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U.S. GENERAL ACCOUNTING OFFICE

STAFF STUDY

UTILITY TACTICAL TRANSPORT AIRCRAFT SYSTEM (UTTAS)

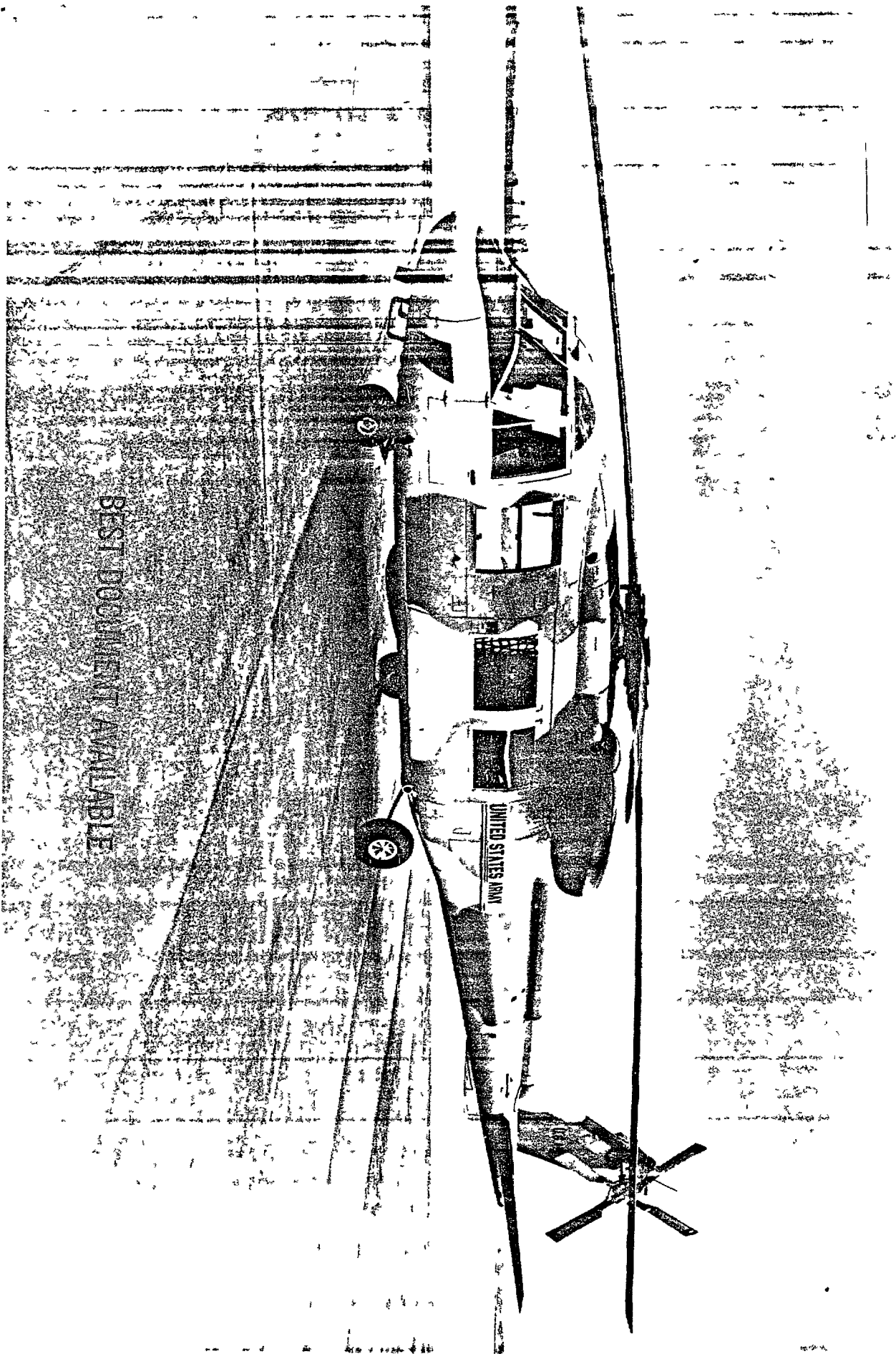
DEPARTMENT OF THE ARMY

MARCH 1974

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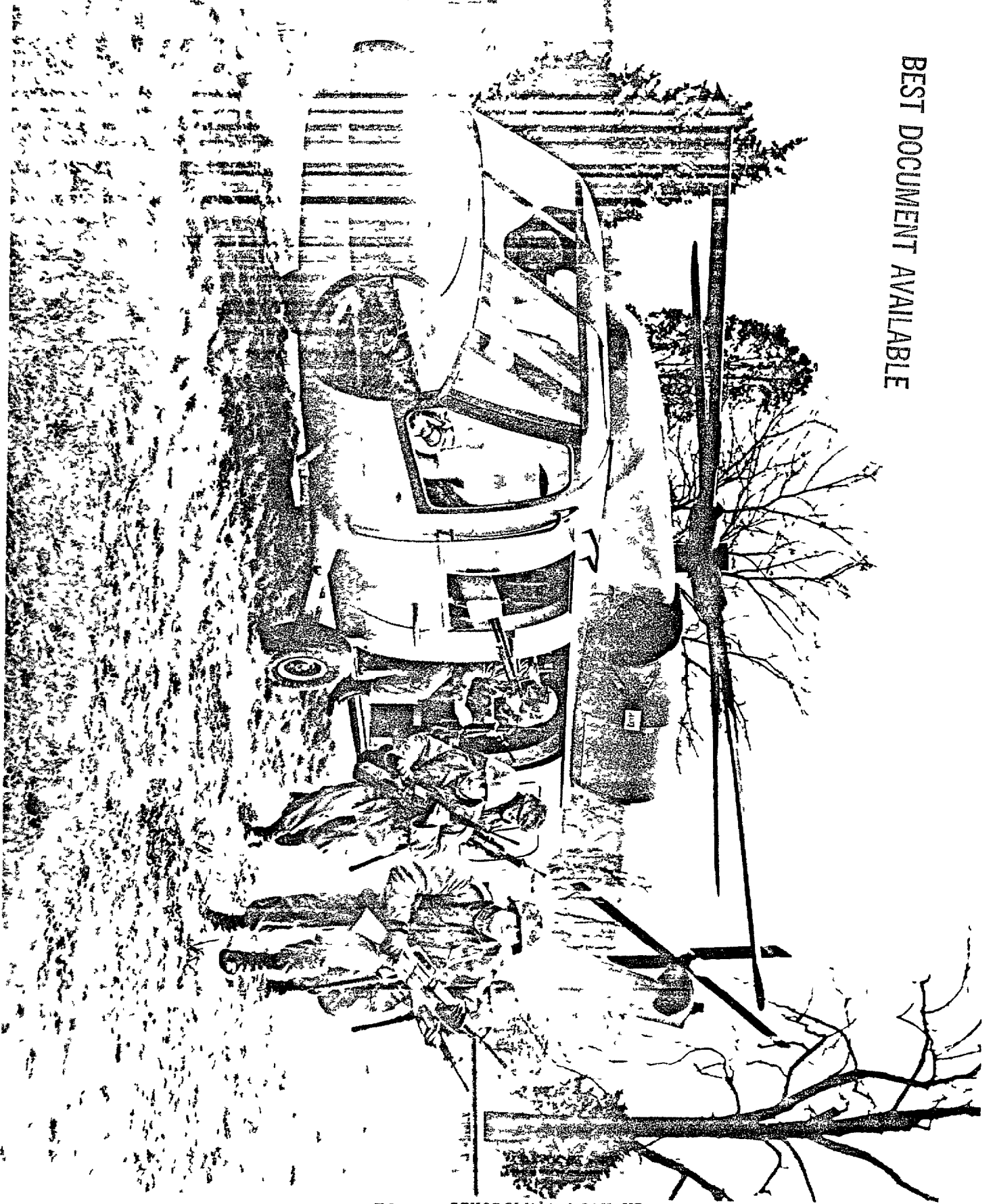
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UTTAS - BOEING VERTOL'S MOCK-UP

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TOP - SIKORSKY'S LOOK-UP

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

DOD	Department of Defense
FY	Fiscal Year
GAO	General Accounting Office
OSD	Office of the Secretary of Defense
SAR	Selected Acquisition Report
UTTAS	Utility Tactical Transport Aircraft System

SUMMARY

SYSTEM DESCRIPTION AND STATUS

The UTTAS is a twin engine helicopter intended to replace the UH-1 in the air assault, air cavalry and aeromedical evacuation missions. This aircraft is being designed to be the Army's first true squad assault helicopter. It is now in full scale development.

COMING EVENTS

Complete fabrication and checkout of prototype number one is scheduled for September 1974. The first flight originally scheduled for September 1974 is now scheduled for November 1974.

COST

The current estimate for development and acquisition of 1107 helicopters as of June 30, 1973, was \$2,325.7 million. This amount represents a reduction of \$18.8 million from the \$2,344.5 million estimate reported in the SAR of June 30, 1972. A contemplated stretchout of the production program from eight to ten years will doubtlessly increase the estimate for production of \$1,913.2 million, stated in FY 1972 escalated dollars. As of June 30, 1973, program acquisition unit cost was estimated at \$2.08 million.

The current estimate as reported in the September 30, 1973, SAR was \$2,342.7 million, up \$17.0 million over the June 30, 1973, SAR. This increase is attributable to contingency funding being held for further reliability and maintainability testing as required to achieve target goals.

Program Funding

Through FY 1973, \$84.5 million has been appropriated for research and development. The FY 1974 requirement is stated at \$102.7 million, with \$225.3 million more needed to complete development.

CONTRACT DATA

The competing airframe contractors on this program, the Boeing Vertol Company and the Sikorsky Aircraft Division of the United Aircraft Corporation, were awarded development contracts for \$91.3 million and \$61.9 million respectively. Results of tests and evaluation of the prototypes will determine which contractor will be selected for the production program.

The General Electric Company was awarded an engine contract for \$97.6 million. All contracts are on a cost-plus-incentive-fee basis.

SCHEDULE

Original program milestones based on six flying articles for each contractor have been revised. The completion of prototype evaluation and selection has been slipped from September 1976 to November 1976. Low rate initial production contract award was accelerated from April 1977 to March 1977.

PERFORMANCE

There were no changes in the UTTAS's performance characteristics during FY 1973. The key performance thresholds identified in the Development Concept Paper are payload and endurance. Cruise speed of 145 knots and 2.3 hours of endurance are the minimum acceptable performance characteristics.

Status of Testing

Testing of the first engine began on February 27, 1973, 5 days ahead of schedule. As of October 24, 1973, the engine had accumulated 746 hours. Testing of prototypes will begin in January 1976.

MANAGEMENT REPORTING SYSTEMS

The management reporting systems of the three contractors have been reviewed by a tri-service team and have met the criteria established by DOD for cost/schedule and control. Technical Performance Measurement Reports submitted quarterly show no significant variance in comparison of estimates with planned performance specifications.

SELECTED ACQUISITION REPORTING

The UTTAS SAR generally meets the requirements of Department of Defense Instruction 7000.3. In accordance with DOD guidance, only certain types of additional procurement costs were reported on the June 30, 1973, SAR.

RELATIONSHIP TO OTHER SYSTEMS

Cost effectiveness studies conducted by the Army concluded that the 10-year life cycle cost for the UH-1H+ would be significantly greater than the UTTAS. The UH-1H and the advanced UH-1H+, a proposed product improvement of UH-1, were the most promising of other candidates for the utility tactical helicopter mission.

AGENCY COMMENTS

A draft of this staff study was reviewed by DOD officials associated

with the management of this program and comments were incorporated as appropriate. As far as we know there are no residual differences in fact.

THE UTILITY TACTICAL TRANSPORT AIRCRAFT SYSTEM (UTTAS)

SYSTEM DESCRIPTION AND STATUS

The UTTAS is a new twin engine helicopter that is expected to replace the UH-1 in the air assault, air cavalry, and aeromedical evacuation missions. This aircraft will be the Army's first true squad assault helicopter and it is designed to transport troops and equipment into combat, resupply these troops while in combat, and perform associated functions of aeromedical evacuation, repositioning of reserves, and other combat support missions. An Army objective for the UTTAS is to achieve increased cost effectiveness through substantially improved maintainability, reliability, survivability, and performance.

The UTTAS program is currently in the competitive prototype phase of full-scale engineering development. The initial Army plans called for 16 developmental aircraft (one static test article, one ground test vehicle, and six flying prototypes for each contractor). However, the development program was reduced from a 6-flying prototype program to a 3-flying prototype program per contractor, in accordance with Congressional direction.

Congressional Action

The House Appropriations Committee Report 92-1389, dated September 11, 1972, stipulated that the number of flying prototypes should be reduced to three for each contractor. On March 30, 1973, the Army presented its rationale for a 5-flying prototype program to Congressional staff members of the Senate Armed Services Committee (Research and Development Subcommittee).

The Army's program was not favorably received. The staff members suggested that the Army continue the present development program with three flying prototypes per contractor and if, in the future a requirement for more research and development testing could be clearly demonstrated, the Army could request an additional authorization at that time.

COST

The estimate for the UTTAS Program Acquisition Cost, as shown in the Selected Acquisition Report (SAR) of June 30, 1973, was \$2,325.7 million. This Army estimate represents a decrease of \$18.8 million from the \$2,344.5 million estimate reported in the SAR of June 30, 1972. The Army plans to purchase 1,107 helicopters at a procurement acquisition unit cost of \$1.73 million and a program unit cost of \$2.08 million.

The following table shows the Revised Planning Estimate and compares the SAR estimate of June 30, 1973, with the estimate of June 30, 1972.

SAR REPORTED COSTS

	(In millions - escalated)			
	Revised Planning Estimate (FY 71 dollars)	Estimate 6/30/72 (FY 72 dollars)	Net Cost Changes	Estimate 6/30/73 (FY 73 dollars)
Development	\$ 409.9	\$ 420.0	\$ - 7.5	\$ 412.5
Procurement	1,897.4	1,924.5	-11.3	1,913.2 ^a
Program Acquisition Costs	<u>\$2,307.3</u>	<u>\$2,344.5</u>	<u>\$ -18.8</u>	<u>\$2,325.7</u>

^aThis estimate is in FY 1972 escalated dollars; however, estimate was updated to \$2249.6 million in December 31, 1973, SAR

The decrease of \$18.8 million in total program cost during FY 1973 is explained below.

Quantity - \$21.3

The number of support engines was reduced from 74 to 50 to reflect the change from a 6-prototype to a 3-prototype program.

Support + \$.5

Revision of prototype support to include avionic representatives at airframe contractor sites, resulted in an increase of \$.7 million. This was decreased by \$.2 million due to the reduction in the flying prototype program from 6 to 3.

Estimating + \$ 3.8

The transfer of Producibility Engineering Planning (PEP) from procurement to Development resulted in additional PEP effort of \$1.4 million. An additional \$2.4 million was added to Development as a result of revised estimating techniques.

Economic - \$ 1.8

A net reduction of \$1.8 million for economic escalation was caused by the change to the 3-flying prototype program.

Procurement Schedule Revision

By letter of December 7, 1973, the Army advised the contractors that the planned production quantities for UTTAS were rescinded and attached a new production schedule which reduced production for the first 3 years from 276 to 57, and extended the total production time from 8 to 10 years.

This revision of production will no doubt increase the unit flyaway cost goal established for the UTTAS. The Project Manager had originally

established a unit flyaway cost goal of \$986,000 (FY 1972 constant dollars). The requirement for the military services to establish unit flyaway cost goals for major weapon programs was directed by the Deputy Secretary of Defense in June 1973.

The Army states that the accounting procedures of transferring PEP funds from procurement to research and development, subsequent to the above established goal, has prompted the Project Manager to prepare a new unit flyaway cost goal of \$978,000 (FY 1972 contract dollars).

Additional Procurement Costs

The total additional procurement costs computed by the Project Office as of June 30, 1973, was \$151.6 million. Only certain types of additional procurement costs are to be reported on the SAR, based on new OSD guidance of May 1972. The June 30, 1973, SAR identifies \$64.2 million in FY 1973 constant dollars as Additional Procurement Costs. This is made up of Component Improvement \$37.5 million and Retrofit Modification \$26.7 million.

In our opinion, a baseline estimate from which to measure variances can and should be established in the SAR for all additional procurement cost.

SAR Costs as of September 30, 1973

The estimate for program acquisition costs, as shown in the SAR of September 30, 1973, is \$2,342.7 million. The increase of \$17.0 million over the SAR of June 30, 1973, is contingency funding being held for further reliability and maintainability testing as required to achieve target goals.

Funding Status and Out-Year Plan

Cumulative program funding for the development of the UTTAS, as of June 30, 1973, was \$84.5 million of which \$50.4 million was appropriated for

FY 1973. Required funding for Budget Year FY 1974 for research and development is \$102.7 million. Funds originally requested (\$108.9 million) reflected a 6-flying prototype program. OSD has deferred \$6.2 million because of the change from a 6 to 3 flying prototype program.

Shown below is the status of available funds, the FY 1974 Budget Year estimate, and the estimate of the balance of funds required to complete the program:

(In millions)

	<u>FY 73 & Prior Years</u>			<u>FY 1973 Dollars</u>	
	<u>Available</u>	<u>Obligation</u>	<u>Expenditures</u>	<u>FY 74 Budget Year</u>	<u>To Complete</u>
Research and Development	\$84.5	\$84.5	\$58.3	\$102.7	\$ 225.3
Procurement	0	0	0	0	1,916.8
Additional Procurement Costs	0	0	0	0	64.2
	<u>\$84.5</u>	<u>\$84.5</u>	<u>\$58.3</u>	<u>\$102.7</u>	<u>\$2,206.3</u>

The FY 1975 Budget includes \$54.1 million for the UTTAS program.

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CONTRACT DATA

The Army awarded contracts on August 30, 1972, to the Vertol Division of the Boeing Company, now the Boeing Vertol Company and to the Sikorsky Aircraft Division of the United Aircraft Corporation. Each contractor will develop and fabricate three flyable prototypes for competitive testing, one static test article, and one ground test vehicle. The test results and the contractors' responses to Army requirements will be evaluated and one contractor will be selected to produce the UTTAS. The total planned production objective is 1,107 aircraft.

On March 6, 1972, the General Electric Company was awarded a cost-plus-incentive fee contract to develop, furnish, and support 18 ground test and 56 flight test engines. The number of flight test engines being procured was decreased from 56 to 32 when the flying prototype program was reduced to 3 aircraft per contractor. The reduction in the number of engines needed will result in a decrease to the engine contract of approximately \$7,387,000.

Details on these contracts follow:

<u>Contractor</u>	<u>Contractor Costs (In millions)</u>			<u>Target Price</u>
	<u>Target Cost</u>	<u>Target Fee</u>	<u>Target Fee as Percentage of Target Cost</u>	
General Electric Co. DAAJ01-72-C-0381 (52) 6 MAR. 72, Cost-plus-incentive-fee	\$90.5	\$ 7.1	7.9%	\$97.6
United Aircraft - Sikorsky Div., DAAJ01-73-C-0006 (P 40) 30 AUG. 72, Cost-plus incentive-fee	58.4	3.5	6 %	61.9
Vertol Division of the Boeing Company DAAJ01-73-C-0007 (P 40) 30 AUG. 72, Cost-plus-incentive-fee	86.1	5.2	6 %	91.3

	<u>Government/Contractor</u>		<u>Incentives</u>		
	<u>Sharing Ratios</u>		<u>Percent of Target Cost</u>		
	<u>Overrun</u>	<u>Underrun</u>	<u>Max. Fee</u>	<u>Min</u>	<u>Fee</u>
General Electric	70/30	70/30	12%		3.9%
Sikorsky	65/35	50/50	15%	2	%
Boeing Vertol	70/30	70/30	15%	2	%

The General Electric contract contains a performance incentive provision whereby the contractor could gain or lose a maximum of \$900,000 in connection with demonstrated specific fuel consumption. Additionally, the contract contains a schedule incentive provision which specifies that General Electric could be penalized up to \$300,000 for delay in completion of the Preliminary Flight Rating Test. No incentive fee is allowed for early completion of this test.

As of November 20, 1973, seven Engineering Change Proposals have been formally introduced into the engine contract at no change in cost. An additional five proposals, reflecting decreases in cost, are awaiting approval pending resolution between the Government and the contractor of the "Design-to-Cost" contract clause.

On November 29, 1973, the engine contract was modified to include a design-to-cost objective for the engine of \$78,700 in FY 1972 constant dollars.

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Airframe contracts reflect target prices in support of a five prototype program per contractor. The program includes 3-flying prototypes, 1 ground test vehicle, and 1 static test article.

The Army had an option for two or three additional flying prototypes with each airframe contractor. These options expired on March 31, 1973, and the program is proceeding on a 3-flying prototype basis.

Until the prototype aircraft are delivered, changes to "Development Specifications" are being reported on Change Reports. As of December 11, 1973, Sikorsky has submitted eight Change Reports which have been approved, and Boeing Vertol has submitted four Change Reports, which have also been approved. The cost impact of these Change Reports will be incorporated into the contracts by future modifications. Changes described in the reports are within the bands of performance shown in the Materiel Need Document according to an official in the Project Office. After delivery of prototype aircraft, changes to "Development Specifications" will be reported in Engineering Change Proposals.

PROGRAM MILESTONES (SCHEDULE)

The only major program milestone scheduled for FY 1973 was the award of prototype development contracts, which occurred on August 30, 1972.

The following milestones are scheduled to be completed during the calendar year 1974.

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<u>Milestone/Event</u>	<u>Engine</u>	<u>UTTAS</u>
Start Ground Test Engine Deliveries	Mar 74	
Start Ground Test Vehicle Development Testing		May 74
Start Flight Test Engine Deliveries	Aug 74	
Complete Preliminary Flight Rating Test	Sep 74	
Complete Fabrication and Checkout of Prototype No. 1		Sep 74
First Flight		Nov 74

The UTTAS schedule milestones, including those reported in the SAR's have been revised during FY 1973 as follows:

	<u>Planning Estimate</u>	<u>Current Estimate</u>
First Flight	Sep 74	Nov 74 (Ch. 1)
Engine Military Qualification Test, 150 hours	Dec 75	Mar 76 (Ch. 2)
Complete Development Test II/ Operational Test II	Dec 77	Aug 76 (Ch. 3)
Complete Prototype Evaluation and Selection	Sep 76	Nov 76 (Ch. 4)
Low Rate Initial Production Award	Apr 77	Mar 77 (Ch. 5)
Initial Limited Production Delivery	Aug 78	Jul 78 (Ch. 6)
Complete Operational Test III	Feb 79	Jan 79 (Ch. 6)
Full-Scale Production Award	Apr 79	Mar 79 (Ch. 6)
Initial Operational Capability	Classified	Classified

Change 1 - A Congressional deletion of \$13.6 million in FY 1973 funds reduced the engineering effort and will cause a two-month delay.

Change 2 - Contractually, the Military Qualification Test is 48 months from date of award of contract. The engine contract was awarded in March 1972, which results in scheduling the test for March 1976.

Change 3 - Clarification and consolidation of testing program resulted in acceleration of test completion date.

Change 4 - Completion was delayed because of a change from a 6-flying prototype to a 3-flying prototype program, per contractor.

Change 5 - Review of milestones indicated that the Low Rate Initial Production Award was accelerated one month.

Change 6 - As a result of the one-month acceleration of the Low Rate Initial Production Award, these milestones were moved up one month.

The Initial Operation Capability date has not been changed.

PERFORMANCE

The planned performance characteristics are given in the following table.

Characteristics

Performance at 4,000 feet/95°F:

Design gross weight	14,790 pounds
Vertical flight performance	450 to 550 feet per minute at hover out-of-ground effect
Cruise speed	145 to 175 knots
Combat-equipped troops/payload	11/2640 pounds
Mission endurance	2.3 hours

The key performance thresholds identified in the Development Concept Paper are payload and endurance. The payload is required to preserve squad integrity and minimize the number of aircraft in the landing zone. Endurance is critical so that mission continuity can be maintained and not interrupted by frequent refueling. Cruise speed of 145 knots and 2.3 hours of endurance are the minimum acceptable performance characteristics.

There were no changes to the planned performance characteristics during the fiscal year ended June 30, 1973.

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Reliability and Maintainability

The UTTAS's mean time between failure of 4.0 hours and fault corrective maintenance man-hour per flight hour of 2.8 are measurements of the system's reliability and maintainability, respectively. The following table provides the targeted values and current estimates for the 3-flying prototype program:

	<u>Mean Time Between Failure (Flight Hours)</u>		<u>Fault Corrective Maintenance Manhours per Flight Hours</u>	
	<u>Target</u>	<u>Current Estimate</u>	<u>Target</u>	<u>Current Estimate</u>
Completion of Government Competitive Tests	2.6	2.3	4.3	4.8
End of Maturity Phase (prior to production)	4.0	3.2	2.8	3.2

As shown by the above schedule, current estimates fall short of target goals. An official of the Project Office stated that the reliability and maintainability goals and tests were based on a 6-flying prototype program. A reduction to the 3-flying prototype program results in a reduced number of flight test hours and a lower degree of confidence in achieving these goals.

The Chief of Research and Development, Department of the Army, has stated that the development schedule will be adhered to until an accurate assessment of the program's reliability and maintainability growth curve can be made. If statistical data indicates the need for a change in the program in order to achieve the reliability and maintainability goals, the development schedule will be adjusted accordingly.

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Status of Testing

Testing of the first engine began on February 27, 1973, five days ahead of schedule. As of October 24, 1973, the engine had accumulated 746 test hours. Due to engine weight increases, the required shaft horsepower of 1,518 was increased to 1,536 (sea level, 59°F standard day). On November 27, 1973, the test engine achieved 1,600 shaft horsepower.

The airframe contractor prototypes will be tested during the Government Competitive Tests which are to be conducted from January through August 1976.

MANAGEMENT REPORTING SYSTEM

The engine contractor and the two airframe contractors are required by contract to have a management cost/schedule control system in compliance with the criteria set forth in DOD Instruction 7000.2 and to furnish Cost Performance Reports. The contracts also require each of the three contractors to have a technical performance measurement system utilizing a work breakdown structure common to their cost and schedule performance measurement systems. The contractors are also required to furnish Technical Performance Measurement Reports.

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Boeing Vertol's cost and schedule control system had achieved tri-service acceptance in March 1972 on the Army's Heavy Lift Helicopter project. A tri-service demonstration team determined in February 1973 that the contractor is properly implementing the accepted system on the UTTAS program. However, the Defense Contract Audit Agency would not concur with the report of findings due to a problem of obtaining access to Boeing Vertol's indirect budgeting data. As of February 1974, the access problem continues to exist.

Status of the Cost and
Schedule Control Systems

General Electric's management control system has been reviewed by a tri-service team and found to meet the cost schedule control system criteria established by DOD. The formal acceptance letter to General Electric was dated August 15, 1973.

Sikorsky's system was subjected to a tri-service demonstration review in January 1973, and was accepted.

RELATIONSHIP TO OTHER SYSTEMS

During the concept formulation phase of the UTTAS program, a comparison was made of the cost effectiveness of aircraft which were considered candidates for the utility tactical helicopter mission. The most promising was the proposed product improvement program of the Bell Helicopter Company UH-1, the Advanced UH-1H+. Cost effectiveness studies conducted by the Army concluded that the 10-year life cycle costs for the UH-1H+ would be significantly greater than those of the UTTAS when performing a projected mission. The

studies also concluded that the additional capabilities of the UTTAS with respect to speed, maneuverability, reliability, safety, and survivability, also make it more cost effective than the UH-1H+,

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