not. Accordingly, the GAO indicated that is why some programs are supported lower in the process, but not at the top. The GAO also reported that Army officials stated there is a culture problem in the Army--where the emphasis has always been on lethality--and that may be the reason the Army did not fund eight of the most have programs in the Warfighting Lens Analysis. The GAO explained that those programs were Combat Service Support, and as such, receive very little advocacy in the process. The GAO also indicated that may be the reason the Army funded the Comanche, but not the Blackhawk, the Improved Cargo Helicopter, and the Light Utility Helicopter. (pp. 35-36/GAO Draft Report)

**DOD RESPONSE:** Concur. Although the GAO views reflect an essentially subjective opinion, the DoD acknowledges that having an institutional proponent has always had a positive impact on program funding and progress. It is also not surprising that Army officials would tend to favor systems with firepower. The Army is responsible for training warfighters, who generally view lethality as a top priority.

- o **FINDING M: Operational Effectiveness May Be Reduced.** The GAO observed that, to reduce maintenance support costs, the strategy proposes limiting the type of helicopters in aviation attack battalions by taking Blackhawk helicopters out of those battalions and consolidating them in general support battalions. The GAO indicated that many active users expressed concern that the limitations will leave the aviation attack battalions without the ability to perform missions, such as search and rescue, without relying on a separate command structure to supply those aircraft. For example, the GAO noted that, in conducting a search and rescue mission, the active unit users told the GAO that the first 30 minutes are critical to the recovery of pilots and their helicopters. The GAO also noted that in a time-critical operation, an attack battalion commander will have to request aircraft from a

Now on p. 21.

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Now on pp. 22-23.

general support battalion and compete against other unit needs. The GAO concluded, based on the opinions of active unit users, that obtaining the Blackhawks for a search and rescue mission under those circumstances could take longer than 30 minutes. The GAO also observed the active unit users are concerned that, in the future, the attack battalions might be deployed without the maintenance support provided by the general aviation support battalions--thereby limiting their ability to perform assigned missions. (pp. 36-37/GAO Draft Report)

**DOD RESPONSE:** Concur. The DoD agrees that implementation of the strategy will require close attention to the concerns cited by the GAO.

- o **FINDING N: The Army Aviation Modernization Strategy Did Not Adequately Consider Alternatives.** The GAO concluded that the Army did not adequately consider alternative helicopters to the Comanche. The GAO also concluded that, should the Comanche be delayed or not produced, the DoD has alternative attack and reconnaissance helicopters that have the ability to conduct all of the Comanche roles and missions, albeit with limitations, such as the more affordable Super Cobra, the Longbow Apache, and the Kiowa Warrior. The GAO further concluded that the alternatives may become more attractive in light of anticipated force structure changes and could impact decisions regarding the mix and quantity of helicopters in the Army projected fleet.

Now on pp. 24-26.

The GAO noted that Army officials believed the issue of alternatives had been sufficiently addressed in the two Comanche Cost and Operational Effectiveness Analyses and other earlier studies. The GAO maintained that, while each Cost and Operational Effectiveness Analysis looked at some alternative helicopters and aircraft, they did not consider all alternative helicopters. The GAO also noted that both supported the continued development of the Comanche. The GAO also pointed out that the DoD, in two recent defense reviews--the Chairman, Joint Chiefs of Staff review of roles and missions and the Secretary of Defense Bottom-Up Review--looked at force structure alternatives. The GAO concluded that each failed to adequately explore the issue of alternative helicopters or weapon systems. (pp. 38-42/GAO Draft Report)

See comment 1.

**DOD RESPONSE:** Nonconcur. The Super Cobra, Longbow Apache and Kiowa Warrior were all considered in the Light Helicopter cost and operational effectiveness analysis, as well as in conjunction with other internal DoD reviews. In addition, other possible alternatives were further analyzed during the DoD Bottom-Up Review. The Bottom-Up Review revalidated the conclusion that the other alternative aircraft cannot fulfill the role of the Comanche helicopter.

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- o **RECOMMENDATION:** The GAO recommended that the Secretary of Defense direct the Secretary of the Army to revise the Army's aviation modernization strategy in order to consider:
  - the agreed upon force structure;
  - the unfunded \$15.7 billion of short and long term requirements;
  - the validated mix and quantity of helicopters for each aviation unit; and
  - an analysis of appropriate alternative capabilities to satisfy the aviation mission's various roles. (p. 7, pp. 44-45/GAO Draft Report)

Now on pp. 5 and 32.

The GAO suggested that the revised modernization strategy be done at the same time the next Aviation Modernization Plan is prepared. (p. 7, pp. 44-45/GAO Draft Report)

See comment 1.

**DOD RESPONSE:** Partially concur. The DoD agrees that major and recent changes in the strategic environment have invalidated parts of the last Army Aviation Master Plan. The Army is currently in the process of revising the Army Modernization Plan, a subset of which is the Aviation Modernization Plan. Publication of the new Army Modernization Plan is currently expected by January 1995. Further OSD direction at this time is not required.

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**MATTERS FOR CONGRESSIONAL CONSIDERATION**

- o **SUGGESTION 1:** The GAO suggested that, to ensure that the Army appropriately revises its aviation modernization strategy, the Congress may wish to consider requiring the Army to submit the revised strategy to the Congress before it submits its fiscal year 1996 appropriations request. (p. 8, p. 45/GAO Draft Report)

Now on pp. 5 and 33-34.

**DoD Response:** Nonconcur. As explained in the DoD response to the GAO Recommendation, the Army is already in the process of revising the Army Modernization Plan, which will include an

See comment 1.

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update of the Aviation Modernization Plan. Publication of the Army Modernization Plan is expected by January 1995. Further congressional direction is not necessary.

- o **SUGGESTION 2:** The GAO also suggested that the Congress may wish to consider requiring the Secretary of the Army to forego any acquisition streamlining initiatives for the Comanche program until the revised modernization strategy is submitted. (p. 8, p. 45/GAO Draft Report)

**DOD RESPONSE:** Nonconcur. The Department plans to review the proposal to implement the streamlined Comanche program in the third quarter of fiscal year 1995. By that time the Army will have completed its revised Aviation Modernization Plan. The findings of the revised Modernization Plan and its implications on the Comanche program will be considered by the Department in its 1995 review.

Now on pp. 5  
and 33-34.

See comment 1.

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The following are GAO's comments on the Department of Defense's (DOD) letter dated September 20, 1994.

1. We have modified the report to incorporate and address this comment.
2. Our statement is not meant to evaluate the seriousness of the threat; it is a description of the world condition within which Army aviation modernization decisions are being made. The Bottom-Up Review acknowledges that ". . . the Army is reducing the size of its helicopter fleet as part of its overall force structure, . . .".
3. As we stated in the report, program managers believe that modernization of the Chinook is required and, therefore, they are requesting funds to start such a program in the fiscal years 1996-2001 budget cycle.
4. The Light Utility Helicopter was originally intended to replace the Vietnam era Huey and Blackhawk helicopters that are currently performing the light utility role. However, the Light Utility Helicopter is still a concept under study, and the Army canceled Blackhawk production. When the Army canceled production of the Blackhawk, we believe it put itself in the position of again considering whether to include most, if not all, 1,000 Huey helicopters in the extension program to achieve the desired light utility helicopter capability.
5. We have deleted this information from the report.
6. DOD officials responsible for putting together the Bottom-Up Review's report told us that they analyzed various force structures, including a 20-division force structure, but when it became obvious that the number of Army divisions was going to be reduced, they turned their focus to a 16-division structure. (Also see comment 1.)
7. The numbers in our analysis show the impact of DOD and Army decisions on computations of helicopter quantities and, therefore, the validity of the quantities in the strategy. DOD's response further highlights the point we are making in the report. DOD conceded that decisions regarding the number of helicopters in an air cavalry troop are still under consideration. According to DOD, emerging analysis indicates that 12 or more might be the optimal number. Once that number and the size of the divisional units are settled, DOD noted that the number of armed reconnaissance aircraft

needed will be determined. Therefore, the quantities in the strategy will have to be adjusted.

Additionally, the Bottom-Up Review's estimate of the cost of the Army's modernization option will have to be adjusted. As previously discussed, the Bottom-Up Review estimate reflects Comanche quantitative requirements based on eight aircraft for an air cavalry troop. (Also see comment 1.)

8. DOD lists the planned initiatives the Army is emphasizing to ensure that the Comanche achieves its low maintenance goal. However, DOD does not rebut the fact that the Bottom-Up Review and DOD's Cost Analysis Improvement Group believe the Comanche's maintenance goals are understated. Also, DOD does not explain why the less sophisticated Kiowa Warrior has a much higher maintenance rate than that projected for the more sophisticated Comanche.

9. The report points out that program officials believe Longbow improvements can increase the effectiveness of Army helicopters. DOD cited individual capabilities of the Longbow radar and the Hellfire missile and concluded that, combined, these subsystems increase the effectiveness and survivability of the Apache.

The individual subsystems may have the capabilities DOD cites; however, the Longbow Hellfire system has not been fully tested as an integrated system. Therefore, it is not possible to verify whether the systems will work together or provide the increased effectiveness DOD's response implies has already occurred.

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