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U.S. GENERAL ACCOUNTING OFFICE

STAFF STUDY

[ ADVANCED ATTACK HELICOPTER ]

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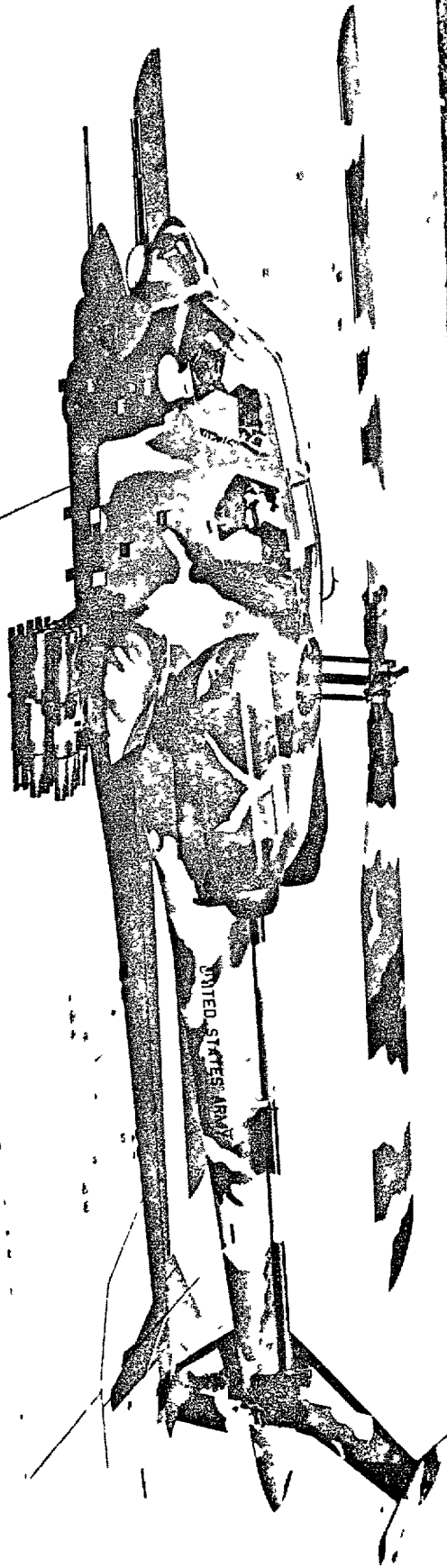
DEPARTMENT OF THE ARMY

MARCH 1974

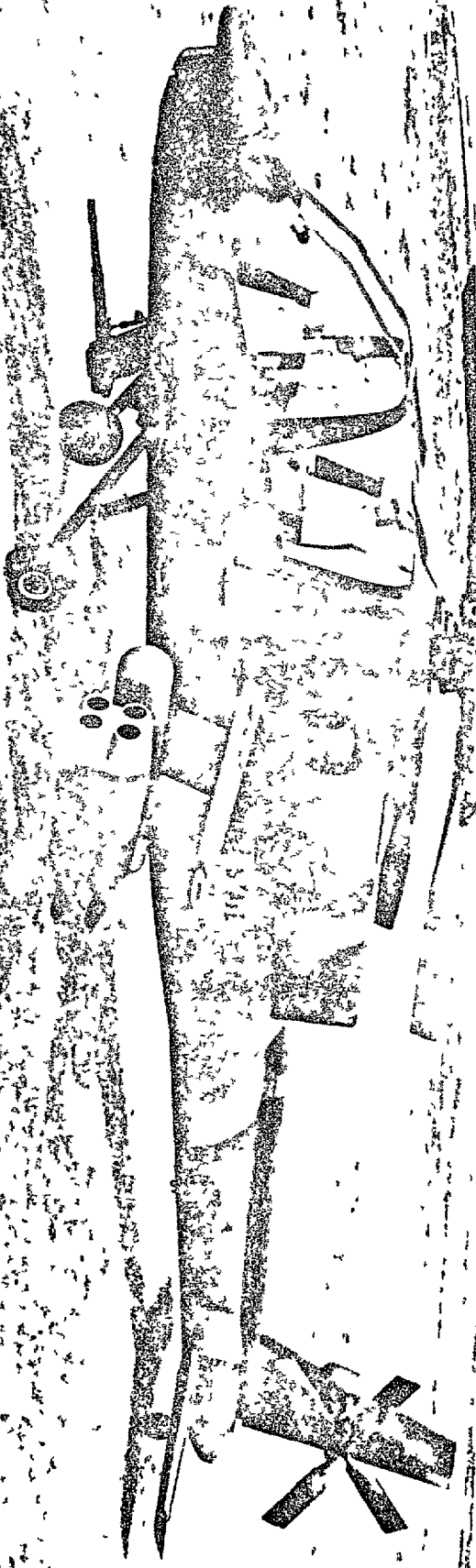
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## A B B R E V I A T I O N S

AAH	Advanced Attack Helicopter
DOD	Department of Defense
FY	Fiscal Year
SAR	Selected Acquisition Report
TOW	Tube-launched, Optically-tracked, Wire-command Link Guided Missile System
FPM	Feet Per Minute

## SUMMARY

### SYSTEM DESCRIPTION AND STATUS

The AAH is a twin-engine helicopter designed as a manned-aerial weapons system. The Army envisions it will be capable of defeating a wide range of targets and of performing its mission at night and under adverse weather conditions. The AAH will also be an integral element of ground units and will contribute mobile and effective firepower to the anti-armor capability of the Army in the field. It is now in the validation phase and is undergoing engineering development.

### COMING EVENTS

During 1974, critical design reviews, mockup reviews, and initial ground tests are to be held on the airframes. The initial flight test engine is scheduled for delivery in November 1974.

### COST

The current estimate for development and production of 481 helicopters (472 production, 7 flyable prototypes, and 2 ground test vehicles) as shown in the SAR as of September 30, 1973, is \$1,811.4 million. This amount includes an \$11.2 million increase in estimated program costs from the Development Concept Paper planning estimate of May 17, 1973. This increase was caused by an anticipated delay in the initial production contract award. This anticipated delay will defer some aircraft production funding to out-years where price escalation rates are expected to be higher.

For FY 1973 and prior years, \$20 million has been appropriated and obligated for the AAH. For FY 1974 and FY 1975, the funding requirements are \$49.3 million and \$60.7 million respectively. Total funding requirements for research and development, including the above amounts, is \$418.7 million (in FY 1973 escalated dollars).

#### CONTRACT DATA

Airframe development contracts for \$44.7 and \$70.2 million were awarded to Bell Helicopter Company and Hughes Helicopters in association with Hughes Aircraft Company respectively, on June 22, 1973 for the competitive phase of engineering development. Results of tests and evaluation of prototypes will determine which contractor will be selected for full-scale development.

The General Electric Company will provide the engines for the competitive flight test program under a July 23, 1973, modification to the company's Utility Tactical Transport Aircraft System engine contract with the Army.

All contracts are cost plus incentive fee.

#### SCHEDULE

The Army has requested OSD to approve a new schedule which will change the initial production contract award date from April 1978 to January 1979. The revised schedule also contains a new Initial Operational Capability date which is five months later than the date shown in the September 30, 1973 SAR. As of March 11, 1974, these changes had not yet received OSD approval.

#### PERFORMANCE

There were no changes in the AAH's performance characteristics since the planning estimate of May 1973. Key minimum performance characteristics

are (1) cruise airspeed - 145 knots; (2) vertical flight performance - 450 feet per minute, (3) primary mission endurance - 1.9 hours; (4) alternate mission endurance - 2.5 hours; and (5) primary mission payload - 8 TOW missiles and 800 rounds of 30 millimeter ammunition.

Prototype helicopters will be tested and evaluated during a competitive flyoff from December 1975 through March 1976.

#### MANAGEMENT REPORTING SYSTEMS

The three contractors are required to establish, maintain and use Cost/Schedule Control Systems in accordance with DOD Instruction 7000.2. General Electric's system has been reviewed and accepted by the Army. Bell's and Hughes' systems are expected to be validated after certain problems are corrected.

#### SELECTED ACQUISITION REPORTING

The AAH was reported on a Selected Acquisition Report for the first time on September 30, 1973.

The SAR did not disclose the logistics support/additional procurement costs applicable to the program. The Army stated that they have not yet computed component improvement and modification costs (categories of logistics support/additional procurement costs). The Army advised that, when these costs are computed, they will be disclosed in the SAR.

#### RELATIONSHIP TO OTHER SYSTEMS

The Army expects the AAH to be superior to the current attack helicopters. The AAH is planned to be part of a mixed attack helicopter fleet of AH-1 Cobras and AAH's. Fixed-winged fighters will complement the attack helicopters in accomplishing the overall close air support mission.

#### AGENCY COMMENTS

A draft of this study was reviewed by DOD officials associated with management of this program and comments were coordinated at Headquarters level. The DOD's comments were incorporated as appropriate. As far as we know there are no residual differences in fact.



## ADVANCED ATTACK HELICOPTER (AAH)

### SYSTEM DESCRIPTION AND STATUS

The Advanced Attack Helicopter is a twin engine, rotary wing aircraft designed as a manned aerial weapons system. The Army envisions it will be capable of defeating a wide range of targets and of performing its mission at night and under adverse weather conditions. The AAH will also be an integral element of ground units and will contribute mobile and effective firepower to the anti-armor capability of the Army in the field. Aircraft armament will include the TOW anti-tank missile system, a 30 millimeter automatic cannon, and 2.75 inch rockets.

In January 1972, a special Army Task Force was established to make an in-depth study of the operational requirements for an attack helicopter in the 1975 to 1985 timeframe. The study was based on analytical investigation, supplemented by engineering flight tests of Sikorsky's Blackhawk, Lockheed's Cheyenne, and Bell's King Cobra Attack helicopter prototypes; field experiments; and Southeast Asia combat experience. As a result of the Task Force report issued in August 1972, the Army approved the initiation of a new development program for an AAH.

In November 1972, the Army approved a new Materiel Need document for an attack helicopter system which would provide greater agility, hover performance and heavier aerial fire support capability than currently possessed by existing Army weapons systems. The Army considers the AAH as its primary attack helicopter and a key factor in future military operations.

The AAH is currently in a competitive prototype phase of engineering development. Two airframe contractors are competing during this phase and each is to fabricate two flying prototypes and one ground test vehicle. Three additional flying prototypes will be constructed by the winning contractor during full-scale development.

COST

The Current Estimate for AAH Program Acquisition Cost in the Selected Acquisition Report (SAR) of September 30, 1973, (which was the first SAR for the AAH Program) is \$1,811.4 million. This includes an increase of \$11.2 million over the Planning Estimate of \$1,800.2 million reflected in the AAH Development Concept Paper, approved May 17, 1973, by the Deputy Secretary of Defense. The Army plans to purchase 9 development, which includes two ground test vehicles, and 472 procurement helicopters at a program unit cost of \$3.8 million. The Army advised that the Current Estimate includes all identified acquisition costs of the program. However, the Army has not yet estimated the logistic support/additional procurement costs for the AAH, which are applicable for the SAR. The Army advised that, as soon as these costs are computed, they will be disclosed in the SAR.

	(In millions - FY 1973 escalated)		
	<u>Planning</u>	<u>Changes</u>	<u>Current</u>
	<u>Estimate</u>		<u>Estimate</u>
Development	\$ 418.7	0	\$ 418.7
Procurement	<u>1,381.5</u>	<u>\$+ 11.2</u>	<u>1,392.7</u>
Total Acquisition Cost	<u>\$1,800.2</u>	<u>\$ 11.2</u>	<u>\$1,811.4</u>

The \$11.2 million increase in procurement costs was caused by an anticipated change in the initial production contract award date. The Army has requested OSD to approve a new schedule which will change the award date from April 1978 to January 1979. This anticipated slippage will defer some aircraft production funding to out-years where price escalation rates are expected to be higher.

As shown above the total acquisition costs are stated in FY 1973 escalated dollars. Application of the OSD December 15, 1973, budget guidance to the current estimate will result in an additional \$189.7 for projected escalation.

#### Design-to-Cost

The Deputy Secretary of Defense has specified a \$1.6 million (FY 1972 constant dollars) design-to-cost goal for the AAH unit recurring flyaway cost based upon a procurement of 472 aircraft produced at an average rate of 8 per month. This means that the Army and its contractors are to design a helicopter which will cost, on the average, no more to fabricate than \$1.6 million each.

When research and development, spares, support equipment, and other acquisition costs are added to this cost goal, it translates to a program unit cost of \$3.8 million in FY 1973 escalated dollars.

Funding Status and Out-Year Plan

The following schedule reflects the planned AAH funding profile as of September 30, 1973.

	FY 1973 and prior years <sup>a/</sup>	FY 1974 <sup>b/</sup>	Required Funds		Total
			FY 1975	To Complete	
Development	\$ 20.0	\$ 49.3	\$ 60.7	\$ 288.7	\$ 418.7
Procurement	--	--	--	1,392.7	1,392.7
Total	<u>\$ 20.0</u>	<u>\$ 49.3</u>	<u>\$ 60.7</u>	<u>\$1,681.4</u>	<u>\$1,811.4</u>

a/ FY 1973 Program - \$20.0 million has been released and utilized, \$1.8 million for Government in-house effort and \$18.2 million for contractor effort.

b/ FY 1974 Program - As of September 30, 1973, \$45.8 million has been released, \$5.6 million for in-house effort and \$40.2 million for contractual effort. The release of the remaining \$3.5 million requirement is pending a Congressionally directed reprogramming action from the Cheyenne attack helicopter program. (The Army advised us on March 7, 1974, that this reprogramming action has now been approved.)

CONTRACT DATA

On November 10, 1972, the Deputy Secretary of Defense authorized release of the AAH Request for Proposal. The request, as issued to industry on November 15, 1972, specified a development program, including Government competitive testing and a \$1.4 to \$1.6 million (constant Fiscal Year 1972 dollars) design-to-cost constraint on production unit recurring flyaway cost. The Government stated it intended to award two engineering development contracts in order to achieve the maximum technical

and cost benefits from competition. Each offeror was required to design, develop, fabricate and test two AAH prototypes and one ground test vehicle. The Government did, however, reserve the right to award a single contract for five prototypes and one ground test vehicle. On February 15, 1973, five contractors responded with proposals. An Army Source Selection Evaluation Board reviewed the proposals and negotiated contracts with each offeror. Board findings were submitted in June 1973 through the Source Selection Advisory Council to the Secretary of the Army for the selection decision.

Airframe development contracts were awarded to Bell Helicopter Company (Bell) and Hughes Helicopters (Hughes) in association with Hughes Aircraft Company on June 22, 1973, for the competitive phase of engineering development. The General Electric Company will provide the engines for the competitive flight test program under a July 23, 1973, modification to the company's Utility Tactical Transport Aircraft System engine contract with the Army.

Two flying prototypes and one ground test vehicle per contractor will be fabricated during the competitive development phase. Three additional flying prototypes will be constructed by the winning contractor during full-scale development.

Data on the contracts, all of which are cost plus incentive fee, follows:

<u>Contractor</u>	<u>Target Price</u> (In millions)
General Electric Co. (Engine) DAAJ01-72-C-0381(52) Modification No. P00022	\$ 20.3
Bell Helicopter Co. (Prime Airframe) DAAJ01-73-C-0741(P40)	\$ 44.7

Continued

Hughes Helicopters (Prime Airframe)	\$68.8
Hughes Aircraft Co. (Associate)	1.4
Total Award to Hughes	<u>\$70.2</u>
DAAJ01-73-C-0743(P40)	

Engine Contractor

On March 6, 1972, the Army signed a contract with the General Electric Company for the design, development, qualification and support of the T-700-GE-700 gas turbine engine for the Utility Tactical Transport Aircraft System. The contract was modified on July 23, 1973, to provide engine support for the AAH competitive flight test program. General Electric will deliver four ground test and 32 flight test engines for the AAH program. The \$20.3 million target price for the AAH engines does not include any design, development, or qualification costs. However, any additional qualification testing or hardware fabrication efforts unique to the AAH will be incorporated into the General Electric contract by supplemental agreement.

On November 29, 1973, the General Electric contract was modified to include a production design-to-cost objective of \$78,700 (average recurring price in FY 1972 constant dollars) based on 4,700 production engines, including both AAH and Utility Tactical Transport Aircraft System engines. The design-to-cost objective is based primarily upon total buy, schedule, and performance parameters. Variance of one or all of the parameters could impact on the design-to-cost objective. An incentive fee toward the accomplishment of that objective was established within the contract's existing maximum and minimum fee limitations. No change was made to total contract target fee or cost.

### Airframe Contractors

For the first 30 days of the contracts, the contractors were limited to clarifying their efforts toward achieving the program's design-to-cost goal of \$1.6 million unit recurring flyaway cost. For this 30-day effort, the Deputy Secretary of Defense directed that Government obligations to the airframe contractors would not exceed \$1 million each. No increase in target cost or fee was authorized for the effort.

Practical design trade-offs were to be identified which would reduce unit production cost, without degrading the minimum performance characteristics in the contract. Initial trade-offs were accomplished and incorporated into the airframe contracts by modification. Both contractors were given authority on July 20, 1973, to continue with their engineering development programs.

SCHEDULE

The AAH schedule milestones, as shown in the September 30, 1973, SAR are as follows:

	<u>Planning Estimate</u> <sup>1/</sup>	<u>Current Estimate</u>
Issue Request for Proposal	November 1972	November 1972 (actual)
Competitive Development Contract Award	June 1973	June 1973 (actual)
Fly-off Competition Completed	March 1976	March 1976
Full Scale Development Contract Award	May 1976	May 1976
Low Rate Initial Production Contract Award	April 1978	<u>2/</u>
First Production Delivery	April 1980	<u>2/</u>
Initial Operational Capability	(See narrative below)	

1/The Planning Estimate for schedule milestones was based on the AAH Development Concept Paper No. 123, approved May 17, 1973. This document also established a six-month schedule threshold for each of these milestones.

2/These dates will be established upon DOD approval of a revision to the AAH Development Concept Paper.

The Army has requested OSD to approve a new schedule which will change the initial production contract award date from April 1978 to January 1979. This revised schedule also contains a new Initial Operational Capability date which is five months later than the date shown in the September 30, 1973 SAR. The first production delivery date is not expected to be changed from April 1980. The need to reschedule the contract award date was primarily caused by an extension of the second phase of engineering development by approximately six months as agreed during contract negotiations. The



operational capability date will be changed to comply with a new standard Army definition of achievement of Initial Operational Capability. An Army official stated that this change was caused only by the new definition and not by a change to the program. As of March 11, 1974, the revision had not been approved by OSD.

In addition to the above changes some other minor changes have occurred in contract milestones as follows:

<u>Event</u>	<u>Original Date</u>	<u>New Date</u>
Mockup Review (Hughes)	December 1973	March 1974
Critical Design Review (Hughes)	December 1973	May 1974
Critical Design Review (Bell)	January 1974	May 1974

Despite these contract changes the prototype first flight is still scheduled for March 1975, as originally planned.

#### PERFORMANCE

The following are planned AAH operational/technical characteristics, based on the AAH Development Concept Paper approved May 17, 1973.

##### Characteristics

Cruise Speed	145 to 175 knots
Vertical Rate of Climb <sup>1/</sup>	450 to 500 feet per minute <sup>2/</sup>
Primary Mission Endurance	1.9 hours
Primary Mission Ordnance Load	8 to 12 TOW missiles, 800 to 1,000 rounds of 30 millimeter ammunition

1/Vertical flight performance is at mission gross weight, hover out of ground effect, 95 percent of Intermediate Rated Power, 4,000 feet/95°F conditions.

2/DCP shows this as 500 FPM, but we have been told it should state 450 FPM TO 500 FPM and will be corrected.

#### STATUS OF TESTING

The tests on the first General Electric T700 engine for the Utility Tactical Transport Aircraft system began February 27, 1973, five days ahead of the schedule milestone date for First-Engine-to-Test. As stated on page 10, the UTTAS engine contract was modified to provide engine support for the AAH program.

The design specification for the General Electric T700 production engine is 1,536 horsepower. As of December 31, 1973, General Electric's engine testing had attained 1,600 shaft horsepower. The initial flight test engine for the AAH is scheduled for delivery in November 1974.

The airframe contractors' prototype helicopters will be tested and evaluated by the Army during the competitive flyoff, scheduled to be conducted from December 1975 through March 1976. Each of the flying competitive prototypes will be instrumented and have basic weapon firing systems installed and functional. Target acquisition, tracking equipment, and fire control systems will not be installed.

The Army had identified the following as critical test issues to be addressed during the competitive development phase.

- The extent to which each prototype meets Material Need requirements.
- The amount of improvement in capability of the winning prototype over the AH-1Q Cobra equipped with the TOW missile.

The flight tests during competitive development will determine basic airframe and engine performance, and establish safe operating conditions for future testing.

Flight testing during full-scale development will expand the vehicles' performance limits and test all integrated subsystems. Each of the three flying prototypes to be fabricated during this phase of development will have all systems installed and operable.

#### MANAGEMENT REPORTING SYSTEM

##### Status of Cost/Schedule Control Systems

Both airframe contractors and the engine contractor are required to establish, maintain and use Cost/Schedule Control Systems, in accordance with DOD Instruction 7000.2, Performance Measurement for Selected Acquisitions.

General Electric's system has been reviewed and was formally accepted on August 15, 1973. Neither Bell's nor Hughes' system had been approved for the AAH program as of December 31, 1973. An Army official said that the Army is withholding validation of Bell's system until a minor problem regarding charging of overhead is resolved. Hughes' validation is dependent upon the contractor's correction of current discrepancies. The Army is assisting Hughes so that their system can be validated as quickly as possible. Both Bell's and Hughes' systems are forecast for validation before the end of June 1974.

##### Cost Performance Reporting

General Electric is submitting monthly Cost Performance Reports on its projected program in accordance with contract requirements. The contractor's September 1973 report showed that the AAH engine program was 4.6 percent

schedule and 57.2 percent under cost. According to General Electric, the variances were primarily caused by lower than anticipated airframe manufacturer support requirements and delays in shifting emphasis to the AAH program.

Both airframe contractors are also submitting monthly Cost Performance Reports on their internal cost and schedule projections. However, Hughes' September 1973 report showed only actual cost of work performed. No budgeted cost figures were reported. Since Hughes' and Bell's Cost/Schedule Control Systems are not validated, precise measurement of performance cannot be accomplished at this time. However, both contractors are slightly behind schedule and over cost. The Army advises that, in large part, this can be attributed to the unprogrammed 30-day cost validation effort prior to full go-ahead for the contracts. This additional effort beyond the original statements of work delayed the scheduled start of design work and resulted in additional costs.

#### Measurement of Technical Progress

The Army advised that they are tracking technical progress through periodic program reviews conducted by each of the contractors, by evaluation of the contractors' specification change notices, and by comparison of contractors' scheduled events to actual accomplishments.

#### RELATIONSHIPS TO OTHER SYSTEMS

The Army has stated that the AAH will be superior to the current attack helicopters in its ability to hover out of ground effect, and

operate day or night in adverse weather. The AAH will also have a higher degree of agility, heavier fire support capability, and better survivability than current attack helicopters. The Army advised us that the AAH will also have better maintainability than current helicopters.

Army force structure plans envision a mixed attack helicopter fleet of AH-1 Cobras and AAH's. Fixed-wing fighters will complement the attack helicopters in accomplishing the overall close air support mission.