

**GAO**

Report to the Honorable  
Peter A. DeFazio, House of  
Representatives

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August 1999

# DEFENSE ACQUISITIONS

## Comanche Program Cost, Schedule, and Performance Status



**G A O**

Accountability \* Integrity \* Reliability

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

National Security and  
International Affairs Division

B-280314

August 24, 1999

The Honorable Peter A. DeFazio  
House of Representatives

Dear Mr. DeFazio:

The Comanche helicopter program, with a total projected cost of \$48 billion, is the Army's largest aviation acquisition program. It began in 1983 as an effort to replace the Army's fleet of aging light utility, reconnaissance, and attack helicopters. Since then, the program has been restructured five times, and it is still in development. The first four times, it was restructured because of concerns over program affordability and changing requirements. As a result, planned procurement quantities were reduced, development was delayed, and unit costs increased. In July 1998, the Army restructured the program for the fifth time.

As you requested, we reviewed the status of the Comanche program. Specifically, we assessed (1) risks in the Army's restructured plans for developing and testing the Comanche, (2) changes in the Comanche's performance capabilities and requirements, (3) current cost estimates for development, and (4) the Comanche's impact on the Army's overall aviation modernization efforts.

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## Results in Brief

The Comanche's restructured program contains significant risks<sup>1</sup> of cost overruns, schedule delays, and degraded performance because it would (1) begin the engineering and manufacturing development phase before some key mission equipment technologies have matured and have been integrated into the flight-test aircraft; (2) compress the flight-test schedule, increasing the amount of concurrent developmental and operational testing; and (3) begin initial production before initial operational testing starts, resulting in concurrency between development testing and initial production. The program is proceeding to the next development phase with high levels of uncertainty. Successful commercial firms generally do

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<sup>1</sup>Risk is a measure of the probability that a planned objective will not be met and of the consequences of failing to achieve that outcome.

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not proceed into product development and production with such high levels of uncertainty.<sup>2</sup>

The Army is proposing changes to the aircraft that would adversely impact some of the Comanche's planned performance capabilities. While their exact impact is unknown, these changes will increase the risk that the Comanche's planned performance goals will not be achieved. For example, to meet increased range requirements for certain missions, the Army plans to use external fuel tanks that would likely reduce the helicopter's planned stealth, cruising speed, maneuverability, and other performance capabilities. Plans to add the Longbow fire control radar system would provide enhanced target acquisition capabilities but would add weight and drag that would reduce other performance capabilities.

The Army acknowledges that it will not achieve its goal of executing the Comanche's restructured development program within the planned funding estimate of about \$4.4 billion for fiscal years 1999 through 2006. An analysis by the Department of Defense's (DOD) Cost Analysis Improvement Group in November 1998, found that total program costs would be about \$150 million (3.4 percent) higher than the Army's current estimate. The Group also believes that insufficient near-term funding could lead to a 6- to 12-month schedule delay, which could add between \$275 million and \$425 million to the program's overall development costs. Further, the Army's accelerated technology development and testing plans increase the risk of additional schedule delays and cost increases.

The Army continues to single out the Comanche as the centerpiece of its aviation modernization plan. The Comanche program, as currently planned, would absorb an increasingly larger share of the Army's total aviation budget and would account for about 64 percent of the budget in fiscal year 2008. According to the Army, its modernization plan provides the best balance between capabilities and resources. The plan recognizes that because of funding constraints, some program modernization requirements must be traded off. As a result, older helicopters will have to be retained longer than originally planned, some helicopter upgrades will be foregone, and lower quantities of some helicopters will have to be procured.

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<sup>2</sup>Defense Acquisition: Best Commercial Practices Can Improve Program Outcomes (GAO/T-NSIAD-99-116, Mar. 17, 1999).

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Given the risks and uncertainties associated with the Comanche development program, this report recommends that the Secretary of Defense reevaluate the Army's highly concurrent restructured plan that accelerates the milestone II decision date for entering the engineering and manufacturing development phase. It also recommends an evaluation of the cost, schedule, and performance impacts resulting from changes in operational requirements and weight growth. In commenting on this report, DOD partially concurred with our recommendations. DOD stated that the Comanche overarching integrated product team considers the issues raised in our report as part of its acquisition oversight and review process and, therefore, no additional evaluations are necessary to satisfy our recommendations. According to DOD, the Comanche program manager's approach to the management of risk and concurrency is considered prudent and appropriate. We are concerned that DOD's acquisition oversight and review process continues to approve program development and production plans that contain significant cost and schedule risks. Accordingly, as DOD undertakes its reviews of the program, we plan to continue monitoring the results of the reviews.

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## Background

The Comanche helicopter program began in 1983 with the aim of building a family of high-technology, low-cost aircraft that would replace the Army's light helicopter fleet of approximately 5,000 aircraft, including the AH-1 Cobra, OH-6 Cayuse, OH-58 Kiowa, and UH-1 Iroquois (Huey). The Army subsequently decided to develop only a single Comanche aircraft capable of conducting either armed reconnaissance or attack missions. Critical to achieving the Comanche's desired capabilities is the successful development of advanced technologies, especially for the mission equipment package, which accounts for over half of the aircraft's cost. The reconnaissance portion of the package includes the target acquisition system, the night vision piloting system, the helmet-mounted display, and the integrated communication and navigation systems. The attack portion includes the Longbow radar, survivability and early warning equipment, the Doppler navigation system, external stores, and weapons.

The Comanche is designed to have capabilities that overmatch an enemy. It will have weapon bays, landing gear, and a 20-mm gun that all retract into the fuselage and will be capable of carrying Longbow Hellfire and Stinger missiles, and Hydra rockets internally or externally. The aircraft is expected to have improved speed and agility; aircrew visibility; and reliability, availability, and maintainability over the current reconnaissance

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and attack fleet. It is also designed for low observability (stealth) and is expected to be capable of deploying over long ranges without refueling.

The program entered the demonstration and validation phase<sup>3</sup> of development in June 1988. Between 1988 and 1998, the program was restructured five times, the development schedule was extended from 1996 to 2006, and planned quantities were reduced from 2,096 to 1,292. Under the latest restructuring, in July 1998, the Army decided to retain the 2 prototype aircraft already built but acquire 14 rather than 16 aircraft. The two prototypes and six preproduction aircraft would be used for developmental testing and eight preproduction aircraft would be used for initial operational testing and evaluation. The Army plan also accelerated the start of the engineering and manufacturing development phase 19 months to March 2000. Initial operational testing and evaluation of the aircraft is now scheduled for February through August 2006, and delivery of the low-rate initial production aircraft is to begin in January 2007. The full-rate production decision and initial operational capability deadline of December 2006 have not been changed. The Army's planned cost estimate for completing the restricted Comanche developmental program was about \$4.4 billion.

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## The Army's Restructured Plan Contains Significant Risks

Under the Army's latest restructured development plan, the Comanche program would advance to the engineering and manufacturing development phase before some key mission equipment technologies have matured and are integrated into the aircraft and tested. Additionally, the Army's plan would (1) compress the flight-test schedule into the last 3 years of development, increasing concurrent developmental and operational testing and (2) begin initial production before initial operational testing is started, increasing concurrency between testing and production.<sup>4</sup> As a result, the restructured program contains significant risk that some technologies may not be mature enough and may not be integrated and tested prior to the scheduled start of low-rate initial production. Testing could identify design changes that may be required after production has started, leading to costly retrofits.

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<sup>3</sup>This phase is now called the program definition and risk reduction phase.

<sup>4</sup>Developmental testing verifies that design, technology, and technical performance of the helicopter will support operational testing. A Combined Test Team (of government and contractor personnel) is responsible for Comanche developmental testing. Operational testing, conducted by the user of the weapon system, assesses the system's performance in an operational environment.

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## Mission Equipment Technology Development Risk

The risk that the technologies required for the Comanche's mission equipment package and associated avionics would not mature as planned has been a major concern since the program's inception. In an effort to reduce risk, the Army's previous development plans called for the mission equipment package to be integrated and tested on a prototype helicopter prior to the milestone II decision<sup>5</sup> to enter the engineering and manufacturing development phase. Under the current restructured program, the Army plans to enter the engineering and manufacturing development phase 19 months earlier than planned, while delaying integration and flight testing of the mission equipment package. Therefore, the reconnaissance mission equipment package will not be integrated and flight tested on a prototype helicopter prior to the milestone II decision. As a result, decisionmakers will not have important test results needed for assessing the state of the Comanche's technologies for the milestone II decision.

In our recent work in the defense acquisition reform area, we found a number of lessons that can be learned from best commercial practices and applied to DOD's major system acquisitions. One in particular is that commercial firms generally obtain a higher level of knowledge before they transition from technology development to product development and, later, to production. The restructured program will squeeze more work into the Comanche's engineering and manufacturing development phase and then reduce the amount of time available for the remainder of the work. This contrasts with best practices of leading commercial firms, which learn more about a product's technology, design, and producibility much earlier than DOD does in the acquisition programs we reviewed. Such knowledge reduces the risks of cost overruns, schedule delays, and performance shortfalls.

One of the purposes of the program definition and risk reduction phase of development is to demonstrate that technology risks are well in hand before the next decision point—milestone II. Some reconnaissance mission equipment technologies for the Comanche helicopter remain immature and untested. According to Army assessments, the helmet-mounted display and two key elements of the electro-optical sensor system—the integrated communication, navigation, and identification

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<sup>5</sup>The purpose of the milestone II decision is to determine whether the results of the program definition and risk reduction phase warrant entry into the engineering and manufacturing development phase, which validates the production process and demonstrates system capability through testing.

avionics and the forward-looking infrared—have a moderate to high developmental risk. None of these technologies has been tested on a Comanche prototype. For example, the technology for the Comanche's integrated communication, navigation, and identification avionics subsystem, which has been under development since 1981, has been demonstrated only in the laboratory, and flight-test hardware will not be flown on the Comanche preproduction aircraft until late 2003, over 3-1/2 years after the engineering and manufacturing development phase is scheduled to begin. Flight tests of a production version of the subsystem are not scheduled until 2004.

In November 1998, DOD's Cost Analysis Improvement Group noted that mission equipment package development was relatively immature. According to the Group, "there has not been any MEP [mission equipment package] flight testing to date and [there are] several technological challenges remaining." Compared with some leading commercial products, the Comanche, like many DOD programs, is proceeding with less available knowledge about key factors of product development. This increases the risk that costs may be higher than planned, product development may take longer, and performance may be lower than planned.

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## Mission Equipment Integration Risks

Throughout the Comanche's development, the Army and others have emphasized that there are significant risks associated with the integration of mission equipment subsystems into the aircraft.<sup>6</sup> In its 1994 independent review, a panel convened by the Institute for Defense Analyses identified integration of the mission equipment package as the most challenging aspect of the mission equipment package. The review stressed the importance of sufficient testing and user involvement because integration must be performed properly in order to achieve the desired combat effectiveness.<sup>7</sup> Although some system integration is scheduled to start in late 2001, some key elements of the mission equipment package will not be fully integrated, tested, and demonstrated until much later. For example, the Comanche is not scheduled to complete a full demonstration of its integrated mission equipment package, including the fire control radar and

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<sup>6</sup>Comanche system integration involves the integration of its weapon systems and battlefield information systems into a total weapon system that provides maximum effectiveness with minimum crew workload.

<sup>7</sup>The review panel made these observations about the Army's efforts to "streamline" the Comanche's development by combining the first two phases of development into one.

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external fuel and armament management system, on a preproduction aircraft until December 2006, about 4 months after completion of initial operational testing and evaluation. The analyses of this demonstration may not be available in time for consideration when the full-rate production decision is made in December 2006.

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### Compressed and Concurrent Test Schedule Increases Program Risk

The restructured test schedule increases the risk that the Comanche helicopter will not be adequately tested prior to the full-rate production decision. Under the restructured program, the Comanche's initial operational capability date is still scheduled for December 2006, even though the preproduction test aircraft will be delivered 19 months later than previously planned. This results in the flight-test schedule being compressed into the last 3 years of development, which increases the amount of concurrency between developmental and operational testing and between testing and initial production. Such high concurrency increases the risk of costly design changes and retrofits.

### Compressed Test Schedule

The first Comanche prototype was scheduled to complete 174 flight-test hours between January 4, 1996, and January 9, 1999. However, only 128 flight-test hours were completed--an average of 3.5 hours per month. According to a program official, the Comanche flight-test program is behind schedule because of periodic developmental problems and funding constraints.

The first preproduction aircraft for testing is scheduled for delivery in October 2003, 19 months later than previously planned. By retaining the December 2006 initial operational capability date, the 19-month delay in acquiring test aircraft will compress the majority of the Comanche's flight-test schedule into the last 3 years of development, shortening the available time for completing all test events before the full-rate production decision. As a result, the restructured program calls for an aggressive flight-test schedule, flying each of the 14 preproduction aircraft 17 hours a month. According to a consultant who reviewed the Comanche program for DOD, helicopter test programs typically achieve 10 to 12 flight-test hours per month. In its initial assessment of the proposed restructured program, DOD's Cost Analysis Improvement Group noted that (1) the delay in acquiring test aircraft increases the risk that the test program will not be completed on time with all necessary test points achieved and (2) any delays in the delivery of mission equipment package subsystems would directly impact flight-test progress.

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## Concurrent Testing and Production

To achieve program test objectives within the compressed time frame, the Army restructured the Comanche test program in such a way that it will increase the amount of concurrent developmental and operational testing and concurrency between testing and initial production. Developmental testing is scheduled to run to December 2006, while the initial operational test and evaluation is scheduled to start in February 2006 and to be completed in August 2006.

The Army plans to conduct initial operational testing with eight of the preproduction aircraft. It will award the low-rate initial production contract as early as February 2005, and the first low-rate initial production aircraft will not be delivered until January 2007. Therefore, the Army will buy low-rate initial production aircraft about a year before the initial operational test and evaluation starts and deliver these aircraft about 5 months after it is completed. According to DOD, a program has high concurrency when it proceeds to low-rate initial production before significant initial operational testing and evaluation is completed. DOD guidance states that such programs typically have a higher risk of production items having to be retrofitted to make them work properly and of system design not being thoroughly tested. In its assessment of the Comanche preproduction program, DOD's Cost Analysis Improvement Group reported that the revised program schedule increases the level of concurrency and limits opportunities to make configuration changes based on results of the flight-test program. We previously reported that weapon systems that enter initial production before completing adequate testing often required significant and sometimes costly modifications to achieve satisfactory performance.<sup>8</sup>

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## Modifications Increase Risk That Comanche Will Not Meet Performance Requirements

The Comanche's performance requirements continue to evolve. To meet newly established mission requirements, the Army plans to make modifications that will adversely impact some of the Comanche's planned performance capabilities. These capabilities, which distinguish the Comanche from other Army helicopters, include its low observability (stealth), lethality, high cruising speed, and maneuverability. The extent to which modifications would reduce operational performance is not yet known. We have found that successful commercial firms do not proceed to product development until there is near certainty that their product design

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<sup>8</sup>Weapons Acquisition: Low-Rate Initial Production Used to Buy Weapon Systems Prematurely (GAO/NSIAD-95-18, Nov. 21, 1994).

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will meet performance requirements and they have gone a long way to ensure that the item can be produced.

The Army's draft update of the Comanche's operational requirements document includes two new extended range mission scenarios that are beyond the range of the Comanche's currently planned internal fuel capability. To meet new range requirements, the Army has decided to add auxiliary fuel tanks, either externally or in the internal weapon bays when the Comanche is used in those particular mission scenarios. While both solutions would reduce the Comanche's planned operational performance, program officials could not tell us to what extent performance would be impacted. Adding wings with external fuel tanks would increase weight and drag, decrease cruise speed, impact aircraft maneuverability, and lower some of its planned stealth characteristics. Furthermore, placing fuel tanks in one or both weapon bays would, according to a program official, preclude carrying most if not all the weapons in the bays. This would maintain stealth characteristics but would reduce or eliminate the Comanche's internal weapon load and therefore its lethality.

A major element of the restructured program is the accelerated development and integration of a smaller and lighter electronic version of the Longbow fire control radar. The radar is expected to provide enhanced target acquisition capabilities, but its size, shape, and weight would increase the Comanche's radar signature and drag, reducing its stealth, range, and maneuverability. Although the Army has not yet decided on the shape of the radar, it expects the radar would reduce the Comanche's cruising speed by about 11 knots. Program office officials could not tell us to what extent adding the radar, wings, and external fuel tanks would impact the Comanche's overall performance.

Other weight increases would further reduce the Comanche performance capabilities, such as range, vertical rate of climb, endurance, cruising speed, maneuverability, and agility. Because it recently added 132 pounds of additional equipment to meet new operational requirements, the Army raised the Comanche's empty weight design goal from 8,690 to 8,822 pounds and lowered the required range for deploying without refueling from 1,260 to 1,206 nautical miles.

The Army currently has a weight reduction program in place for the Comanche. However, the Comanche Combined Test Team, which was set up to manage testing under the development program, noted in August 1998 that implementing changes to the aircraft to address problems

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discovered during developmental testing would make it very difficult not to increase the aircraft's weight. Because of its continuing concern over weight growth, the program office is now planning to modify the Comanche's rotor to provide more lift capability.

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## Restructured Program Will Not Meet Funding Objective

According to the Cost Analysis Improvement Group's evaluation of the restructured program's planned cost estimates, the Army will not meet the Comanche program's developmental funding objective. The Army acknowledges that it will not achieve its goal of executing the Comanche's restructured development program within the planned funding estimate of about \$4.4 billion for fiscal years 1999 through 2006.

The Army's Cost and Economic Analysis Center, which determines the Army's official cost position, concluded that allowing for inflation, the program office's \$4.4-billion estimate was reasonable. But DOD's Cost Analysis Improvement Group concluded that the estimate was generally optimistic and that the restructured program would require \$4.55 billion, about \$150 million (3.4 percent) more than the program office estimated. The Group also said that if funding was not increased, a 6- to 12-month program delay would occur, adding between \$275 million and \$425 million to program costs.

The Group noted significant differences between its estimate of Comanche funding requirements and the Army's for fiscal year 2000 and in four of the six following fiscal years. For example, the Army estimated funding requirements for fiscal year 2000 and 2001 at \$433 million and \$574 million, respectively. The Group estimated these requirements at \$484 million and \$657 million, or \$134 million more for the 2 years. The Group believes that more funding for the Comanche's airframe and mission equipment package development is needed in fiscal years 2000 and 2001, before fabrication and assembly. The program office, however, believes the funds could be made available after fabrication and assembly and that the total shortfall may only be \$109 million.

Since the Group made its assessment in 1998, DOD has reduced proposed funding for the development program to reflect inflation rate decreases. According to the program office, the reduction aggravates the funding shortfall and, as a result, its assessment of the cost risk has increased from low to moderate. At the time of our review, the program office noted that the funding reduction could result in one preproduction aircraft being eliminated, deliveries of other aircraft being delayed, and the initial

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operational capability date being delayed. The program office has since signed a Memorandum of Understanding with the Comanche developers defining the engineering and manufacturing development phase. It will include the design and fabrication of 13 rather than 14 preproduction aircraft. While this may decrease cost risks, it will further increase the risks that the flight-test program will not be completed on time with all necessary test points achieved. The program office also plans to increase the average monthly flight-test hours from 17 to 18 per aircraft and further delay delivery and flight testing of the preproduction aircraft by several more months.

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## Impact of Comanche on Army's Aviation Modernization

The Army continues to single out the Comanche as the centerpiece of its aviation modernization strategy. As development and production costs increase, the Comanche's share of the Army's overall aviation budget also increases. In 1994, we reported that the Army had chosen to use most of its available aircraft modernization resources to procure the Comanche helicopter and upgrade the Apache, thus forcing the Army to retain aging utility and cargo aircraft.<sup>9</sup> According to the 1998 Army aviation modernization plan, the Comanche is still the centerpiece, and "older, obsolescing aircraft will remain in the inventory into the foreseeable future."

The plan points out that "continued pressures on the defense budget have forced the Army to trade off aviation modernization requirements . . . and consider reduced aircraft resourcing strategies." According to program office officials, the plan was developed as the best balance between capabilities and resources, and while it is not the preferred approach, it is the optimum one based on available resources. In December 1998, the program office estimated that while the Army's aviation budget would fluctuate from fiscal year 1999 through 2008, the Comanche's share of the budget would consistently increase. For example, while the Army aviation budget was estimated to decrease from \$2 billion to \$1.9 billion between fiscal year 1999 and 2000, the Comanche's share of the budget would increase from \$368 million to \$433 million or from 19 percent to 23 percent of the Army's aviation budget. The Comanche's share of the total projected Army aviation budget of \$3.3 billion is expected to rise to about 64 percent in fiscal year 2008, when its annual production cost would be over

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<sup>9</sup>Army Aviation: Modernization Strategy Needs to Be Reassessed (GAO/NSIAD-95-9, Nov. 24, 1994).

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\$2 billion. Various Army aviation officials provided the following examples of how the Comanche's funding requirements have impacted modernization efforts in other Army aviation programs.

- The Army decided to reduce the number of advanced Apache Longbow helicopters it plans to upgrade from 758 to 530 and end that program earlier than planned because it could not afford to have a second production line in progress when Comanche initial production starts in 2005.
- The Army will not achieve its utility helicopter requirements because of funding imbalances in the Army's 1998 aviation modernization plan. The plan identified an unfunded requirement for an additional 90 Black Hawk helicopters to fill shortages in the Army's utility helicopter fleet. But because of its inability to fund its requirement for new utility helicopters, the Army has decided to keep the Huey helicopter in service until at least fiscal year 2020. In its report accompanying the Fiscal Year 1998 National Defense Authorization Bill, the Senate Armed Services Committee noted that utility helicopter requirements were identified but not resourced in a balanced manner and cited the readiness of the National Guard utility fleet as a serious concern. In 1994, we reported that as a consequence of its strategy to develop the Comanche, the Army had decided against funding other aviation program requirements, including modernization of the Huey light utility helicopter. Since then, the Army has had to ground its Huey helicopters on two occasions because of safety concerns.
- As a stop gap measure until the Comanche is fielded, the Army procured a limited number of Kiowa Warrior helicopters to provide reconnaissance capability until fiscal year 2009, when the Army planned to transfer the Kiowa Warrior to the reserves. Although the Kiowa Warrior has operational deficiencies, the Army now plans to retain it in the active forces until fiscal year 2022 because there will not be enough Comanche helicopters to replace them. According to the 1998 Army aviation modernization plan, "long-term retention of these aircraft will require safety and sustainment upgrades to keep these aircraft viable. The Army estimates that a minimum of 190 aircraft will require additional refurbishment beyond what is currently planned. A Kiowa Warrior program office official said that the Army has not requested funding for the Kiowa Warrior since 1988, and does not plan to request funding for future refurbishment upgrades for the 190 aircraft, which are estimated to cost about \$1.7 billion.

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## Conclusions

The Comanche's restructured program continues to contain significant risks of cost overruns, schedule delays, and reduced performance. The program is proceeding into product development without some key technologies being mature and prior to critical mission equipment and component capabilities being integrated and tested in the aircraft. The Army is proposing changes to the aircraft that will increase, to an unknown degree, the risk that some key performance capabilities will not be met. It is also proceeding into product development when uncertainties and risks are high and not consistent with best practices of commercial firms. To pay for the program, the Army has reduced the number of advanced Apache Longbow helicopters it plans to modify and is buying and upgrading fewer other replacement aircraft. This will force the Army to retain older aircraft for a longer period of time.

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## Recommendations

We recommend that the Secretary of Defense reevaluate the Army's decisions to (1) accelerate the Comanche program's milestone II decision and (2) implement a development program with high concurrency. The reevaluation should demonstrate how the Army specifically plans to:

- minimize the risk associated with the technology being developed for inclusion in the mission equipment package prior to the milestone II decision and
- ensure that major mission equipment package systems can be successfully integrated and tested in the Comanche in order to meet developmental and operational test schedule requirements.

We also recommend that the Secretary of Defense require the Secretary of the Army, before the milestone II decision, to evaluate and report on the extent to which increased operational requirements and weight growth would impact key performance capabilities, such as stealth and maneuverability, and how the Army intends to manage the program's cost and schedule to accommodate any adverse impacts, if found.

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## Agency Comments and Our Evaluation

DOD partially concurred with our first recommendation calling for a Secretary of Defense reevaluation of the Army's plans. It noted that it exercises oversight of the Comanche program through the DOD acquisition process. Further, it considered the acceleration of the milestone II decision, as well as the program manager's approach to the management of risk and concurrency, to be prudent and appropriate at this point in

program development. Specifically, DOD noted that integrated product teams review the issues raised in our first recommendation on a recurring basis and that the overarching integrated product team will revisit them again at least two more times before the milestone II decision. DOD believes the overarching product team reviews comply with our recommendations.

DOD also partially concurred with our second recommendation calling for an evaluation and report, prior to the milestone II decision, on the impact of increased operational requirements and weight growth on the program's cost, schedule, and performance. DOD stated that the Army has been directed to ensure that upgraded operational requirements are reviewed by the Joint Requirements Oversight Council prior to the milestone II decision. DOD further stated that the program's overarching integrated product team will consider all the issues mentioned in the recommendation prior to the milestone II decision and that no additional report is required to satisfy the recommendation.

We recognize that integrated product teams and overarching integrated product teams are an integral part of DOD's acquisition oversight and review process. However, we are concerned that the oversight and review process continues to accept program plans that contain significant risks that are not generally accepted by leading commercial firms. Accordingly, as DOD undertakes its reviews of the program, we plan to continue monitoring the results of these reviews.

DOD's comments are reprinted in appendix I. DOD also provided some technical comments, which we incorporated in the report where appropriate.

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## Scope and Methodology

To assess the risk in the Army's plans for developing and testing the Comanche, we examined and compared program schedules, acquisition plans, and acquisition strategies and discussed potential changes with Comanche program officials. We reviewed flight-test plans schedules and reports and discussed key issues with program officials. We reviewed program documents related to risk and analyzed program risks and development problems by comparing them with various test schedules and plans.

To assess changes in performance capabilities and requirements, we analyzed actual and projected performance and compared it with the

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Comanche's operational requirements, system specifications, and projected mission scenarios. We also obtained and evaluated Army documents describing the way the Army plans to operate in the future. We compared the Comanche's planned capabilities against the operational plans identified in those documents.

To assess the status of current cost estimates for the Comanche, we reviewed program documentation, interviewed officials, and performed analyses of program costs. Our analyses focused on the impact of restructuring decisions on the Comanche program. To assess the Comanche's impact on the Army's overall aviation modernization efforts, we reviewed program documents, interviewed officials, and performed analyses of the program's impact on the Army's overall aviation plans. Our analyses focused on the impact of the Comanche's costs on the Army's ability to procure other aircraft and incorporate technological upgrades in its helicopter fleet.

In performing our work, we obtained documents and interviewed officials from the Offices of the Secretary of Defense and of the Army, Washington, D.C.; the U.S. Army Aviation and Missile Command, Huntsville, Alabama; the Training and Doctrine Command and the Aviation Technical Test Center, Fort Rucker, Alabama; the Operational Test and Evaluation Command, Alexandria, Virginia; the Evaluation Analysis Center, Aberdeen, Maryland; the Boeing-Sikorsky Joint Project Office, Philadelphia, Pennsylvania; and the Longbow-Limited Corporation, Baltimore, Maryland.

We conducted our review from April 1998 to May 1999 in accordance with generally accepted government auditing standards.

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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 of this report to Senator John W. Warner, Chairman, and Senator Carl Levin, Ranking Minority Member, Senate Committee on Armed Services; Representative Floyd D. Spence, Chairman, and Representative Ike Skelton, Ranking Minority Member, House Committee on Armed Services; Senator Ted Stevens, Chairman, and Senator Robert C. Byrd, Ranking Minority Member, Senate Committee on Appropriations; and Representative C.W. Bill Young, Chairman, and Representative David R. Obey, Ranking Minority Member, House Committee on Appropriations. We are also sending copies of this report to the Honorable William Cohen, Secretary of Defense; the Honorable Louis

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Caldera, Secretary of the Army; and the Honorable Jacob Lew, Director, Office of Management and Budget. Copies of this report will be made available to others on request.

If you have any questions regarding this report, please contact me on (202) 512-4841. GAO contacts and key contributors to this report are listed in appendix II.

Sincerely yours,

A handwritten signature in black ink that reads "Louis J. Rodrigues". The signature is written in a cursive style with a large, looping initial "L".

Louis J. Rodrigues  
Director, Defense Acquisitions Issues

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# Comments From the Department of Defense



ACQUISITION AND  
TECHNOLOGY

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON  
WASHINGTON DC 20301-3000

21 JUL 1999

Mr. Louis Rodrigues  
Director, Defense Acquisitions Issues  
National Security and International Affairs Division  
U.S. General Accounting Office  
Washington, D.C. 20548

Dear Mr. Rodrigues:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "DEFENSE ACQUISITIONS: Comanche Program Cost, Schedule, and Performance Status," dated June 14, 1999 (GAO Code 707348/OSD Case 1842). The DoD partially concurs with the recommendations in the draft report. We continue to exercise oversight of the Comanche program through the DoD acquisition process and consider the acceleration of the Milestone II decision, as well as the Program Manager's (PM) approach to the management of risk and concurrency, to be prudent and appropriate at this point in program development. Our comments regarding the GAO's recommendations are attached. Further detailed comments on the report have been provided separately.

The DoD appreciates the opportunity to comment on the draft report.

A handwritten signature in cursive script that reads "George R. Schneiter".

George R. Schneiter  
Director  
Strategic and Tactical Systems

Attachment



General Accounting Office Draft Report  
"DEFENSE ACQUISITIONS: Comanche Program Cost,  
Schedule, and Performance Status,"  
Dated June 14, 1999  
(GAO Code 707348/OSD Case 1842)

DEPARTMENT OF DEFENSE COMMENTS TO  
THE GAO RECOMMENDATIONS

**RECOMMENDATION 1:** The GAO recommended that the Secretary of Defense reevaluate the Army's decisions to (1) accelerate the Comanche Program's Milestone II and (2) implement a development program with high concurrency. The reevaluation should demonstrate how the Army specifically plans to:

- Minimize the risk associated with the technology being developed for inclusion in the mission equipment package prior to the Milestone II decision, and
- Ensure that major mission equipment package systems can be successfully integrated and tested in the Comanche in order to meet developmental and operational test schedule requirements. (P. 17/Draft Report)

**DOD RESPONSE:** Partially concur. The DoD Acquisition Process formally addresses, as core management issues or elements thereof, all of the concerns contained in Recommendation 1. In addition, such issues are considered on a recurring basis during each acquisition phase by integrated product teams (IPT), and in reviews by the Overarching IPT (OIPT). In the case of the Comanche Program, the OIPT has considered the issues contained in Recommendation 1 twice in the past 12 months and will revisit them at least two more times before the DAB considers the Milestone II decision in March 2000. Acceleration of the Milestone II decision, as well as the PM's approach to the management of risk and concurrency, is considered prudent and appropriate at this point in program development. The OIPT's review of the Comanche program satisfies Recommendation 1.

**RECOMMENDATION 2:** The GAO also recommended that the Secretary of Defense require the Secretary of the Army, before the Milestone II decision, to evaluate and report on the extent to which increased operational requirements and weight growth would impact key performance capabilities, such as stealth and maneuverability, and how the Army intends to manage the program's cost and schedule to accommodate any adverse impacts, if found. (P. 17/Draft Report)

**DOD RESPONSE:** Partially concur. The Army has been directed to ensure that the updated Operational Requirements Document is reviewed by the Joint Requirements Oversight Council prior to Milestone II. As with Recommendation 1, all the issues mentioned in Recommendation 2 will be considered by the OIPT prior to Milestone II and, if necessary, by the DAB during the Milestone II decision meeting. No additional report will be required to satisfy this recommendation.

See pp. 13 and 14.

See pp. 13 and 14.

# GAO Contacts and Staff Acknowledgments

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## GAO Contacts

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In addition to those named above, Raymond W. Allen, Leon S. Gill, William E. Petrick, Jr., and John P. Swain made key contributions to this report.

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