DOCUMENT RESUME

01122 - [A0891453]

Status of the Utility Tactical Transport Aircraft System Program. PSAD-77-31; B-163058. February 25, 1977. 12 pp.

Report to the Congress; by Robert F. Keller, Acting Comptroller General.

Issue Area: Federal Procurement of Goods and Services (1900); Federal Procurement of Goods and Services: Notifying the Congress of Status of Important Procurement Programs (1905).
Contact: Procurement and Systems Acquisition Div.
Budget Function: National Defense (050); National Defense: Weapon Systems (057).
Organization Concerned: Department of Defense; Department of the Army.
Congressional Relevance: House Committee on Armed Services; Senate Committee on Armed Services; Congress.

The Utility Tactical Transport System Program is a twin-engined helicopter scheduled to replace the Army's current utility helicopter, the UH-1, in air assault, air cavalry, and medical support units. Findings/Conclusions: Improved reliability, maintainability, availability, survivability, and performance were primary factors in the justification for this development. A competitive development program has been substantially completed at a cost of about $463 million, and a production contract for 15 of the aircraft was awarded in December 1976. The reliability and maintainability results demonstrated during competitive testing are questionable and may not be valid. GAO is uncertain whether the Army has met the objective of developing an aircraft with major improvements in reliability and maintainability, as the UH-1 demonstrated much better reliability and maintainability than the competing prototypes during Government competitive testing. Recent life cycle cost estimates indicate that the cost of a fleet of new aircraft will be more expensive than a comparable fleet of new UH-1 helicopters. This is contrary to the figures used to justify the development program. Recommendations: The Secretary of Defense should make sure that reliability and maintainability goals have been achieved before the Army exercises contract options for follow-on production. (Author/SC)

REPORT TO THE CONGRESS

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

Status Of The Utility Tactical Transport Aircraft System Program

Department of the Army

The Utility Tactical Transport Aircraft System is being purchased to replace the Army's current utility helicopter, the UH-1. The Army has completed the competitive development phase and awarded a production contract in December 1976.

GAO is uncertain whether the Army has met the objective of developing an aircraft with major improvements in reliability and maintainability.

The Secretary of Defense should make sure that reliability and maintainability goals have been achieved before the Army exercises contract options for follow-on production.

PSAD-77-31

FEB. 25, 1977

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

B-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 Utility Tactical Transport System 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 their 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.

ACTING Comptroller General
of the United States

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

STATUS OF THE UTILITY TACTICAL TRANSPORT AIRCRAFT SYSTEM
Department of the Army

D I G E S T

The Utility Tactical Transport Aircraft System is being developed to replace the Army's current utility helicopter, the UH-1, in air assault, air cavalry, and medical support units. It is a twin-engined helicopter that will provide the Army with increased operational capability because of its greater internal size and lift capability. Design improvements and increased performance make the aircraft less vulnerable to enemy fire. Improved reliability, maintainability, availability, survivability, and performance were primary factors in the justification for this development.

A competitive development program has been substantially completed at a cost of about $463 million, and on December 23, 1976, the Army awarded a production contract for 15 aircraft to Sikorsky Aircraft Division of United Technologies Corporation. (See pp. 1, 5, and 6)

The following important matters were noted during our review:

--Government competitive testing of the Prototypes and the UH-1 completed in September 1976 at Fort Campbell, Kentucky, shows the new helicopter has met its interim reliability and maintainability goals. The UH-1, which is a mature system, demonstrated much better reliability and maintainability than the competing Prototypes. (See ch. 3.)

--Recent life cycle cost estimates indicate the cost of a fleet of new aircraft will be more expensive than a comparable fleet of new UH-1 helicopters. This is contrary to estimates used to justify the new helicopter development. (See p. 4 .)

--An August 1976 independent cost estimate indicates the design-to-cost goal will be exceeded by about 6 percent. The Army now believes the goal may be slightly exceeded. (See p. 4 .)

Sikorsky's prototypes generally met aircraft performance requirements except for vertical flight performance. Excessive weight of the prototypes resulted in less vertical rate of climb than anticipated. However, production models are expected to improve because of a 350-pound weight reduction. The prototypes also substantially exceeded the allowable vibration levels, and the vibration specifications for the production model have been relaxed. (See pp. 6-7 .)

GAO believes that reliability and maintainability results demonstrated during competitive testing are questionable and may not be valid. GAO is uncertain whether the Army has met the objective of developing an aircraft with major improvements in reliability and maintainability. The Army advised that the new helicopter is expected to be better than the UH-1 as it becomes a mature system.

GAO recommends that the Secretary of Defense make sure reliability and maintainability goals have been achieved before the Army exercises contract options for follow-on production.

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

Contents

ABBREVIATIONS

GAO	General Accounting Office
UTTAS	Utility Tactical Transport Aircraft System

UTILITY TACTICAL TRANSPORT AIRCRAFT SYSTEM (UTTAS)
(BOEING-VERTOL PROTOTYPE, YUH-61A)

UTILITY TACTICAL TRANSPORT AIRCRAFT SYSTEM (UTTAS)
(SIKORSKY PROTOTYPE, YUH-60A)

CHAPTER 1

INTRODUCTION

The Utility Tactical Transport Aircraft System (UTTAS) is a new twin-engined helicopter that is scheduled to replace the Army's current utility helicopter, the UH-1 in air assault, air cavalry, and medical evacuation missions. It is planned to be the Army's first true squad assault helicopter, designed to transport 11 fully-equipped combat troops. The UTTAS is to perform the missions of transporting troops and equipment into combat, resupplying the troops while in combat, and performing associated functions of aeromedical evacuation, repositioning of reserves, and other combat support missions. An Army objective for UTTAS is to achieve increased cost effectiveness through substantially improved maintainability, availability, reliability, survivability, and performance.

UTTAS development was approved by the Deputy Secretary of Defense in June 1971. In March 1972 the General Electric Company was awarded a cost-plus-incentive fee contract to develop, furnish, and support ground and flight test engines for the UTTAS. A contract for further development of the engine, issued in March 1975, is scheduled to run until December 1979. Cost-plus-incentive fee contracts were awarded for airframe prototype design and fabrication in August 1972 to the Boeing Vertol Company, division of Boeing Company, and to Sikorsky Aircraft, division of the United Technologies Corporation. Initial Army plans called for 16 developmental aircraft; however, the Congress provided funds for only 10--1 static test article, 1 ground test vehicle, and 3 flying prototypes per contractor. In October and November 1974 the airframe contractors accomplished first flight with their aircraft and began prototype flight tests. Each contractor's flight testing consisted of about 700 flight hours. The testing was completed in March 1976, and the aircraft were turned over to the Army for competitive testing.

The development program is substantially completed at a cost of about $463 million. On December 23, 1976, a production contract for 15 aircraft was awarded to Sikorsky Aircraft for $83.4 million. The contract contains options for 56 aircraft in the second year, 129 in the third year, and 168 to 185 in the fourth year. The Decision Coordinating Paper requires the Army to demonstrate that reliability and maintainability goals for the mature aircraft have been

achieved prior to the full-scale production decision. The Army does not plan to demonstrate the attainment of these goals until 200 aircraft are on contract. The total program acquisition cost is currently estimated to be about $3.4 billion for 10 development and 1,107 production aircraft.

RELATIONSHIP TO OTHER SYSTEMS

Both UTTAS competitor's prototypes are being considered for the Navy's Light Airborne Multi-Purpose System. The Navy plans to obtain competition in the selection of an airframe for this program rather than automatically accepting the winner of UTTAS competition. The Navy has issued requests for proposals which were to be received by November 5, 1976. Eight contractors have expressed interest in the Navy's program. Three airframe contractors including Boeing and Sikorsky have responded to the Navy's request for proposal.

The UTTAS is also being considered for the Navy's carrier antisubmarine warfare helicopter and as a Marine Corps troop transport helicopter. Marine Corps officials told us that due to differences in squad size and distance requirements, the Marine Corps may need a larger helicopter with more speed than UTTAS.

SCOPE OF REVIEW

Our review primarily dealt with UTTAS program cost, schedule, performance testing, and related technical matters at the UTTAS project manager's office and the Army Aviation Systems Command, St. Louis, Missouri. We reviewed Government testing data at a test site at Fort Campbell, Kentucky, and discussed procedures with testing personnel. We discussed program results with Department of Army officials and with officials of the Army Materiel Systems Analysis Activity at Aberdeen Proving Ground, Maryland.

CHAPTER 2

SYSTEM STATUS

Cost, schedule, and technical performance goals have generally been met during the UTTAS development program. Program cost has increased about $1 billion over the fiscal year 1971 estimate, primarily because of inflation. We believe the design-to-cost goal for the UTTAS will be exceeded. However, the Army advised that any increase would be slight. The scheduled milestones for the development program have generally been met, on a timely basis, with the production contract awarded only 1 month behind schedule. The Army has considered several changes to the initial production quantities. Current plans call for 200 aircraft to be purchased during the first 3 years of production with a fourth year option for 168 to 185 additional aircraft. Previous plans to purchase 85 aircraft during the first 3 years were changed because of cost considerations. (See p. 4 .)

Performance goals for UTTAS have generally been demonstrated except for the prototype helicopters exceeding weight limitations which affect hover and climb capabilities and excessive vibration in the cabin and cockpit areas.

COST

The Army estimates the average program unit acquisition cost for developmental and production helicopters is about $3 million. The average unit cost in the Army's planning estimate was about $2 million. The following chart lists the program development and procurement acquisition cost estimates:

Selected Acquisition Report Costs

	Planning estimate FY 1971	Current estimate 9-30-75
	(millions)	
Development	$ 409.9	$ 463.0
Procurement	1,897.4	2,903.6
Program cost	$2,307.3	$3,366.6

Inflation has increased the 1971 planning estimate by more than $50 million for development and $1.2 billion for procurement. The net increase of about $1 billion in procurement also included decreases for deletion of program requirements, removal of replenishment spare parts from the estimate, and application of revised estimating techniques. The estimated price overrun at completion for the research and development contracts for both contractors amounted to $57 million.

Design-to-cost goal

The Army Aviation Systems Command's independent cost estimate for the UTTAS prepared in August 1976 indicated the UTTAS cost would exceed the design-to-cost goal by 6 percent. Design-to-cost goals are stated in terms of the flyaway cost which includes the unit cost of the airframe, engines, avionics, and Government-furnished equipment. Stated in 1977 dollars, the unit design-to-cost goal is $1.44 million. The independent cost estimate for the UTTAS is $1.52 million or about $80,000 more than the goal. This estimate was based on an initial production of 85 aircraft over a 3-year period. We were advised by an Army official that increasing the initial production quantity from 85 aircraft to 200 resulted in substantial savings which reduced the average flyaway cost of the aircraft. The Army advised that the design-to-cost goal may be slightly exceeded.

Life cycle costs

The Army Deputy Chief of Staff for Operations and Plans directed a cost and operational effectiveness analysis be performed to determine the ranking of alternative systems in performing the UTTAS missions. The Aviation Systems Command was assigned the responsibility of providing life cycle cost estimates of alternative aircraft systems for the analysis.

The Aviation Systems Command's study, prepared in September 1976, showed that UTTAS life cycle costs will be about $310 million more than a new UH-1 fleet. The following are the comparisons of the life cycle cost estimates in 1977 dollars for these systems.

Life Cycle Cost Summary

	System	
	UH-1	UTTAS
	(billions)	
Development	$ -	$ .112
Investment	1.058	2.249
Operating and support	10.625	9.632
Total life cycle cost	$11.683	$11.993

The investment cost in the above table is based on the procurement of sufficient numbers of aircraft to perform the UTTAS mission--1,587 UH-1s and 1,107 UTTASs. The quantity of UTTAS is lower because of its improved operational effectiveness. The operating and support costs are based on a 20-year aircraft life and 27 flying hours per month. Development costs were not included in the UH-1 cost because development has been completed.

The Army's Decision Coordinating Paper, dated May 14, 1971, stressed several fundamental considerations which required the UTTAS development. One consideration was that an airfleet composed of UH-1 helicopters would be $600 million to $850 million (1971 dollars) more expensive to own and operate than a comparable UTTAS fleet. The life cycle cost estimate above shows that the UTTAS will be about $300 million (1977 dollars) more expensive than the UH-1. Based on the Aviation Systems Command's study, it appears that the anticipated cost savings will not be achieved and the consideration is no longer valid.

The Army advised that the most recent life cycle cost estimate shows the UTTAS will be about $236 million (1977 dollars) more expensive than a comparable fleet of new UH-1 aircraft.

SCHEDULE

Minor slippages in program schedule milestones have occurred. Government competitive testing was completed 4 months behind schedule because icing tests were not completed until December 1976. However, the initial production

contract for 15 aircraft was awarded to Sikorsky Aircraft in December 1976, only 1 month behind schedule. A follow-on development effort to correct deficiencies disclosed during competitive testing and to continue reliability and maintainability testing will run concurrently with initial production. Except for this effort, which is estimated to cost about $61 million, the basic engineering development phase is complete.

Scheduled major milestones are shown below.

Scheduled Major Program Milestones

Producibility engineering planning contract completion--engine	September 1977
Exercise second year option for 56 aircraft	October 1977
Deliver first limited production aircraft	August 1978
Completion of follow-on engineering development testing	September 1978
Exercise third year option for 129 aircraft	October 1978
Phase III development and operational test completion	April 1979
Defense Systems Acquisition Review Council IIIA	August 1979 (note a)
Exercise fourth year option for 168 to 185 aircraft	October 1979

a/Replaced by Army Systems Review Council IIIA in August 1979.

PERFORMANCE

There have been no changes to the performance requirements since the competitive contracts were awarded. Following are the performance requirements reported in the September 30, 1976, Selected Acquisition Report.

Characteristics	Requirements
Basic mission payload (note a)	11 combat-equipped troops
Mission endurance (note a)	2.3 hours
Mission reliability	.986909 (probability of completing a mission)
Cruise speed (note a)	145 to 175 knots
Vertical flight performance (note a)	450 to 550 feet per minute at 95-percent intermediate (military) rated power
Maintenance man-hours per flight-hour (note b)	3.8 hours

a/Performance at 4,000 feet/95 degrees Fahrenheit.

b/1.0 hour preventive and 2.8 hours fault corrective.

Sikorsky generally met the performance characteristics listed above except vertical flight performance. The weight of the prototypes was above the weight originally estimated in the contractors' specifications. As a result, the prototypes demonstrated less hover out of ground effect/vertical rate of climb performance than required of the production aircraft. The production specifications were established at 480 feet per minute rate of climb. The Army advised the production helicopter is expected to be within the required weight tolerances, and should achieve the required rate of climb.

Sikorsky's prototypes exceeded the specifications for allowable vibration levels in the cockpit and cabin areas by about 100 percent. The development specifications allowed a vibration level of .05g. Sikorsky's prototypes demonstrated approximately .10g. The production specifications have been relaxed to .10g for the cockpit and .12g for the cabin. The Army advised that this is better than the .20g normally specified for helicopters.

As of October 6, 1976, General Electric and the airframe contractors have accomplished about 29,000 total test hours on the development engines. Project officials advised that the production configuration engine successfully completed the 150-hour military qualification test in March 1976 and is ready to go into production.

CONCLUSIONS

Cost, schedule, and technical performance goals of the UTTAS have generally been met during the basic engineering development phase. Excessive weight of the prototypes and excessive vibration in the cabin and cockpit areas were encountered during the development phase. In our opinion, aircraft weight and vibration levels should be closely watched during initial production when further refinement and development testing will be conducted.

CHAPTER 3

GOVERNMENT COMPETITIVE TESTING

Government competitive tests show that the UTTAS contractors' prototypes have exceeded the Army's interim reliability and maintainability goals of 2.6 hours mean time between failures and 4.3 hours fault corrective maintenance man-hours per flight hour. However, test results also show that the UH-1 demonstrated much better reliability and maintainability than the UTTAS. As shown in appendix I, Government test results are questionable in view of the results of the UH-1 helicopter, and may not be valid.

Government competitive tests for reliability and maintainability were conducted from March through September 1976. The purpose of the testing was to establish a reliability, maintainability, logistics, and operational effectiveness data base for use in evaluation of the UTTAS development program. The testing was comprised of two major phases--developmental testing and operational testing. The developmental testing was conducted by the Army Test and Evaluation Command at Fort Rucker, Alabama; the Aviation Systems Command, Aviation Engineering Flight Activity at Edwards Air Force Base, California; and at Fort Wainwright, Alaska. Operational testing was conducted by the Army Operational Test and Evaluation Agency at Fort Campbell, Kentucky.

The contractors provided six aircraft for competitive testing. The three aircraft from each contractor were flown about 750 hours during Government testing. Two aircraft were utilized for engineering flight testing and four were utilized during the developmental and operational testing. UH-1 aircraft were also flown about 540 hours during testing to obtain reliability and maintainability data for comparison purposes. The final 200 hours of operational testing was established as the time frame to demonstrate the attainment of reliability goals.

MEAN TIME BETWEEN FAILURES

Simply stated, mean time between failures indicates the length of time aircraft will fly without a failure. The Army's UTTAS goal for this development phase was 2.6 hours with an eventual goal of 4.0 hours by full production. The Army expected the UTTAS prototypes to demonstrate a mean time between failure rate of 2.3 hours by the end of the competitive tests.

During the last 200 hours Boeing demonstrated 3.59 hours and Sikorsky 2.97 hours for mean time between failures, while the UH-1 demonstrated significantly better performance--6.29 hours.

Testing disclosed differences in mean time between failures between each contractor's prototypes. For example, during the last 200 hours of testing, one of Boeing's two prototypes demonstrated 5.0 hours mean time between failures and the other prototype only 3.4 hours. The prototype demonstrating the highest reliability crashed in November 1975 before Government competitive testing. Army officials indicated some of the repairs made to the damaged helicopter resulted in new parts and general refurbishment of the aircraft which could account for some of the differences. The Army advised us that the refurbished helicopter did not incur the same vibration problems experienced by the other prototype.

Sikorsky experienced a similar difference with its prototypes. During the last 200 hours of testing, one of its prototypes demonstrated mean time between failures of 4.2 hours, while the other demonstrated 2.8 hours. Project officials were unable to explain the differences on the Sikorsky prototypes.

The UH-1 achieved 6.29 hours for mean time between failures during the last 200 hours of Government testing. Army officials have said that the UH-1, based on historical data, demonstrates 2.6 hours for mean time between failures. When the 6.3 hours is compared to the 2.6 hours, the validity of Government test results becomes somewhat questionable.

There are several possible reasons why reliability achieved by the UTTAS prototypes during Government competitive testing was better than anticipated:

--Improvements were incorporated by the contractors during the testing.

--Major components had few failures because of the relatively low number of flying hours on the system.

--The failure criteria was changed, with certain maintenance actions being reclassified as preventive maintenance and therefore not chargeable.

MAINTENANCE MAN-HOURS

An Army objective during the UTTAS development was to obtain low maintenance man-hours per flight hour. The interim goal at the end of competitive development was 4.8 hours for fault corrective maintenance with it being reduced to 2.8 hours before October 1979. During the last 200 hours of Government competitive testing Boeing and Sikorsky both demonstrated their aircraft required less fault corrective maintenance than the goal for the mature aircraft.

However, the UH-1 fault corrective maintenance was at least three times better than either UTTAS contractor demonstrated during the last 200 hours of Government testing. We believe and project officials agreed that the demonstrated maintenance values are not representative of what will be experienced on the UTTAS. Some possible reasons for the unrealistically low maintenance hours were:

--Maintenance that could have been performed was deferred because of design change considerations.

--Some items that could have been repaired in the field were repaired at the contractors' plants and not charged to the contractor. Army officials advised that they elected to rely on contractor support where feasible to minimize costs associated with training of personnel and parts stockage.

--The low number of flight hours on the prototypes and allowing contractors to incorporate improvements during Government competitive tests may have resulted in fewer failures.

Although maintenance man-hours per flight hour demonstrated were much better than anticipated, project officials believe required maintenance will increase. However, they estimate it will not exceed the 2.8 hour goal for the UTTAS.

CONCLUSIONS AND RECOMMENDATION

Government test results show that the UTTAS prototypes have exceeded the interim reliability and maintainability goals. However, we believe that reliability and maintainability test results are questionable and may not be valid. Therefore, we recommend that the Secretary of Defense make sure the reliability and maintainability goals have been achieved before the Army exercises contract options for follow-on production.

APPENDIX I

GOVERNMENT COMPETITIVE TEST RESULTS

	UTTAS interim goals	Develop-Development	Opera-tional	Development and operaional	Last 200 hours
Boeing (note a):					
Mean time between failures	2.6	2.35	3.60	2.82	3.59
Mission reliability	b/.90	.954	.973	.963	.967
Fault corrective maintenance man-hours per flight hour	4.3	.819	.447	.643	.466
Operational availability (note c)	d/.75	.838	.859	.849	.855
Sikorsky (note a):					
Mean time between failures	2.6	2.37	3.11	2.65	2.97
Mission reliability	.90	.940	.965	.952	.967
Fault corrective maintenance man-hours per flight hour	4.3	.703	.589	.646	.632
Operational availability (note c)	d/.75	.850	.854	.853	.849
UH-1:					
Mean time between failures			5.2		6.29
Mission reliability			.993		.990
Fault corrective maintenance man-hours per flight hour			.177		.148
Operational availability (note c)			.853		.850

a/Figures include assumed failure rates for Government-furnished equipment.

b/Figure represents minimum acceptable values to be demonstrated during Government competitive testing. No interim goal was established for this parameter.

c/No interim goal was established for this parameter. However, .75 is to be demonstrated during Developmental/Operational Test III, which is to take place October 1978 through March 1979.

d/Operational availability test results were computed using a 10-percent factor for aircraft not operational because of supply parts. (Not operationally ready-supply.)