BY THE COMPTROLLER GENERAL

Report To The Congress

OF THE UNITED STATES

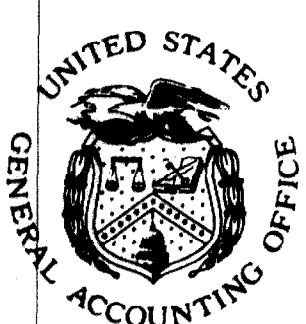
Air Force And Navy Trainer Aircraft Acquisition Programs

GAO examined the status of one Navy and two Air Force Programs to acquire 1,184 trainer aircraft costing an estimated $10.8 billion over the next decade. GAO found that:

--The Department of Defense needs to firm up its plans to acquire T-45 aircraft for training Navy pilots. In doing so, the Navy should be directed to consider extending use of its present aircraft.

--The Air Force's T-46A has experienced some cost growth. Its accelerated engine development and concurrent testing and production are areas of potential concern.

--The Air Force planned to begin development of the Tanker-Transport-Bomber Training System in fiscal year 1983, but the Congress did not authorize appropriations for the program in that year. The Air Force has applied for fiscal year 1984 approval.



GAO/MASAD-83-22
JULY 5, 1983

Request for copies of GAO reports should be sent to:

U.S. General Accounting Office
Document Handling and Information
Services Facility
P.O. Box 6015
Gaithersburg, Md. 20760

Telephone (202) 275-6241

The first five copies of individual reports are free of charge. Additional copies of bound audit reports are $3.25 each. Additional copies of unbound report (i.e., letter reports) and most other publications are $1.00 each. There will be a 25% discount on all orders for 100 or more copies mailed to a single address. Sales orders must be prepaid on a cash, check, or money order basis. Check should be made out to the "Superintendent of Documents".

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

B-209123

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

This report presents our views on the major issues concerning the Navy and the Air Force programs to acquire new aircraft for pilot training.

For the past several years, we have reported annually to the Congress on the status of selected major weapon systems. This report is one in a series that is being furnished to the Congress for its use in reviewing fiscal year 1984 requests for funds.

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

Charles A. Bowsher

Comptroller General
of the United States

D I G E S T

The Navy and the Air Force have proposed three programs to acquire 1,184 trainer aircraft at a cost of about $10.8 billion during the next 20 to 25 years. They are the Navy's proposed T-45 aircraft for its Undergraduate Flight Training System, the Air Force's T-46A Next Generation Trainer, and the Air Force's Tanker-Transport-Bomber Training System aircraft. The T-45 will replace the Navy's T-2B/C intermediate and TA-4J advanced jet trainers. The T-46A will replace the Air Force's aging T-37 basic jet trainers. The Tanker-Transport-Bomber Training System will be a multiengine jet trainer used to introduce student pilots to multiengine aircraft flying.

GAO reviewed the proposed programs to provide the Congress with information on the status and significant issues of these programs.

CONGRESSIONAL CONCERN

The Congress has expressed skepticism about these programs and has taken the following actions:

--In August 1982, the House and Senate Armed Services Committees' conferees expressed concern over the proliferation of military aircraft production lines.

--Last year, the Congress did not authorize any appropriations for the Tanker-Transport-Bomber Training System despite Air Force plans to begin.

--While 1983 funds were appropriated to continue development of the T-45 and the T-46A, the House and Senate Armed Services Committees' conferees expressly reserved judgment about authorizing any production. They said they would reserve judgment until the Secretary of Defense presents the Congress with a comprehensive plan which persuasively establishes the administration's ability to fund these aircraft without diverting resources from existing production lines.

T-45

The T-45 is a two-tandem seat, jet engine trainer designed and built in Britain. A version will be built for the Navy in this country by McDonnell Douglas Corporation and will possess added capability enabling it to operate from aircraft carrier decks.

Pre full-scale development of the Navy's T-45 began in September 1982. Full-scale development is planned to begin about March 1984, but this will probably be delayed because the Navy was late in starting its pre full-scale development phase. A review of the acquisition program by the Defense Systems Acquisition Review Council was planned in 1982 but was postponed twice. The Navy is still involved in internal review of the program and a new date for the Council's review has not been set.

The Navy originally planned to buy 282 aircraft, all of which would have been capable of operating from aircraft carriers. To reduce costs in the early program years, it subsequently proposed to buy a mixed fleet of 305 aircraft (plus 2 development models), of which 251 would be carrier capable. Contractor studies show that a mixed aircraft fleet is feasible but may be more costly. As of April 1983, the Navy had not decided on the structure of the program and had no cost estimate for the mixed fleet alternative that was satisfactory for budget purposes. (See pp. 6 to 8.)

The Navy might be able to avoid buying a mixed fleet of T-45 aircraft, thus possibly reducing the cost of the program. Under the mixed fleet plan, the Navy would purchase the noncarrier-capable T-45s starting in 1987 to replace TA-4Js. But, the Navy will not need any carrier-capable T-45s to replace T-2B/Cs until 1990. While a shortfall of TA-4Js is projected to develop in 1987, this could be avoided by modifying and transferring TA-4Js from lower priority training programs. This would allow the Navy to wait until 1990 for the carrier-capable T-45s and avoid procurement of noncarrier-capable T-45s. GAO believes the Navy needs to examine this alternative. (See p. 9.)

The House Appropriations Committee, in its fiscal year 1980 report, stressed the desirability of having training aircraft that can meet the needs of both the Navy and the Air Force. However, there is little likelihood that the Air Force will procure any T-45 aircraft because it sees no need to replace its present T-38 aircraft used for advanced pilot training within the next 10 to 15 years. Further, the T-45 does not meet the Air Force's performance requirements. (See p. 10.)

Public Law 97-252 requires submission to the Congress of periodic reports on major weapon system acquisition programs. No periodic reports on the status of the T-45 program have been presented to the Congress. The Secretary of Defense requested a waiver on submitting Selected Acquisition Reports on the T-45 program; however, the waiver was denied. A Department of Defense official told GAO that they expect to begin reporting as of September 30, 1983. (See p. 11.)

RECOMMENDATIONS TO THE SECRETARY OF DEFENSE

GAO recommends that the Secretary of Defense direct the Secretary of the Navy to consider extending the use of existing TA-4J aircraft in lieu of procuring the T-45s that are not capable of operating from aircraft carriers. This would permit delaying acquisition of the T-45 until a carrier capable version could be made available. This would eliminate a need to acquire a mixed fleet of aircraft. (See p. 11.)

GAO also recommends that the Secretary of Defense direct the Navy to develop a firm program plan which discloses the uncertainties, risk, and judgment factors involved in determining the quantity of T-45 aircraft to be procured, the procurement schedule, and funding requirements. (See p. 12.)

T-46A

In 1982 the Air Force awarded contracts for full-scale development of the T-46A; the

contracts also contain options for initial production units.

Compared to the T-37, the T-46A is expected to have increased performance, improved maintainability, reduced fuel consumption, lower operating costs, and improved capability to operate in certain adverse weather conditions. (See p. 15.)

The latest cost estimate available at the time of GAO's review was made in June 1982. Between July 1981 and June 1982, the estimated program costs increased $164 million from $3.277 billion to $3.441 billion, or 5 percent. This increase occurred primarily because higher escalation indices were used to project the effect of inflation on costs and the production schedule was stretched to reduce fiscal year 1984 funding requirements. The $164 million cost increase would have been about $82 million higher, but the Air Force transferred aircraft simulator development to another program, deleted one development aircraft, and canceled plans for one phase of engine testing. Some other potential future Air Force costs for interim contractor support and engine component improvement were not included in the cost estimate. (See p. 16.)

The President's budget request for the T-46A submitted to the Congress in January 1983 shows the latest program cost estimate as $3.45 billion. GAO did not analyze this new estimate.

The Air Force plans to develop a new engine in parallel with the T-46A airframe by adopting the technology of an existing, but larger commercial engine. The performance demanded of this engine will be high. Despite the relatively short development time being allowed, Air Force officials are confident of success. In 1980, a GAO review of management problems in aircraft gas turbine engine programs determined that experience has shown that such efforts have not been trouble free. This report shows that adequate development time for modified engines requires 5 to 7 years as opposed to the 33 months allowed for the T-46A engine development. (See p. 18.)

The aircraft program schedule provides for considerable overlap between development and production. Twenty-six production aircraft are due to be delivered before flight testing is complete. Any delay in the development schedule or problems identified in the flight test program could result in the need to make changes in the aircraft or its engine after production is underway. (See p. 19.)

The Navy has no interest in acquiring the T-46A because it sees no need to replace its much less expensive primary trainer aircraft, the T-34C, at this time. (See p. 20.)

The Department of Defense expects to begin submitting Selected Acquisition Reports to the Congress on the status of the T-46A program as of June 30, 1983. (See p. 19.)

TANKER-TRANSPORT-BOMBER TRAINING SYSTEM

The Air Force plans to use the Tanker-Transport-Bomber Training System to train advanced student pilots in multiengine aircraft. The Air Force presently does not have multiengine training capability for the undergraduate student pilot. Air Force officials approved this specialized pilot training concept in June 1980 and the Mission Element Need Statement in September 1981. The Air Force expects to procure off-the-shelf, twin-engine aircraft to train tanker, transport, and bomber aircraft students during the second phase of their flight training. Use of this aircraft could reduce training cost and delay the need to replace T-38 trainers. (See p. 20.)

The Air Force planned to begin development in fiscal year 1983, but the Congress did not authorize appropriations for the program in that year. The Air Force renewed its initiative by requesting fiscal year 1984 funds. (See p. 21.)

The Air Force changed the year it expects to begin using the aircraft from 1986 to 1988 because an analysis showed that the new aircraft would not be needed until 1988. (See p. 23.)

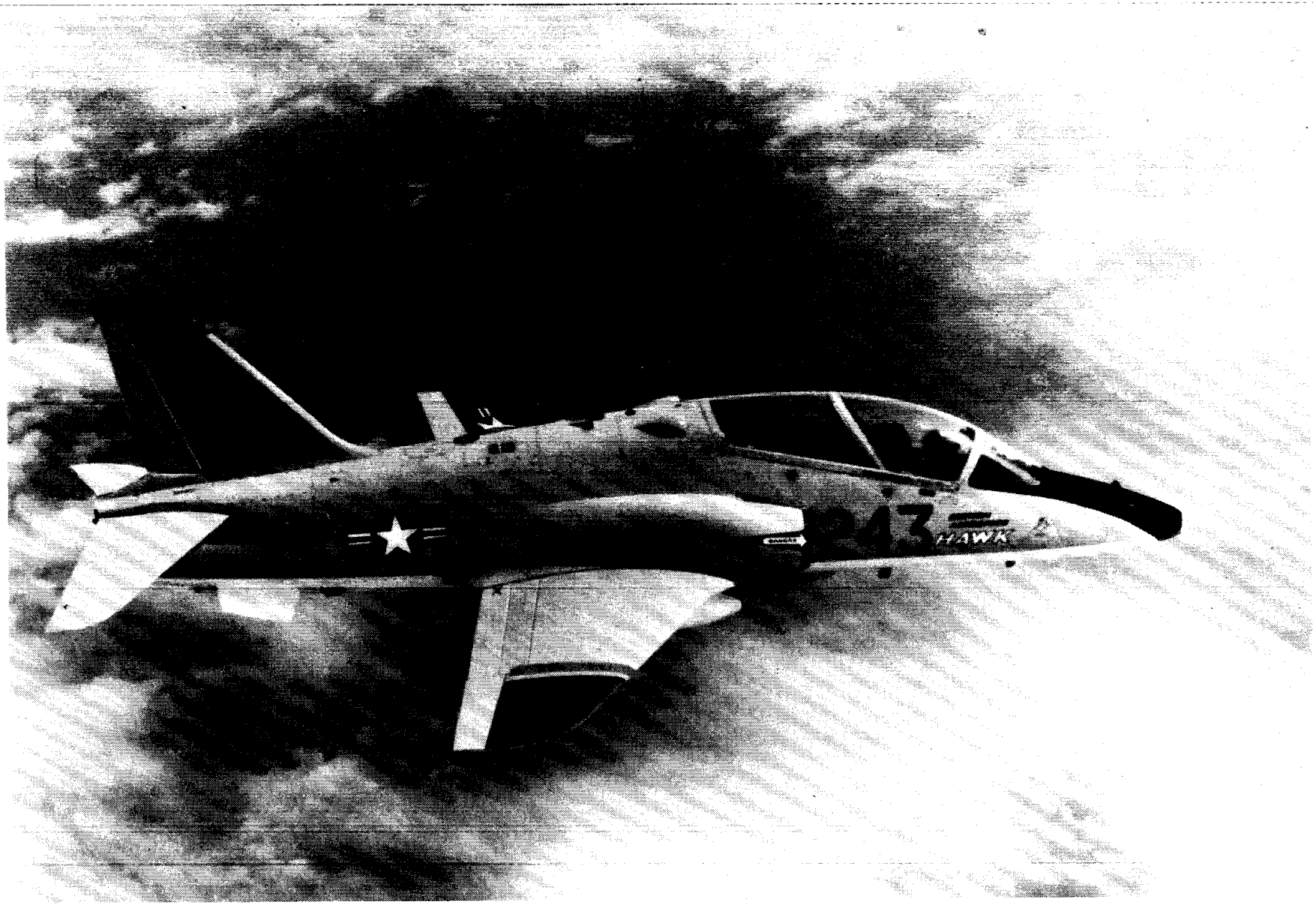
AGENCY COMMENTS

The Department of Defense reviewed a draft of this report and provided GAO with official oral comments. The Department's spokesperson said that in general the Department had no substantial dispute with the facts and conclusions stated in the draft. However, as considered appropriate, GAO has made some minor changes as suggested by spokespersons for the Department of the Navy. Defense spokespersons did not specifically state agreement or disagreement with GAO's recommendations.

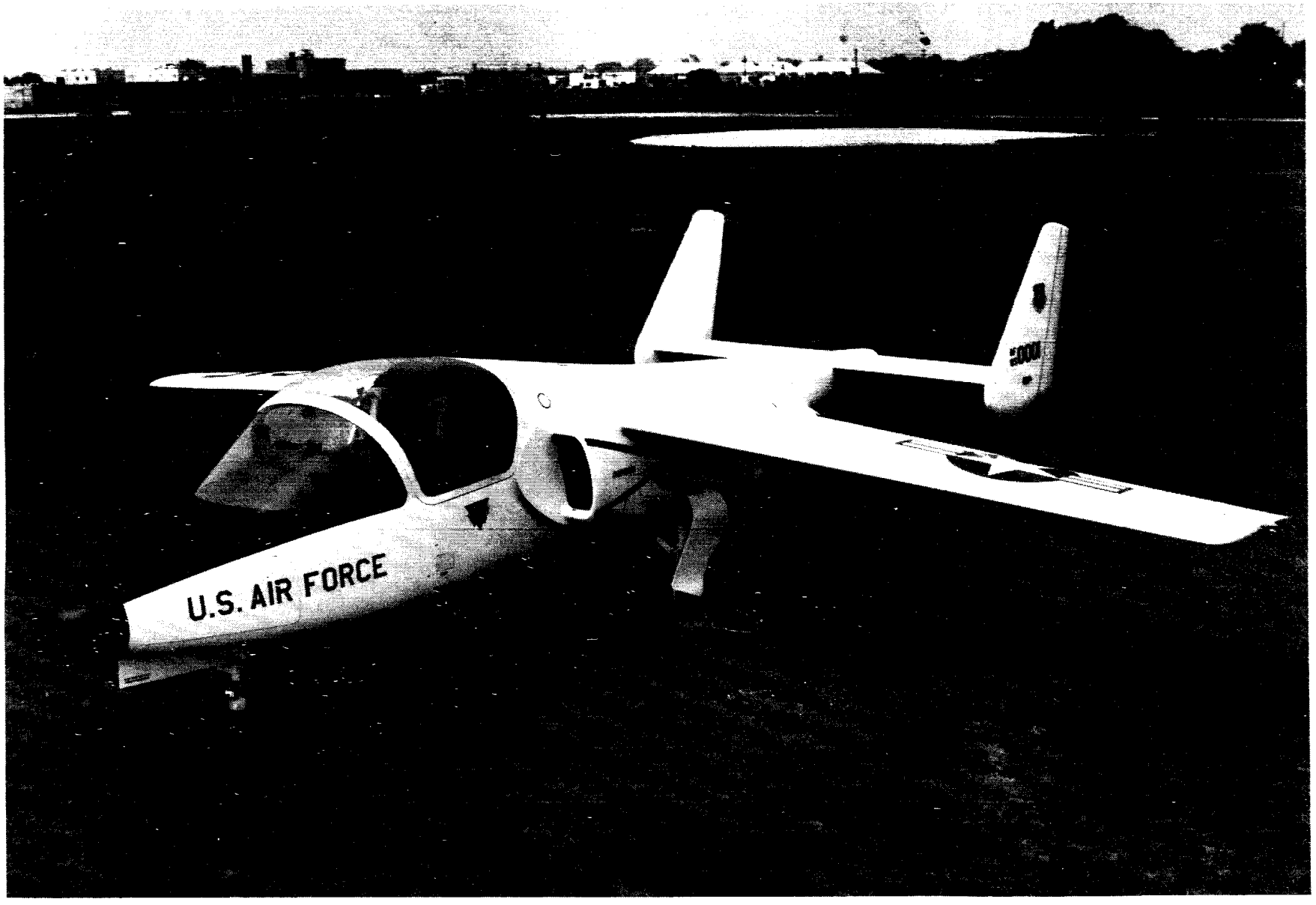
Contents

ABBREVIATIONS

DOD	Department of Defense
GAO	General Accounting Office
TTBTS	Tanker-Transport-Bomber Training System
VTXTS	Navy Undergraduate Jet Flight Training System



T-45 Hawk (VTXTS)



T-46A Next Generation Trainer-prototype.

CHAPTER 1

INTRODUCTION

The Navy and the Air Force have proposed three programs to acquire 1,184 trainer aircraft at a cost of about $10.8 billion. They are the Navy's proposed T-45 aircraft for its Undergraduate Flight Training System, the Air Force's T-46A Next Generation Trainer, and the Air Force's Tanker-Transport-Bomber Training System aircraft. The T-45 will replace the Navy's T-2B/C intermediate and TA-4J advanced jet trainers. The T-46A will replace the Air Force's aging T-37 basic jet trainer. The Tanker-Transport-Bomber Training System will be a multiengine jet trainer to be used to introduce student pilots to multiengine aircraft flying.

While funds were appropriated to continue development of the T-45 aircraft and the T-46A aircraft in the other two programs, the House and Senate Armed Services Committees' conferees reserved judgment about authorizing any production.

TRAINER AIRCRAFT TO BE ACQUIRED

Table 1 identifies the three new trainer aircraft which the Air Force and the Navy plan to acquire for pilot training during the next 20 to 25 years. The early stages of these three trainer aircraft programs were discussed in a prior report.[1]

TABLE 1

TRAINER AIRCRAFT ACQUISITION PROGRAMS

	NAVY	AIR FORCE	AIR FORCE
NEW AIRCRAFT	T-45 (VTXTS)	T-46A (NGT)	TTBTS
REPLACES	T-2B/C and TA-4J	T-37B	
INTENDED USE	Intermediate and Advanced Jet Pilot Training	Basic Pilot Training	Specialized Tanker, Transport, Bomber Pilot Training
ESTIMATED QUANTITY	307	652	225
SOURCE	McDonnell Douglas Corporation	Fairchild Republic Aircraft Company and Garrett Turbine Engine Company	Not Yet Determined
CONFIGURATION	British Hawk, Single Engine Jet With Tandem Seating	Twin Engine Jet With Side-By-Side Seating	Twin Engine Commercial Business Jet
START FULL DEVELOPMENT	1984	July 1982	1984
START PRODUCTION	Unknown	December 1984	Unknown
INITIAL OPERATING CAPABILITY	1991	October 1987	1988
TOTAL PROGRAM COST	$5.5 Billion	$3.4 Billion	$1.9 Billion

[1]Air Force and Navy Plans to Acquire Trainer Aircraft (MASAD-81-11, Feb. 28, 1981).

CONGRESSIONAL CONCERN EXPRESSED

The Congress did not authorize appropriation in the fiscal year 1983 funds, as requested by the Air Force, to begin the development of the TTBTS.

The Congress and the Office of the Secretary of Defense stated that support for the development of the future undergraduate pilot training aircraft would be provided only for one new basic trainer and one new advanced trainer. To ensure the training aircraft currently in development are capable of being used by both services, should the need arise, a Memorandum of Understanding between the Air Force and the Navy was signed on May 5, 1981. The Memorandum of Understanding specifies the coordination actions to be taken during acquisition of the Navy's T-45 and the Air Force's T-46A.

In August 1982, the House and Senate Armed Services Committees' conferees expressed concern over the proliferation of military aircraft production lines. While the conferees approved the funds to continue developing the T-45 and the T-46A, they said they would reserve judgment on any production decisions until the Congress is presented with a comprehensive plan which persuasively establishes the administration's ability to fund these aircraft without diverting resources from existing production lines. The report was issued in April 1983, but it did not appear to provide additional substantive information on the service's trainer aircraft programs.

OBJECTIVE, SCOPE, AND METHODOLOGY

Our objective was to provide the Congress with information on the status and significant issues of these programs.

We obtained background, schedule, performance, and current status information from program documents and officials. In reviewing cost estimates, we interviewed program officials to determine the reasons for cost changes and to find out if all applicable costs were included. We analyzed contractor study reports and service calculations for important aircraft requirements. We also analyzed projected aircraft inventories to determine when replacement trainer aircraft would be needed.

The adequacy of the T-46 engine development time was discussed with Air Force propulsion officials. Service reports and correspondence were used to evaluate Air Force and Navy coordination in acquiring trainer aircraft. We did not evaluate the

effectiveness of the current Air Force and Navy pilot training programs nor the other programs for which the trainer aircraft are planned to be used.

We performed our work at the Office of the Secretary of Defense, Air Force Headquarters, Office of the Chief of Naval Operations, and Naval Air Systems Command, Washington, D. C.; Office of Chief, Naval Education and Training, Naval Air Station, Pensacola, Florida; Air Training Command, Randolph Air Force Base, Texas; and Aeronautical Systems Division, Wright-Patterson Air Force Base, Ohio.

Our review was made in accordance with generally accepted government auditing standards.

CHAPTER 2

T-45

The T-45 is a two-tandem seat, jet engine trainer designed and built in Britain. A version will be built for the Navy in this country by McDonnell Douglas Corporation and will possess added capabilities allowing it to operate from aircraft carriers.

Pre full-scale development of the Navy T-45 began in September 1982. Full-scale development is planned to begin about March 1984, but this will probably be delayed because the Navy was late in starting its pre full-scale development phase. A review of the program by the Defense Systems Acquisition Review Council was planned in 1982 but was postponed twice. The Navy is still involved in its internal reviews of this program and a new date has not been set for the Defense Systems Acquisition Review Council's review.

The Navy originally planned to buy 282 aircraft, all of which would have been capable of operating from aircraft carriers. It subsequently proposed to buy a mixed fleet of 305 aircraft (plus 2 development models), of which 251 would be carrier capable. The other 54 would not be able to operate from a carrier. Contractor studies show that a mixed aircraft fleet is feasible but may be more costly. As of January 1983, the Navy still had not decided on the structure of the program and had no cost estimate for the mixed fleet alternative that was satisfactory for budget purposes.

The Navy may not need the T-45 before 1990 because shortages of T-2B/C will not begin until then, and it may be able to modify and reassign TA-4Js from other programs to relieve any shortages in the late 1980s. Further, the Navy might be able to avoid buying a mixed fleet of T-45 aircraft because carrier-capable T-45s should be ready for delivery by 1990.

The Congress stressed the desirability of having training aircraft that can meet the needs of both the Navy and the Air Force. However, there is little likelihood that the Air Force will procure any T-45 aircraft because it sees no need to replace the present T-38 aircraft used for Air Force advanced pilot training within the next 10 to 15 years. Further, the T-45 does not meet the Air Force's performance requirements.

Public Law 97-252 requires submission to the Congress of periodic reports on major weapon system acquisition programs. No periodic reports on the status of the program have been presented to the Congress. The Secretary of Defense requested a waiver on submitting Selected Acquisition Reports on this program but the waiver was refused. A Department of Defense

(DOD) official told us they expect to begin reporting as of September 30, 1983.

PROGRAM STATUS IS UNCERTAIN

The Navy is still involved in its internal review of its acquisition strategy for the program. A review of the program by the Defense Systems Acquisition Review Council was scheduled for 1982 but was postponed twice and has not been rescheduled.

The Undergraduate Jet Flight Training System (VTXTS) program and its T-45s are intended to replace the current Navy strike pilot training system's intermediate and advanced phases which use the T-2C (Navy intermediate jet trainer aircraft) and the TA-4J (Navy advanced jet trainer aircraft), respectively. VTXTS is planned to be an integrated pilot training system which provides not only an aircraft but also course materials, flight simulators, and a training management system. According to the Mission Element Need Statement, the need for the VTXTS is based on the following:

--The existing flight training system is becoming increasingly expensive to operate and maintain.

--The fleet of TA-4J advanced trainer aircraft currently in use are projected to begin reaching the end of its service life in fiscal year 1985.

--The ability of the present system to provide comprehensive effective training in response to fleet requirements in the 1990s and beyond is doubtful.

Source selection

According to earlier congressional committee direction, the Navy's program acquisition plan of June 11, 1981, contemplated selection of two contractors to compete through the pre full-scale development phase. However, the development command could award only one contract because the Navy did not include enough fiscal year 1983 funds in its budget request to support two contractors.

Six proposals were received in response to the pre full-scale development request for proposals. The Source Selection Advisory Council recommended awarding a contract to either one or both of two specified offerors. In the Council's opinion, both proposals were essentially equal and acceptable. The Council stated that (1) McDonnell Douglas Corporation's proposed system had the lowest life-cycle cost of all six proposed systems and (2) its proposed aircraft, being a derivative design, would permit a shorter contractor flight test program than the other offeror's new design aircraft.

The Source Selection Authority said that only one source was selected because fiscal year 1983 funds were not likely to be sufficient to support two awards. He explained that in the spring of 1981, the Naval Air Systems Command requested $28 million in fiscal year 1983 funds to support two sources. However, later in the year, the Office of the Chief of Naval Operations reduced the fiscal year 1983 VTXTS request to $10 million.

A second pre full-scale development contract would have cost at least another $14 million. While this will now not be spent, the Navy lost the competitive leverage a second source would have provided.

The McDonnell Douglas Corporation has been selected to develop the VTXTS, including its T-45 which will be a modified version of the Hawk aircraft produced by British Aerospace. The T-45 is powered by a single Rolls Royce engine. The Navy originally planned to buy 282 aircraft, all of which would have been capable of operating from an aircraft carrier (carrier capable). In June 1982, in response to concerns about program structure, affordability, and schedule, the Secretary of the Navy told the Congress that the Navy had decided to buy a mixed fleet totaling 305 aircraft in two phases. During the first phase, 54 aircraft not capable of operating from a carrier, designated as T-45B, would be bought. During the second phase, 251 carrier-capable aircraft, designated the T-45A, would be bought. In January 1983, Navy officials said the two-phase program was still the preferred alternative. Total program cost for this VTXTS two-phase program is estimated to be about $5.5 billion in then-year dollars.

Program schedule

The VTXTS program is in what the Navy calls the pre full-scale development phase. Navy officials use this term to emphasize the planning efforts required to effect transition into full-scale development. Since the concept exploration studies were completed in March 1981, the following events for the pre full-scale development phase have taken place.

Event	Date
Request for proposals for pre full-scale development contract sent to contractors	Mar. 6, 1981
Proposals received	June 2, 1981
Contractor source selection completed	Nov. 19, 1981
Pre full-scale development contract awarded	Sept. 24, 1982

Award of the pre full-scale development contract slipped about 10 months while the Navy restructured the program in response to

congressional concerns about program schedule, priority, and affordability. The contract is scheduled for completion on September 29, 1984. Because of delay in awarding the pre full-scale development contract, award of the full-scale development contract will probably be delayed beyond the March 1984 milestone.

Under the mixed fleet concept, production of the T-45B and the T-45A would start in fiscal year 1985 and fiscal year 1988, respectively. Deliveries would start in 1987 and 1990, respectively. Initial training capability with the T-45B is expected in fiscal year 1988. Full system capability with the carrier-capable T-45A is expected to be achieved in fiscal year 1991 when the first VTXTS squadron is scheduled to begin training operations.

Program cost

As of January 1983, the Navy had not completed a budget quality[2] cost estimate for the 305 mixed fleet aircraft program but expected to have such an estimate in time for a Defense Systems Acquisition Review Council review of the program which was projected for later in the year. In June 1982, the Secretary of the Navy informed the Congress that the 305 mixed aircraft program would cost an estimated $5.5 billion in then-year dollars. However, Navy documents state that because of the large uncertainties in acquisition strategy and aircraft configuration, the $5.5 billion was only a "rough order-of-magnitude" estimate of the program cost. The Navy also informed the Congress that the 282 all carrier-capable aircraft program would cost an estimated $5.2 billion in then-year dollars. This $5.2 billion was a budget quality estimate prepared for the Navy's 1984 fiscal year Program Objectives Memorandum and would normally be the one on which the President's fiscal year 1984 budget request would be based. However, the $5.2 billion estimate was subsequently replaced in the Program Objectives Memorandum by the $5.5 billion rough order-of-magnitude estimate.

In addition to differences in the number of aircraft, the Navy's mixed fleet program would be significantly different than the fully carrier-capable program. Because of actions taken after the $5.2 billion estimate was prepared, the system will no longer have digital cockpit and head-up instrument displays nor aerial situation trainers (aircraft simulators).

---

[2]Estimate based on an engineering analysis of detailed characteristics of the items being acquired.

MIXED FLEET IS FEASIBLE BUT MAY BE MORE COSTLY

A mixed fleet of aircraft is feasible but may be a more costly alternative than an all carrier-capable fleet. The all carrier-capable aircraft fleet the Navy originally planned to buy would have required higher funding in the early program years than was compatible with the Navy's budget. To alleviate this situation, the Navy is considering a mixed fleet since an initial buy of the noncarrier-capable T-45B would postpone funding requirements.

The concept of a mixed fleet was studied by the contractor, McDonnell Douglas Corporation, during the concept exploration phase because only 9 percent of the syllabus flight hours requires carrier-capable aircraft. The contractor concluded that a mixed fleet would meet the Navy's training requirements, and described two mixed fleet options, but in each instance the projected costs for the mixed fleet exceeded those for the all carrier-capable fleet. Plan A, the contractor's first option, required buying 50 noncarrier-capable aircraft in addition to the requirements of an all carrier-capable aircraft fleet. The 50 aircraft would be the basic British designed Hawk aircraft with minimum modifications for Navy use and an ability to permit practicing carrier type landing on airfields. These 50 aircraft would be transferred out of the pilot training program upon delivery of the carrier-capable aircraft. The contractor estimated that plan A cost about $360 million more in constant 1980 dollars than a fleet of all carrier-capable aircraft.

Plan B proposed buying a mixed fleet of which 52 percent of the aircraft would not be carrier capable, but these aircraft would have the capability to practice carrier type landings on airfields. Their speedbrakes would be relocated and they would have Navy avionics, including a pilot head-up display system. The plan provided for a two-phase syllabus in which all tactical and carrier qualification training would be done in the second phase with carrier-capable aircraft. This plan would require 12 more aircraft than an equivalent all carrier-capable fleet. The contractor estimated that plan B cost about $178 million more in 1980 dollars than a fleet of all carrier-capable aircraft.

Program officials said the details for the Navy's mixed fleet program will be developed during pre full-scale development and full-scale development. Under its mixed fleet program, the Navy would keep the noncarrier-capable aircraft in the VTXTS program. Therefore, the Navy's mixed fleet program is similar to plan B except that the percentage of noncarrier-capable aircraft in the fleet would be only 18 percent as against 52 percent. Under its mixed fleet plan, the Navy would initially use

the T-45B in conjunction with TA-4J. According to Navy officials, this would optimize use of the TA-4J for carrier qualification. When the carrier-capable T-45A enter the fleet, the Navy intends to use the T-45B interchangeable with the T-45A except for carrier qualification.

The above shows that use of a mixed aircraft fleet is feasible, but the contractor's study indicates that acquisition of a mixed fleet would cost more than an all carrier-capable fleet, under the options considered, and preliminary data on the option proposed by the Navy indicates that it, too, appears to be more expensive.

T-45 MAY NOT BE NEEDED UNTIL 1990

The T-45 may not be needed as early as proposed. Under the proposed mixed fleet program, the T-45B deliveries were scheduled to begin in 1987. Shortages of the T-2B/C will not begin until 1990. The Navy would have sufficient TA-4J for strike pilot training until fiscal year 1995 if it were to transfer TA-4J from other programs to strike pilot training and modify these aircraft to extend their service life.

The Navy had an inventory of about 304 TA-4Js in October 1982. Of these, 175 were allocated to strike pilot training. The balance was used for other programs such as Naval Flight Officer Training, the reserves, and other training programs. Navy officials said that the first priority for use of TA-4Js is strike pilot training and that the other programs will be curtailed within limitations, if necessary, to provide the TA-4J for strike pilot training.

Sufficient aircraft are available in the Navy inventory to maintain strike pilot training capability until at least 1990. Navy projections show that by 1987 when the first quantity of T-45B will be delivered, the Navy will already have had to transfer at least 39 TA-4Js from other programs to strike pilot training. An additional 21 TA-4Js would have to be transferred to strike pilot training between 1987 and 1990 if no T-45Bs are received. The initial quantity of T-45As were planned for delivery during fiscal year 1990 when the Navy projects a T-2B/C shortage. Based on Navy projections, there is an adequate number of TA-4Js for strike pilot training until fiscal year 1995 if all TA-4Js can be used for strike pilot training and if the TA-4J service life is extended to 12,000 flying hours. At present, the Navy has no plan to extend the service life of these aircraft, nor is it committed to transferring the additional 21 TA-4Js to the strike pilot training program.

To prevent curtailing the other programs, the Navy would have to replace the TA-4J transferred to strike pilot training. The Navy transferred eight single seat A-4E aircraft into one of the other programs in January 1983. This released four TA-4Js which were transferred to the strike pilot training program. As they become available, additional A-4s will be transferred to the other programs. Some A-4Es are scheduled for retirement in the mid-1980s. According to Navy officials, these A-4Es could be modified for use on the other training programs. The modifications, estimated by a contractor in an unsolicited proposal to cost about $4 million per aircraft, would include addition of a second seat and a service life extension. Navy officials said, and Navy records show, 25 A-4Ms will become available starting in fiscal year 1988 and 1989. These 25 aircraft would probably require substantial rework before they could replace the TA-4J transferred to strike pilot training.

Clearly, some cost would be entailed if the Navy was to rely on existing T-2B/C and TA-4J assets for strike pilot training until 1990. However, that alternative would seem to merit careful study before the Navy commits itself to procure 54 T-45Bs to meet a projected 3-year shortfall of aircraft in the late 1980s.

AIR FORCE USE OF T-45 UNLIKELY

In response to congressional interest to have commonality in Air Force and Navy training aircraft, especially the House Appropriations Committee's fiscal year 1980 report, the Air Force is participating in the Navy's VTXTS program. However, Air Force comments indicate little potential for the T-45 as a replacement for the Air Force's existing T-38 advanced trainer. Further, the T-45 will have a carrier capability not needed for the Air Force's basic flying training program as a replacement for the T-37B.

The Air Force and the Navy executed a Memorandum of Understanding in May 1981 providing for their participation in each other's trainer aircraft programs at various milestones. According to the memorandum, their interest in commonality is limited to assessing whether they could use each other's aircraft if needed within the next few years. The Air Force does not plan to replace its T-38 within the next few years because planned implementation of specialized undergraduate pilot training in fiscal year 1988 is expected to extend the useful life of the T-38 well beyond the year 2000. (See ch. 4, p. 21.)

Five Air Force officials participated in the VTXTS source selection process to ensure the T-45 had no design or operational characteristics which would preclude Air Force use should the need arise in the next few years. The Air Force concluded that the T-45, as proposed, was not a suitable T-38 replacement, but that the aircraft could be modified to meet the Air Force's requirements. According to the Air Force, the T-45 performance was well below that of the T-38. In addition, the proposed T-45 had (1) several heavy components and avionics sets not needed by the Air Force and (2) built-in test and diagnostic equipment which could increase maintenance costs. If these items were eliminated and other modifications were made, such as adding anti-icing or deicing capability, Air Force requirements could be satisfied. The Navy agreed to an Air Force request that the full-scale development contract include a provision under which the contractor would estimate the cost and time needed to modify the T-45 to meet Air Force requirements.

NO PROGRAM STATUS REPORTING

DOD has not submitted any Selected Acquisition Reports to the Congress on the VTXTS program. In January 1983, it proposed that the periodic VTXTS status reporting otherwise required by Public Law 97-252, September 8, 1982, be waived. The request was denied and officials expect to commence reporting as of September 30, 1983.

CONCLUSIONS

The Navy's acquisition of T-45 is a program that began with a delayed start. Cost estimates prepared and provided to the Congress have been uncertain and imprecise. The Navy has been preparing a new estimate, but its value will remain questionable until the Navy firms up the procurement course it will follow. Insufficient funding for contracting has precluded competitive contract award for pre full-scale development of alternate aircraft proposals. The Congress is concerned about the program's schedule, priority, and affordability. The Navy selected a foreign-designed aircraft that must be changed to meet the Navy's requirements for landing on aircraft carriers. Because an all carrier-capable fleet would require higher funding in the early program years, the Navy now shows preference for a mixed fleet of carrier and noncarrier-capable aircraft. Although feasible from an operational standpoint, the mixed fleet will probably cost more than an all carrier-capable fleet. Meanwhile, the Navy's plans for a review of the program by the Defense Systems Acquisition Review Council has been postponed twice because of the Navy's unreadiness for this high-level examination. There are indications that the T-45 may

not be needed until 1990 if the Navy can extend the operational life and reassign the TA-4J it presently possesses. The extension would permit the Navy to postpone the early-years funding and probably avoid procuring the noncarrier-capable aircraft.

RECOMMENDATIONS TO THE SECRETARY OF DEFENSE

We recommend that the Secretary of Defense direct the Secretary of the Navy to consider extending use of existing TA-4J aircraft in lieu of procuring T-45s that are not capable of operating from aircraft carriers. This would permit delaying acquisition of the T-45 until a carrier capable version could be made available. This would eliminate the need to acquire a mixed fleet of aircraft and could result in cost savings.

We also recommend that the Secretary of Defense direct the Navy to develop a firm program plan which discloses the uncertainties, risk, and judgment factors involved in determining the quantity of T-45 aircraft to be procured, the procurement schedule, and funding requirements.

AGENCY COMMENT

DOD officials reviewed a draft of this chapter and provided oral comments to us. The spokespersons said that in general DOD had no substantial dispute with the facts and conclusions presented. We made changes based upon their comments as considered appropriate for factual purposes. DOD spokespersons did not specifically state agreement or disagreement with our recommendations.

CHAPTER 3

T-46A

In 1982 the Air Force awarded contracts for full-scale development of the T-46A. The contracts also contain options for initial production units. The Air Force plans to use the T-46A to replace its primary trainer, the aging T-37B (Air Force basic trainer aircraft). Compared to the T-37B, the T-46A is expected to have increased performance, improved maintainability, reduced fuel consumption, lower operating costs, and improved capability to operate in certain adverse weather conditions. The aircraft will even exceed Air Force requirements if all development objectives are achieved.

The latest cost estimate available at the time of our review was made in June 1982. Between July 1981 and June 1982, the estimated program costs increased $164 million, from $3.277 billion to $3.441 billion, or 5 percent. This increase occurred primarily because higher escalation indices were used to project the effect of inflation on costs and the production schedule was stretched to reduce fiscal year 1984 funding requirements. The $164 million cost increase would have been about $82 million higher, but the Air Force transferred aircraft simulator development to another program, deleted one development aircraft and canceled plans for one phase of engine testing. Some other potential future Air Force costs for interim contractor support and engine component improvements were not included in the cost estimate. The President's budget submitted in January 1983 shows a total program cost of $3,450.2 billion. We did not analyze this estimate.

The Air Force plans to develop a new engine in parallel with the T-46A airframe by adopting the technology of an existing but larger commercial engine. The performance demanded of this engine will be high. Despite the relatively short developing and testing time being allowed, Air Force officials are confident of success. In 1980 our review of management problems in aircraft gas turbine engine programs determined that experience has shown that such efforts have not been trouble free.

The aircraft program schedule provides for considerable overlap between development and production. Twenty-six production aircraft are due to be delivered before flight testing is complete. Any delay in the development schedule or problems

identified in the flight test program could result in the need to make changes in the aircraft or its engine after production is underway.

The Navy has no interest in acquiring the T-46A because it sees no need to replace its much less expensive primary trainer aircraft, the T-34C, at this time.

DOD expects to begin submitting Selected Acquisition Reports to the Congress on the status of the T-46A program as of June 30, 1983.

T-46A DEVELOPMENT AND INITIAL PRODUCTION CONTRACTS AWARDED

The T-46A concept-exploration studies indicated the aircraft would be within the state of the art and with low complexity in its components. Consequently, the acquisition program will not have a demonstration/validation phase. On October 7, 1981, the Air Force solicited proposals for full-scale development and initial production of the T-46A. After evaluating five proposals, the Air Force awarded contracts to Fairchild Republic Company, Farmingdale, New York, and to Garrett Turbine Engine Company, Phoenix, Arizona, for developing the T-46A airframe and engine, respectively. Fairchild also has primary responsibility for airframe and engine integration. The contracts provide for 2 development aircraft and contain 2 production options to buy up to 65 aircraft. Target prices were established for the production options.

Air Force officials described the status of the acquisition program to personnel in the Office of Secretary of Defense in May 1982 before the development contracts were awarded. Based on these briefings, the Deputy Secretary of Defense in June 1982 determined that a Defense Systems Acquisition Review Council review of the program was not required and stated that an Air Force review should be made after development had begun. The Defense Systems Acquisition Review Council principals have never reviewed the program but an Air Force Systems Acquisition Review Council review of the program is planned for July 1983.

The Air Force expects to buy 652 T-46As with an initial operational capability in 1987 and final aircraft delivery in 1992. Two of these will be development aircraft. The other 650 are for the following programs:

Program	Number of aircraft
Undergraduate pilot training	483
Euro-NATO joint jet pilot training	86
Advanced co-pilot enrichment	43
Undergraduate navigator training	38
Total	650

T-37Bs are currently used for the above programs.

Performance objectives

The T-46A is expected to provide several operational and maintenance benefits over the T-37B. The contractor proposed greater performance than the Air Force requested.

The following is a comparison of some key performance and maintenance factors for the T-37B and the T-46A.

Characteristic	T-37B	T-46A
Cruise altitude (feet)	25,000	45,000
Cruise speed (knots)	326	394
Gallons of fuel per hour	185	64
Maintenance hours per flight hour	6.5	4.25
Anti-icing capability	No	Yes
Oxygen supply system	Gaseous	Liquid
Pressurized cabin	No	Yes
Mission range	1.8 hours	1.5 hours plus 300 nautical miles to alternate field

As shown in the chart, it is evident that the T-46A is expected to have lower maintenance requirements, use less fuel, and, because of its pressurized cabin, be able to operate at higher altitudes. The aircraft's liquid oxygen system will require less maintenance. The T-46A's ability to go to an alternate field after a 1.5-hour mission and its anti-icing capability will permit operations in certain weather conditions which would prevent T-37B operation.

Two of the above T-46A performance characteristics exceed Air Force requirements. The Air Force wanted an aircraft cruise speed of 300 knots and a cruise altitude of 35,000 feet. The aircraft proposed by Fairchild is expected to have a cruise speed of 394 knots and a cruise altitude of 45,000 feet.

According to program management officials, no additional acquisition costs were identified or allowed for the proposed extra performance. They also said the improved performance was a by-product of meeting other required performance requirements. The Air Force's legal counsel informed them that the development contract should be based on the contractor's proposal.

ESTIMATED PROGRAM COSTS HAVE INCREASED

The following data shows that the June 1982 cost estimate for the total program was about $164 million higher than the July 1981 estimate:

Phase	July 1981 estimate	June 1982 estimate	Difference
	(millions)		
Development	$ 417.7	$ 347.3[a]	$ -70.4
Production	2,859.6	3,093.6[a]	+234.0
Total	$3,277.3	$3,440.9[a]	$+163.6

[a]The President's budget request submitted to the Congress in January 1983 shows the latest total program cost estimate to be $3,450.2 million. This consists of $334.4 million for research and development and $3,115.8 million for production. We did not analyze this new estimate.

Because Air Force officials did not think the Congress would approve the estimated $417.7 million development cost, they reduced the number of development aircraft from three to two, deleted certain testing, and transferred some development activities to other Air Force simulator and engine programs. The production cost estimate was increased as a result of using higher escalation factors than in previous estimates and stretching the production schedule to meet expected Air Force funding limitations. Some other potential future costs were not included in the Air Force estimate.

Development cost changes

Overall, the development cost was decreased $70.4 million through the following actions.

Action	Amount
	(millions)
Deletion of one test aircraft	$-24.0
Transfer of simulator development	-36.2
Deletion of one engine testing phase	-22.1
Other items	+11.9
Total decrease	$-70.4

The aircraft simulator development will be funded under a separate simulator development program, but simulator production cost remains part of the T-46A program. Although not currently programmed, the deleted phase of engine testing may eventually be funded under a separate engine component improvement program.

Production cost changes

Program management officials said the $234 million increase in production costs, from $2,859.6 million in July 1981 to $3,093.6 million in June 1982, was the net result of a $182.2 million decrease in the base-year (1981) cost estimate and a $416.2 million increase in estimated inflation. The cost data in the development/production proposals showed that the Air Force's prior estimate of base-year production costs, before application of escalation, was overstated by $182.2 million. The escalation indices to be applied to base-year estimates were increased considerably between July 1981 and June 1982. In addition, the Air Force changed the production schedule so that fiscal year 1984 funding requirements would not exceed $135 million, the amount Air Force officials expected would be available. The changes in the funding schedule will delay production as follows:

	Number of aircraft	
Fiscal year	July 1981 estimate	June 1982 estimate
1984	4	0
1985	18	8
1986	129	32
1987	144	135
1988 and later	355	475
	650	650

Applying the higher Office of the Secretary of Defense escalation indices to the revised production schedule resulted in an increase of $416.2 million.

Other possible future costs

The development and production costs discussed above do not include the costs of planned interim contractor support and engine component improvement. Air Force officials estimated that 3 years of interim contractor support would cost $8.5 million. This should be considered a part of program cost as it supports introduction of the system into service use. Air Force officials were unable to provide an estimate of the engine component improvement. When determined, in our opinion, this too should be included in the program cost estimate.

Fairchild's contract also contains an option for $877,680 to perform a technology modernization study while Garrett's contract contains an option for $1,338,900 for technology modernization. These costs should be considered as T-46A program costs if and when it is clear the options will be exercised.

TECHNICAL RISK JEOPARDIZES PROGRAM OBJECTIVES

The Air Force looks on development of the T-46A as a rather straight forward application of state-of-the-art technology. According to program management officials, they are confident about meeting established cost, schedule, and performance objectives.

System Program Office officials said no engine meeting T-46A requirements was available. Consequently, while Fairchild develops the airframe, Garrett Turbine Engine Company, the engine contractor, will be developing a new engine by adapting the technology of an existing, but larger, commercial engine. Developing the engine to meet durability requirements will require considerable effort.

Originally, the Air Force planned to test the T-46A's engine for one lifetime in four phases. To reduce costs, the fourth phase was deleted. As a result, the engine will be tested for only one-half of a lifetime. Program management officials said there is sufficient time to adequately develop the aircraft and its engine. They said engine development is the critical factor in the program and that the 33 months between the July 1982 start of aircraft development and the first flight in April 1985 should provide sufficient time to

develop the engine. According to Air Force officials, the accelerated mission testing under the engine development approach should reduce the need for retrofiting the earlier production aircraft. However, much of the accelerated mission testing is scheduled to be done after production begins.

Although we have no evidence to indicate that the Air Force's expectations for the engine program may encounter delays, historically, such programs have not been trouble free. Our prior report[3] shows that adequate development of modified engines usually requires 5 to 7 years as opposed to the 33 months being allowed in this program.

AIRCRAFT DEVELOPMENT AND PRODUCTION OVERLAP

The aircraft program schedule provides for considerable overlap between development and production. For example, the decision to exercise the option for the first lot of at least 10 aircraft is scheduled to be made in January 1985, 4 months before first flight of the aircraft. In addition, the option for the second lot of at least 22 aircraft is scheduled to be exercised in December 1985 after only 8 months of flight testing. Twenty-six production aircraft are scheduled to be delivered before May 1987 when flight testing is scheduled to be complete.

Any delay in the T-46A development schedule or problems identified during the flight test program could result in the need to make changes to the aircraft or its engine after production is underway.

STATUS REPORTING TO START SOON

DOD instructions call for preparing and submitting Selected Acquisition Reports for selected major system acquisition programs. Public Law 97-252, September 8, 1982, requires submitting similar periodic reports for defense acquisition programs where, as in the T-46A program, procurement is expected to cost over $1 billion.

An official of the Office of the Secretary of Defense informed us that they expect to begin submitting Selected Acquisition Reports on the status of the T-46A program as of June 30, 1983.

---

[3]Are Management Problems in the Acquisition of Aircraft Gas Turbine Engines Being Corrected? (PSAD-80-72, Sept. 30, 1980).

NAVY PARTICIPATION IN THE PROGRAM

In accordance with the Memorandum of Understanding (see p. 2), a Navy official participated in the T-46A source selection. The official's primary concern was whether the T-46A would meet the Navy's primary flight training requirements. In general, the T-46A would be acceptable for the Navy's use as a primary trainer, but, at present, the Navy has no need to replace its much less expensive T-34C primary trainer. Also, the T-46A performance exceeds what is necessary for its primary trainer.

If the Navy was to procure the T-46A, some minor changes in instruments and pilot ejection seats would be required. The Navy flight training syllabus would also have to be changed to accommodate the T-46A's higher performance and the student pilot's transition to the Navy's T-45.

CONCLUSIONS

The T-46A program involves some concurrent development and production and a reduction of testing. The engine development has a short schedule compared to other such programs and its testing has been reduced. Although Air Force officials believe the risks are low, historically, such efforts are not trouble free. A delay in the T-46A development schedule or problems identified during the flight test program could result in changes to the aircraft or its engine after production has started.

AGENCY COMMENT

Air Force officials reviewed a draft of this chapter and commented that the report suggested that DOD was in violation of Public Law 97-252 for not providing Selected Acquisition Reports to the Congress. The report has been changed and any such implication has been eliminated.

CHAPTER 4

TTBTS

The Air Force plans to use the TTBTS to implement specialized undergraduate pilot training. Air Force officials approved the specialized pilot training concept in 1980 and the Mission Element Need Statement in September 1981. The Air Force expects to procure off-the-shelf, twin-engine aircraft to train tanker, transport, and bomber aircraft students during the second phase of their pilot flight training. Use of a TTBTS could reduce training cost and delay the need to replace the T-38 trainers.

The Air Force planned to begin development in fiscal year 1983, but the Congress did not authorize appropriations for the program in that year. The Air Force renewed the initiative by requesting fiscal year 1984 funding.

The Air Force changed the initial operational capability milestone from 1986 to 1988 because an analysis showed that the new aircraft would not be needed until 1988.

TTBTS COULD REDUCE COSTS AND DELAY T-38 REPLACEMENT

The TTBTS would enable the Air Training Command to implement specialized pilot training. The current Air Force pilot training program provides generalized training to all students regardless of the category of aircraft to which they will be assigned later. After initial training in a T-37B, all students presently receive the next level of training in a T-38 before graduating as pilots. Specialized training would separate student pilots after the first phase into one of the two categories: the fighter, attack, and reconnaissance category on the one hand or the tanker, transport, and bomber category on the other hand. The T-38 would continue to be used for the fighter, attack, and reconnaissance student pilots. The TTBTS would be used to train the student pilots who are selected to fly tanker, transport, or bomber aircraft. According to Air Training Command officials, about 60 percent of the student pilots would be trained in the TTBTS.

The TTBTS aircraft will permit training in tasks unique to the particular categories of operational aircraft and possibly reduce the cost of training. Some operational requirements that can be taught in off-the-shelf TTBTS aircraft include crew coordination, air-drop fundamentals, airborne rendezvous, radar procedures, and refueling while airborne. These skills are only

addressed in a cursory manner in the current generalized program. A TTBTS aircraft is expected to use 115 to 225 gallons of fuel per hour less than the T-38. It is also expected to require less maintenance. Depending on the amount of fuel saved, the Air Force estimates the annual savings could range from $39 million to $89 million.

TTBTS use will reduce the present demands on the T-38 fleet and delay the insufficiency of that fleet from the late 1980s to beyond the year 2000. Without the TTBTS, the T-38 would have to be used more extensively to provide generalized pilot training. A larger number of T-38 would be required to meet expected pilot training rates, but the T-38 is no longer in production. Therefore, the current inventory would be insufficient after fiscal year 1987 to meet generalized training requirements. However, if specialized training is implemented and the TTBTS is used, the available T-38 would be used to train only fighter, attack, and reconnaissance pilots. Consequently, the fleet of T-38 would be used less, and the life of these aircraft would be extended beyond the year 2000.

Existing military aircraft do not meet TTBTS operating requirements. The Navy's T-44 turboprop trainer aircraft does not have the performance characteristics needed for low-altitude, high-speed navigation training or to transition Air Force pilots into the high-altitude, high-speed, turbofan aircraft which comprise the majority of Air Force's operational tankers, transports, and bombers. The Army does not have any aircraft similar to the TTBTS.

AVAILABLE BUSINESS AIRCRAFT COULD MEET TTBTS REQUIREMENTS

Industry responses to Air Force requests for information indicate that some off-the-shelf business aircraft could meet revised TTBTS operational requirements.

In a September 1981 management directive, Headquarters, U.S. Air Force, stated that off-the-shelf equipment will be used whenever possible for the TTBTS to minimize development costs. The TTBTS Program Office issued three requests for information between September 1981 and April 1982 to obtain information about possible TTBTS. The September 1981 request asked for information about the development and acquisition of a TTBTS using off-the-shelf equipment. A January 1982 request solicited information about the engines that would be used in the TTBTS candidate aircraft. The April 1982 request solicited information about the possible leasing of the TTBTS.

Program management officials said responses from nine aircraft manufacturers indicate that commercially available business aircraft could be used but would not be able to meet some operating requirements outlined in the September 1981 request for information. They also said that Air Training Command officials considered the industry responses and revised the aircraft's operating requirements. Some of the business aircraft, according to the officials, could meet the revised requirements.

Program office personnel also said the industry responses to the leasing request for information indicate leasing would be more costly than buying the TTBTS.

FUNDING PROBLEMS DELAY PROGRAM

The TTBTS acquisition was delayed because anticipated fiscal year 1983 funding was not authorized. The Air Force currently estimates that the TTBTS will cost almost $2 billion, $14.5 million for development and $1,897.1 million to procure 225 aircraft and 29 simulators. Originally, development was scheduled to begin in fiscal year 1983. Air Force officials said they will now seek fiscal year 1984 authorization. In another action, Headquarters, U.S. Air Force, changed the initial operational capability from 1986 to 1988 because its analysis showed the TTBTS will not be needed until 1988.

NO STATUS REPORTING OF PROGRAM

As in the case of the T-46A and the VTXTS programs, DOD has not submitted the Selected Acquisition Reports to the Congress on the status of the TTBTS program.

A DOD official informed us in January 1983 that DOD will not submit such reports nor seek a waiver of such reporting unless the Congress makes program funding available.

(951719)

25 641

AN EQUAL OPPORTUNITY EMPLOYER

UNITED STATES
GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE,$300

POSTAGE AND FEES PAID
U. S. GENERAL ACCOUNTING OFFICE

THIRD CLASS