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The Advanced Attack Helicopter is being developed to defeat a wide range of targets, including tanks and other armored vehicles, and will become the Army's primary attack helicopter in the mid-1980's. Findings/Conclusions: The program cost estimate was \$3.58 billion at September 30, 1976, an increase of \$748 million from the prior year and almost double the original cost estimate. The current program unit cost for each of the 536 helicopters is estimated to be about \$6.6 million. This estimate does not include several items required for the helicopters to destroy targets, including Hellfire missile development and procurement costs of \$735 million. The Advanced Attack Helicopter program has undergone numerous changes--mostly in the last year--in cost, schedule, and technical characteristics. Costs increased; schedules were extended; and new equipment was added. Because of these changes, the success of the program now also depends upon the concurrent successful development of the Hellfire missile, the Target Acquisition and Designation System, and new 30-millimeter ammunition. Recommendations: The Congress and the Secretary of Defense should closely examine the status of Hellfire missile and other supporting subsystems when evaluating the Advanced Attack Helicopter program. The Army should make adjustments to allow for additional development time and cost increases caused by the changes in the program. (Author/SC)

02151



REPORT TO THE CONGRESS

*BY THE COMPTROLLER GENERAL
OF THE UNITED STATES*

Status Of Advanced Attack Helicopter Program

Department of the Army

The Advanced Attack Helicopter is being developed to defeat a wide range of targets including tanks and other armored vehicles. The Army plans to buy 536 helicopters for about \$6.6 million each.

During the past year, the program has changed, increasing costs. The primary change was the decision to use the Hellfire missile, which is also being developed. The Advanced Attack Helicopter program now depends upon concurrent successful development of the Hellfire missile and supporting subsystems. The Army has been optimistic in assessing the impact of program changes.

The Congress and the Secretary of Defense should closely examine the status of the Hellfire missile and other supporting subsystems when evaluating the Advanced Attack Helicopter program.



COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

E-163058

To the President of the Senate and the
Speaker of the House of Representatives

This report presents our views on the major issues of the Advanced Attack Helicopter Program. For the past several years we have annually reported to the Congress on the status of selected major weapons systems. This report is one of a series of 29 reports that we are furnishing this year to the Congress for its use in reviewing fiscal year 1978 requests for funds.

A draft of this report was reviewed by agency officials associated with the program and their comments are incorporated as appropriate.

We made our review pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

We are sending copies of this report to the Director, Office of Management and Budget, and the Secretary of Defense.

A handwritten signature in black ink, appearing to read "R. G. ...".

ACTING Comptroller General
of the United States

D I G E S T

The Advanced Attack Helicopter will become the Army's primary attack helicopter in the mid-1980s. The Army awarded a contract in December 1976 for full-scale development of the aircraft, which is designed to provide heavier, more accurate fire support; increased agility; and greater lift capability than existing attack helicopters. It is expected to defeat a wide range of targets, including tanks and other armored vehicles.

The program cost estimate was \$3.58 billion at September 30, 1976, an increase of \$748 million from the prior year and is almost double the original cost estimate. Program unit cost for each of 536 helicopters is estimated to be \$6.6 million. This estimate does not include several items required for the helicopters to destroy targets, including Hellfire missile development and procurement costs of \$735 million. (See p. 4.)

The Advanced Attack Helicopter program has undergone numerous changes--mostly in the last year--in cost, schedule, and technical characteristics. Costs increased, schedules were extended, and new equipment was added, as shown below.

--In February 1976 the Defense Systems Acquisition Review Council confirmed the Army's decision to use the Hellfire missile on the Advanced Attack Helicopter as a replacement for the tube launched, optically tracked, wire-guided missile. (See p. 8.)

--In March 1976 the Office of the Secretary of Defense directed that a new type of 30-millimeter ammunition be developed to replace the existing ammunition. This will cause modifications to the 30-millimeter automatic gun and will reduce

the number of rounds carried from 500 to 320 because the new ammunition is heavier. (The Army previously reduced the number of rounds from 800 to 500 when it decided to use the Hellfire missile on the Advanced Attack Helicopter.) (See pp. 8 and 11.)

--In May 1976 the Senate Armed Services Committee recommended that a Target Acquisition Designation System, including Pilot Night Vision System be competitively developed as part of the Advanced Attack Helicopter program. The Army plans to award development contracts in March 1977. The project manager estimates that competitive development of these two systems will cost about \$100 million more than single source development. (See pp. 9 and 10.)

--To improve the Advanced Attack Helicopter's ability to hit targets, the Office of the Secretary of Defense approved, in August 1976, the Army's plan to incorporate direct view optics in the Target Acquisition and Designation System. (See p. 10.)

--Research and development costs increased \$322.9 million during the past year and totaled \$843.6 million as of September 30, 1976. The primary reason for the increase was the changes required to incorporate the Hellfire missile and its supporting subsystems. (See pp. 3 to 4.)

--Procurement costs increased \$425.2 million during the past year and totaled \$2.74 billion as of September 30, 1976. (See p. 3.)

--The Army has added 9 months to the development schedule to allow for changes made during 1976. (See p. 5.)

Because of these changes, success of the program now also depends upon concurrent successful development of the Hellfire missile, the Target Acquisition and Designation System, and new 30-millimeter ammunition.

GAO recommends that the Congress and the Secretary of Defense closely examine the status of Hellfire missile and other supporting subsystems when evaluating the Advanced Attack Helicopter program.

GAO believes the Army has been optimistic in assessing the effects of cost, schedule, and performance changes on the program, and should make adjustments to allow for additional development time and cost increases.

In January 1977 the Army said the development effort will be extended 5 months and will reflect additional program costs of about \$175 million--about \$92 million for research and development and \$83 million for additional procurement cost. The Army believes this adjustment will make reported cost and schedule data realistic and attainable.

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ABBREVIATIONS

AAH	Advanced Attack Helicopter
ASH	Advanced Scout Helicopter
GAO	General Accounting Office
PNVS	Pilot Night Vision System
SAR	Selected Acquisition Report
TADS	Target Acquisition Designation System
TOW	tube-launched, optically tracked, wire-guided missile



ADVANCED ATTACK HELICOPTER (AAH)

(PHOTO COURTESY OF U.S. ARMY.)

CHAPTER 1

INTRODUCTION

The Advanced Attack Helicopter (AAH) will become the Army's primary attack helicopter in the mid-1980s. It will be complemented by the existing Cobra attack helicopters and the planned scout helicopters. AAH is a twin-engined aircraft which recently completed competitive engineering development. The development program is comprised of two phases: Phase 1--competitive airframe development and Phase 2--subsystem development testing and integration. The contractors, Bell Helicopter Textron and Hughes Helicopters, each developed two flyable prototypes and one ground test vehicle. Both contractors' helicopters and the Army's new utility helicopter are powered by General Electric T-700 engines.

Phase 1 flight testing was performed October 1975 through September 1976. The Hughes prototypes accumulated 488 flight hours and the Bell prototypes accumulated 465 flight hours. Included were approximately 120 hours of competitive flight testing by each contractor. The test results were used to select the Phase 2 prime contractor.

Source selection has been completed and a Phase 2 development contract totaling \$317.4 million was awarded to Hughes Helicopters on December 10, 1976. This phase will continue through February 1981.

RELATIONSHIP TO OTHER HELICOPTER SYSTEMS

The Army will use the AAH with existing Cobra attack helicopters. The AAH will provide heavier and more accurate fire support and will have greater payload and agility under increased temperature/altitude conditions than existing helicopters. The aircraft will have night and adverse weather capability. It will be less vulnerable to enemy fire because of greater maneuverability, armor protection, dual flight components, and the increased capabilities of the Hellfire missile.

Plans call for the AAH to operate autonomously or together with the proposed Advanced Scout Helicopter (ASH). The ASH would search, locate, and report the presence of enemy materiel and personnel. It would acquire and designate targets for Hellfire missiles, permitting the AAH to stay out of range of enemy air defenses, reduce its vulnerability, and increase its effectiveness.

The Army envisions buying 723 ASHs, costing about \$2.5 billion. For fiscal year 1977 the Army requested \$26.0 million for the ASH program; however, the Congress disapproved the request. The Army advises that due to cost considerations plans are being made to modify an existing observation helicopter to satisfy the ASH requirement. This modified helicopter will become an interim scout helicopter. The Army has requested \$19 million in fiscal year 1978 and plans to request \$15 million in fiscal year 1979 to support this program.

SCOPE OF REVIEW

The data presented in this report is based on interviews and review of records at the AAH Project Manager's Office; the Army Missile Command; and Headquarters, Department of the Army.

CHAPTER 2

COST, SCHEDULE, AND TECHNICAL PERFORMANCE

The AAH program has undergone numerous changes that have caused research and development costs to double, the schedule to increase by 21 months, and reductions in the primary mission payload of 30-millimeter ammunition. This change was made to obtain the improved combat effectiveness that will be provided by the Hellfire missile.

COST

The program cost in escalated dollars was estimated at \$3.58 billion in the September 30, 1976, Selected Acquisition Report (SAR)--an increase of \$748 million from the prior year--and has almost doubled since the original cost estimate. The program cost estimate is being revised to reflect the contract award made in December 1976 and may be revised again after the March 1977 contract to develop the designator system is awarded.

The procurement cost was estimated at \$2.74 billion as of September 30, 1976. This was an increase of \$425.2 million from the prior year estimate of \$2.31 billion. Reasons for the increase were:

	(millions)
Economic escalation	\$ 37.1
Production schedule slips	56.8
Production quantity increase from 472 to 536	<u>331.3</u>
Total	<u>\$425.2</u>

Program unit cost increased from a 1973 planning estimate of \$3.7 million to an estimate of \$6.6 million as of September 30, 1976. The design-to-cost goal for each helicopter is estimated to be \$3.8 million.

The research and development cost was estimated at \$843.6 million at September 30, 1976. This was an increase of \$322.9 million from the prior year estimate. The primary reason for the increase was changes required to incorporate the Hellfire missile and its supporting subsystems.

The following table shows the change made to the September 30, 1975, estimate of \$520.7 million to arrive at the current \$843.6 million estimate of research and development costs.

	Escalated dollar <u>estimate</u>
	(millions)
September 30, 1975, estimate	<u>\$520.7</u>
Current changes:	
Deletion of funds provided for long leadtime items	24.8
Program change (Hellfire)	67.3
Economic escalation	20.0
Contractor cost overrun	14.6
Program change (TADS and PNVS) (note a)	176.5
Phase 2 schedule slip for addition of Hellfire and TADS/PNVS	19.0
Program change (ADEN/DEFA ammunition) (note b)	0.9
Return of prior year funds	<u>-0.2</u>
Subtotal	<u>\$322.9</u>
September 30, 1976, estimate	<u>\$843.6</u>

a/Target Acquisition and Designation System and Pilots Night Vision System,

b/Type of 30-millimeter ammunition.

The AAH program cost estimate of \$3.58 billion does not include the following items which are required to provide AAH capability.

--Hellfire development and procurement costs of \$735 million, which are reported on a separate SAR.

--New 30-millimeter ammunition development and procurement costs, of which development costs alone are about \$9 million. (See pp. 10 and 11.)

--Designator procurement, costs of approximately \$3 million.

--Funds to purchase two additional Target Acquisition Designation Systems, that are estimated to cost \$3.9 million.

The Army advised that the last two items will be included in the cost reported in the December 31, 1976, SAR.

Contractors' overruns

The contractors have incurred a \$60.5 million cost overrun at contract completion. An approved reprogramming of \$14.6 million in fiscal year 1976 covered a portion of this overrun. We were told the funds for the remaining overrun came primarily from reserves built into the program estimates. Because of the shortage of funds, the Army allowed both contractors to defer development work until after the full-scale development contract was awarded.

Status of design-to-cost

The Army's design-to-cost goal is \$1.7 million unit flyaway cost in fiscal year 1972 constant dollars or \$3.8 million in escalated dollars. The Project Office believes the \$1.7 million goal is achievable and that changes to the Hellfire, TADS and PNVs, and the new ammunition will not cause the design-to-cost goal to be exceeded. The Army advised they plan to review the design-to-cost goal after the contract to develop the designator system is awarded.

SCHEDULE

The engineering development schedule was extended 9 months due to the addition of the Hellfire and TADS and PNVs to the AAH program. This extended the schedule a total of 21 months since the development contracts were awarded.

Some of the additional schedule milestones established in the Phase 2 contract award are:

	<u>Month/year</u>
Phase 2 contract award	12/76
Competitive TADS/PNVs contract award	3/77
First flight of a full system vehicle	11/78
Selection of TADS/PNVs contractor	12/79
Completion of operational testing	2/81
Production contract award	6/80

The Project Office was assessing schedule risk, but the results were not available at the conclusion of our review.

TECHNICAL PERFORMANCE

The following are the Army estimates of AAH performance as of December 1976.

	<u>Army requirement</u>	<u>Phase 2 estimated performance</u>
Cruise speed (knots)	145	146
Vertical rate of climb (feet per minute)	450	700
Primary mission endurance (hours)	1.83	1.83
Primary mission gross weight (pounds)	less than 16,000	13,910

These estimates are based on operating conditions of 4,000 feet, 95 degrees Fahrenheit with 95-percent intermediate rated power, and a primary mission payload of 8 Hellfire missiles and 320 rounds of 30-millimeter ammunition. The number of rounds of 30-millimeter ammunition was reduced from 800 rounds to 320 rounds because of the weight penalties resulting from the addition of the Hellfire and the new 30-millimeter ammunition. The Army advised the AAH will have the capability to carry 1,200 rounds of ammunition when climatic conditions or other tradeoffs made to reduce aircraft weight permit carrying this number of rounds.

Reliability and maintainability requirements are not planned to be fully demonstrated during engineering development, because the number of flight hours available during this phase is not sufficient to prove these requirements. Army plans call for these requirements to be demonstrated during the first 2 years of production.

CONCLUSION AND RECOMMENDATION

The AAH program has undergone numerous changes, mostly in the last year. Program cost, schedule, and technical characteristics have been revised considerably. Because of these changes, the AAH program is now dependent upon concurrent successful development of the Hellfire missile, TADS and PNVS, and new 30-millimeter ammunition.

We recommend that the Congress and the Secretary of Defense closely examine the status of the Hellfire missile and other supporting subsystems when evaluating the AAH program.

CHAPTER 3

SUBSYSTEM DEVELOPMENT

The success of the AAH program may be affected by the development of subsystems that will provide the increased capability over existing attack helicopters. The Hellfire missile, which is in development, has encountered seeker problems resulting in delivery delays. Problems are being experienced with several laser designator candidates which we believe makes timely availability of the TADS for the integrated AAH testing program questionable. The status of the TADS and PNVIS, the new ammunition, and the direct view optics are uncertain at this time because development contracts have not yet been awarded.

HELLFIRE

The Hellfire is a helicopter-launched terminal homing missile system that uses a semiactive laser seeker. The missile will be guided by laser designation autonomously from the AAH or remotely from another helicopter or ground equipment. The laser seeker used on the missile is being developed for the Air Force by Rockwell International Corporation.

In February 1976 the Defense Systems Acquisition Review Council confirmed the Army's decision to use the Hellfire missile on the AAH as a replacement for the tube-launched, optically tracked, wire-guided missile (TOW). This action that was taken to increase the AAH mission capability added an estimated \$67.2 million to AAH development cost for airframe integration, extended the development schedule for 6 months, and reduced the number of rounds of 30-millimeter ammunition that will be carried on the aircraft. On October 8, 1976, the Army awarded a contract for approximately \$66.7 million to Rockwell International Corporation for Hellfire engineering development. This cost and related Hellfire development and procurement costs totaling \$735 million are not reported as part of the AAH estimate program cost.

The Hellfire added about 400 pounds to the AAH, depleting available weight reserves. To compensate, the Army reduced the primary mission payload from 800 rounds to 500 rounds of 30-millimeter ammunition. The primary mission payload has been further reduced to 320 rounds by the decision to use new ammunition. (See p. 11.)

Laser seeker

The Hellfire seeker has unresolved development problems which we believe could affect the AAH schedule and technical performance. Because of these development problems, the Army has been unable to obtain seekers on schedule. Seekers are being accepted with deficiencies and are being modified for Hellfire use. The Army believes these problems will not affect the AAH program because of the time available before they are needed for AAH testing.

The Army will receive a total of 51 seekers currently contracted for by the Air Force which is lead Service for this tri-service seeker. The first 25 seekers were to be delivered by June 1976. As of September 1976, the contractor had delivered 2 seekers and the remaining 23 will be delivered in April, August, and September of 1977. All 25 seekers will be accepted by the Army with known deficiencies. The Army is to receive an additional 26 seekers from the Air Force starting in November 1977. The 26 additional seekers are configured to Air Force requirements and must be modified for Hellfire use at an estimated total cost of \$185,000 to \$250,000. The Army believes the schedule delays will not affect the AAH program.

Target Acquisition Designation System and Pilot Night vision System

The TADS and PNVS subsystems added an estimated \$195.5 million to development cost and extended the Phase 2 development schedule by 3 months. Development problems with laser designator candidates may cause a redesign of existing designators or a new laser designator development program. Either could further delay the AAH schedule.

Although they are two subsystems, the TADS and PNVS will be developed together and are considered one unit for contractual purposes. The subsystems will provide the required target designation for the Hellfire missile and night flying capability for the pilot. These subsystems provide the capability to locate, track, range, designate, and engage targets.

The Senate Armed Services Committee recommended the TADS and PNVS be competitively developed for the AAH. Program responsibility was placed on the AAH Project Office. In implementing this recommendation, the Army will select two contractors in March 1977 who will be designated subcontractors to Hughes Helicopters. The Congress provided fiscal

year 1977 funds for TADS and PNVs development by transferring \$18.7 million from the ASH program to the AAH program and recommending that the Army use \$10.0 million of prior year ASH funds.

The Project Manager estimates that competitive development of TADS and PNVs will cost \$100 million more than single source development.

Designator problems

Development problems and delivery delays have made the availability of a laser designator for the TADS questionable. There are three designator candidates that could be considered for the subsystem. All require redesign, either to (1) correct technical problems or (2) reduce weight and size. The Project Office considered only one of these to be a viable candidate. However, this candidate, which is used in another Army designator system, is experiencing technical problems which make its availability for AAH testing questionable.

Army personnel from the Precision Laser Designator office stated it is unlikely that a laser designator will be available in time for the AAH test program. The program requires TADS deliveries in August 1978, 18 months after selection of the TADS and PNVs competitive contractors. The personnel stated this was optimistic, because a similar designator system took 24 months for first delivery.

Direct view optics

Direct view optics are needed to improve the AAH target acquisition capability, providing greater clarity and field of view at ranges of 3,000 to 4,000 meters. On August 13, 1976, the Office of the Secretary of Defense approved the Army's plans to incorporate direct view optics in the TADS at an estimated cost of \$7.7 million. The Army will provide the funds starting in fiscal year 1978. The Project Office stated there is no schedule risk associated with this program change; however, personnel from the Precision Laser Designator office stated, and we believe, this action will add risk to the AAH schedule.

ADEN/DEFA AMMUNITION AND 30-MILLIMETER GUNS

In March 1976 the Office of the Secretary of Defense directed the Army to use a type of 30-millimeter ammunition,

referred to as "ADEN/DEFA" in the AAH because of congressional guidance and potential advantages of standardization among countries in the North Atlantic Treaty Organization. This action interjected another development effort in the program, increased AAH development costs by \$2.1 million, and further reduced the 30-millimeter firepower capability of the aircraft for the primary mission. The AAH Project Manager has development responsibility for the new ammunition. The ammunition will replace the "WECOM-30" ammunition, for which the Army has spent approximately \$7.8 million on procurement, gun development, and testing for the AAH program.

During Phase 1, both contractors developed a 30-millimeter gun for AAH use. During 1976 tests were performed on both guns using the WECOM-30 ammunition. The test results were not provided to us; however, the Army said the test results supported the selection of Hughes chain gun for Phase 2 development. The gun will be modified to use ADEN/DEFA ammunition.

Existing ADEN/DEFA ammunition does not meet Army requirements for a high explosive dual purpose antipersonnel/armor piercing cartridge housed in an aluminum case. As a result, a new ammunition will be developed. The Army estimates that \$9 million will be needed for the research and development effort.

The change to the new ammunition will add about 168 pounds to the AAH. To achieve the required performance, the Army reduced the ammunition payload from 500 to 320 rounds of 30-millimeter ammunition. The Army had previously reduced the ammunition payload from 800 to 500 rounds because of the Hellfire program change. (See p. 8.)

CONCLUSION

Subsystem changes involving the Hellfire missile, TADS and PNVIS, and a new 30-millimeter ammunition have increased development risk and lengthened the development schedule. Development problems with the seeker and laser designator candidates are unresolved, and we believe the timely availability of the TADS for the AAH testing program is questionable. The Army believes the AAH program will not be affected by the seeker and designator problems.

We believe the Army has been optimistic in assessing the impact of these changes on the AAH program. In our

opinion, the current plan will have to be adjusted to allow for additional development time and increased costs.

In January 1977 the Army said that the December 31, 1976, Selected Acquisition Report that will be issued in February 1977 will show that the development effort has been extended 5 months and will reflect additional program costs of about \$175 million. About \$92 million of the increase is for research and development and the remaining \$83 million is additional procurement cost. The Army believes that this adjustment will make report cost and schedule data realistic and attainable.