

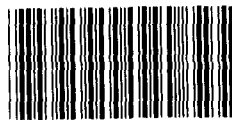
GAO

Briefing Report to the Honorable
Robert Dole
United States Senate

July 1986

AIRCRAFT PROCUREMENT

Development and Production Issues Concerning the T-46A Aircraft



129957

RESTRICTED—Not to be released outside the General
Accounting Office except on the basis of specific
approval by the Office of Congressional Relations.

RELEASED

[Faint, illegible text or markings within the main body of the page, possibly bleed-through from the reverse side.]



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

NATIONAL SECURITY AND
INTERNATIONAL AFFAIRS DIVISION

May 20, 1986

B-201269

The Honorable Robert Dole
United States Senate

Dear Senator Dole:

This report is in response to your February 6, 1986, request to review certain aspects of the Air Force T-46A aircraft program. Specifically, you requested that we provide (1) a history of the contract difficulties associated with the T-46A program, (2) information on the current status of production, (3) data about the quality of aircraft from a performance and production standpoint, and (4) information on the extent that fiscal year 1986 funds are being expended.

In July 1982, the Air Force awarded the Fairchild Republic Company a fixed price incentive contract with a target price of \$104 million to develop the airframe of the next generation trainer aircraft--the T-46A. The contract included priced production options for up to 65 aircraft. At the same time, the Air Force awarded the Garrett Turbine Engine Company a fixed price incentive contract with a target price of \$121.2 million for development and initial production of the F-109 engine for the trainer. The T-46A was to replace the Cessna T-37B as the Air Force's primary trainer aircraft. As many as 650 new trainers with a total acquisition cost of over \$3 billion were expected to be acquired over the life of the program.

In November 1984, the Air Force exercised the first production option for 10 aircraft, including support equipment and a data package at a price of \$58.1 million. One development aircraft has been completed and is being flight tested. A second development aircraft is nearing completion. Ten production option aircraft are being produced.

Fairchild has experienced cost and schedule difficulties since shortly after the award of the T-46A development contract. An Air Force Contract Management Division review of contractor operations at Fairchild in June 1985 identified major problems and numerous deficiencies. Fairchild has taken or is in the process of taking corrective actions. The Secretary of the Air Force, citing these problems and budget constraints, has decided not to continue the T-46A acquisition program. The Air Force withheld fiscal year 1986 funding for lot 2 production

of 33 aircraft. The President did not request any T-46A production funding in the fiscal year 1987 budget. The Air Force states that sufficient funding has been provided to fulfill its financial obligations in completing T-46A development and production of the first 10 aircraft.

The Air Force states that it intends to extend the life of the T-37B approximately 5 years beyond its original life expectancy. Air Force Air Training Command officials state that there is a shortage of T-37Bs in the inventory. During the next several months, the Air Force will explore options to meet its future trainer aircraft needs. Among its options are to resume or recompute the T-46A production.

The results of our review are summarized below and discussed in more detail in the appendixes.

CONTRACT DIFFICULTIES

Within several months of the 1982 award, Fairchild's actual costs were more than budgeted and its work was behind schedule. Although some milestones were met, several key milestones were completed later than originally scheduled. For example, first flight was completed 6 months later than originally scheduled. Air Force concerns about schedule delays led to a mutually agreed upon contract modification in late 1985 that extended milestone and delivery dates.

Air Force reviews during 1985 found many areas of Fairchild's operations to be unsatisfactory. Following an extensive contractor operations review that reported 279 findings, the Air Force, in August 1985, began withholding 50 percent of Fairchild's progress payments. Air Force officials stated that the findings were not graded as to significance, and that the number of deficiencies found were not unusual for such reviews. However, they also stated that Fairchild was the first contractor to be rated unsatisfactory in all eight management areas reviewed.

On April 21, 1986, the Air Force, citing Fairchild's substantial progress in correcting these deficiencies, restored half of the withheld progress payments. Fairchild officials stated that corrections to all the prior deficiencies would be essentially completed by September 1986. See appendix II for discussion of contractor operations review findings and corrective actions taken.

The Air Force cost estimate as of December 31, 1985, for Fairchild to complete T-46A airframe development and the first production lot of 10 aircraft was about \$122 million more than the Air Force is obligated to pay Fairchild under the terms of the contract. (See table I.1.) Fairchild will absorb those

costs if the development and first production lot programs are completed.

STATUS OF T-46A PRODUCTION

The first T-46A test aircraft is undergoing flight testing. The second test aircraft is undergoing preliminary ground testing before beginning flight tests in July 1986. The first 10 production aircraft are being manufactured with delivery of the first aircraft scheduled for November 1986. However, Air Force program office officials believe the delivery of the first production aircraft will not be accomplished until early 1987. On March 28, 1986, the Secretary of the Air Force announced his intention not to exercise the option for the second production lot of T-46As.

PRODUCTION QUALITY

The Air Force has made six assessments of Fairchild production capability since 1982. These reviews identified numerous deficiencies relating to or impacting production quality that needed corrective action. However, the reviews generally concluded that Fairchild was capable of manufacturing the T-46A. The three reviews conducted by the Air Force T-46A program office recommended that the production program be continued. In late 1985 the Air Force noted that Fairchild's manufacturing operations had improved.

QUALITY OF AIRCRAFT PERFORMANCE

As of March 31, 1986, the first T-46A developmental aircraft had been flown about 110 hours during 74 of 221 planned test flights. Air Force and Fairchild officials said flight tests results have been very successful to date. The T-46A is expected to meet or exceed most of the Air Force Air Training Command's original performance requirements. However, it is not expected to meet some of the more stringent contract performance requirements. These more stringent requirements were proposed by Fairchild when competing for the T-46A contract and were subsequently included in the contract.

Flight testing has identified problems in aircraft drag, lack of adequate stall warning, primary flight controls, and speed brake buffeting. Air Force officials said these types of problems are not unusual at this stage of development and that they can be solved without major aircraft modifications and within the scope of the development contract.

An Air Force Air Training Command official said that based on actual flights by their personnel the T-46A's performance was excellent, met the Command's needs for a modern trainer, and would save millions of dollars in yearly maintenance cost.

USE OF FISCAL YEAR 1986 FUNDS

As of April 30, 1986, about 51 percent of the \$49.9 million¹ appropriated for fiscal year 1986 research, development and testing funds for the T-46A had been committed to be obligated. The \$169.9 million¹ appropriated for T-46A production lot 2 in fiscal year 1986 has not been released to the program. The Air Force does not plan to request additional production funding for the T-46A program at this time.

STATUS OF CORRECTIVE ACTIONS

Fairchild has developed and is implementing actions to correct the deficiencies identified in the Air Force's contractor operations review. Corrective action has been completed and submitted to the Air Force for approval on 83 percent of the deficiencies. The Air Force has approved 61 percent of those actions as of March 31, 1986. (See table II.1.)

- - - -

In conducting our work, we reviewed cost data, contract files, flight test data, correspondence files, and production readiness reports. We also interviewed officials from the Office of the Secretary of Defense and Air Force headquarters in Washington, D.C.; the T-46A System Program Office, Wright-Patterson Air Force Base, Ohio; Air Force Plant Representative Office at Fairchild Republic Company, Farmingdale, New York; Air Force Contract Management Division, Kirtland Air Force Base, New Mexico; Air Force Operational Test and Evaluation Center, Kirtland Air Force Base, New Mexico; Air Force Flight Test Center, Edwards Air Force Base, California; and Air Training Command, Randolph Air Force Base, Texas. We also obtained data from and interviewed officials of the T-46A airframe development contractor--Fairchild Republic Company, Farmingdale, New York.

As agreed with your office, we did not review the Garrett Turbine Engine Company's development, testing, and production of the F-109 engine used in the T-46A aircraft, or the development of the operational flight trainer by the Reflectone Company. Nor did we evaluate possible alternatives to fulfill Air Force trainer needs. Also, as agreed with your office, we did not request official agency comments on this report. However, the views of Air Force and contractor officials were obtained and incorporated where appropriate. Fairchild officials advised us that the report is an accurate and balanced presentation. They

¹Amounts after reductions mandated by the Balanced Budget and Emergency Deficit Control Act of 1985.

observed, however, that because of the essentially historical nature of the questions, the report does not emphasize the motivation and professional character with which the company is operating today.

We conducted our work from February 1986 through April 1986 in accordance with generally accepted government auditing standards. We plan no further distribution of this report until 5 days after its issue date unless you publicly announce its contents earlier. At that time, we will send copies to the House and Senate Committees on Appropriations and on Armed Services; House Committee on Government Operations; Senate Committee on Governmental Affairs; the Secretaries of Defense and Air Force; the Director, Office of Management and Budget; and other interested parties.

Sincerely yours,

A handwritten signature in cursive script that reads "Frank C. Conahan".

Frank C. Conahan
Director

C o n t e n t s

		<u>Page</u>
LETTER		1
APPENDIX		
I	REQUESTED INFORMATION ON T-46A PROGRAM	7
	Background	7
	Contract difficulties	7
	Cost difficulties	7
	Schedule difficulties	9
	Air Force concerns resulted in contract modification	10
	Contract management systems difficulties	11
	Production status	12
	Development aircraft	12
	Production aircraft	13
	Production quality	14
	Pre-award contract assessment	14
	Production readiness reviews	14
	Independent manufacturing assessment review	15
	Contractor operations review	15
	Manufacturing assessment review	16
	Quality of aircraft performance	16
	Problems identified	18
	Use of fiscal year 1986 funds	19
II	AIR FORCE CONTRACTOR OPERATIONS REVIEW OF FAIRCHILD MANAGEMENT	21
	Status of corrective actions	21
TABLE		
I.1	T-46A Cost Estimates, December 31, 1985	8
I.2	T-46A Contract Demonstration Milestones	9
I.3	T-46A Performance Predictions	17
II.1	Corrective Actions in Process and Completed	23
FIGURE		
I.1	T-46A Aircraft	14
<u>ABBREVIATIONS</u>		
AFPRO	Air Force Plant Representative Office	
COR	Contractor Operations Review	
SPO	System Program Office	

REQUESTED INFORMATION ON T-46A PROGRAMBACKGROUND

In July 1982 the Fairchild Republic Company was awarded a fixed price incentive contract for the design, development, testing, and delivery of two T-46A trainer aircraft with support equipment and a data package. The contract included two fixed priced options for the production of up to 65 aircraft.

Fairchild was selected for the contract award following the evaluation of competitive proposals from five companies. The proposal evaluation criteria, in order of importance, were (1) operational utility, (2) readiness and support, (3) life-cycle cost, (4) design approach, and (5) manufacturing/program management. The Secretary of the Air Force, in making the selection, stated that Fairchild's proposal offered significant advantages over the other proposals. He specifically stated that (1) the Fairchild proposal provided the best aircraft in terms of training effectiveness, operational safety, reliability, maintainability, and availability, (2) its design met or exceeded all Air Force requirements, and (3) its manufacturing approach made it the leader in this area.

CONTRACT DIFFICULTIES

Within several months of the 1982 award, Fairchild began experiencing cost, schedule, and other difficulties. These problems and other events led to a 1985 restructuring of the contract delivery schedule, reduced progress payments, and a major contractor effort to correct identified problems in 1985.

Cost difficulties

At the time the development fixed priced incentive contract was awarded, both Fairchild and the Air Force recognized that Fairchild's cost proposal was optimistic; that is, lower than expected actual costs. Fairchild officials said their cost proposal had been influenced by the Request for Proposal which specified funding limitations.

The contract had an original target price of \$104 million and a ceiling price of \$125.3 million. Any costs beyond the ceiling price must be fully absorbed by the contractor. Contract modifications can result in increases to the target price and ceiling.

In October 1982, several months after the contract award, an Air Force independent cost estimate showed that the T-46A development and production estimates prepared by the Air Force program office were reasonable and considerably higher than the contractor estimate.

Beginning in September 1982, Fairchild started reporting cost variances in its monthly cost performance reports. Fairchild recognized in its September 1983 cost performance report that the estimated completion cost would exceed budgeted costs. Between September 1983 and July 1984, Fairchild increased its estimated completion costs several times from \$116 million to \$139.1 million, which at that time exceeded the July 1984 contract ceiling price of \$127.1 million. Since that time, the contract ceiling price has increased due to contract modifications.

With cost estimates continuing to increase, Fairchild officials said they realized that the scope of work was greater than expected and that managing the program within the amounts in the original contract would not be possible. Air Force officials said that the T-46A engineering, test, and manufacturing effort was underestimated and that Fairchild was not applying the required resources (personnel and funds) to complete development on schedule. Fairchild has been providing additional resources since January 1985.

Projected cost overruns resulted in the Air Force Plant Representative Office (AFPRO) reducing Fairchild's progress payments on the development portion of the contract in August 1984 and on the first production lot in January 1985. These reductions were made in accordance with procurement regulations to more closely match the progress payments with work progress.

As shown in table I.1, Fairchild's cost performance reports and Air Force cost performance data as of December 31, 1985, show that the estimated final cost for both T-46A development and first production lot will be substantially greater than the contract ceiling price.

Table I.1: T-46A Cost Estimates, December 31, 1985

<u>Program phase</u>	<u>Contract</u>		<u>Estimate at completion</u>	
	<u>Target price</u>	<u>Ceiling price</u>	<u>Fairchild</u>	<u>Air Force</u>
----- (000 omitted) -----				
Development	\$111,832	\$134,354	\$220,308	\$220,308
Lot I production	<u>58,053</u>	<u>64,241</u>	<u>91,521</u>	<u>100,441</u>
Total	<u>\$169,885</u>	<u>\$198,595</u>	<u>\$311,829</u>	<u>\$320,749</u>

Under the terms of the contract, the Air Force is obligated to pay up to the ceiling price or \$198.6 million. Based on the Air Force estimate, Fairchild would absorb \$122.2 million in excess of the ceiling.

Schedule difficulties

In addition to cost difficulties, the T-46A contractor experienced a number of missed schedule milestone dates. The T-46A development contract with Fairchild contained 10 demonstration milestones ranging from completion of preliminary design review on February 1, 1983, to first flight on April 15, 1985. As shown in table I.2, Fairchild did not meet the original scheduled date for 5 milestones, including first flight. The first flight milestone, originally scheduled for April 15, 1985, was made 6 months later, on October 15, 1985. Two milestone dates to begin structural testing were extended by contract modifications.

Table I.2: T-46A Contract Demonstration Milestones

<u>Milestone</u>	<u>Contract date</u>		<u>Accomplishment date</u>		Months behind <u>original contract</u>
	<u>Original</u>	<u>Modified</u>	<u>Actual</u>	<u>Planned</u>	
Air Vehicle Preliminary Design Review (PDR) Complete	02/01/83	-	02/01/83	-	0
Air Vehicle Critical Design Review Complete	08/01/83	09/13/83	09/13/83	-	1
Organizational and Intermediate Support Equipment PDR Complete	12/01/83	-	12/15/84	-	12
First Test Aircraft Major Assembly Started	03/01/84	-	03/01/84	-	0
Escape System Qualification Started	07/15/84	-	07/15/84	-	0
Depot Support Equipment PDR Complete	12/01/84	-	12/01/84	-	0
Start of Full-Scale Static Testing	12/01/84	10/31/85	10/31/85	-	11
First Test Aircraft Empennage (Tail) and Wing Assembly Delivered	01/01/85	-	12/31/84	-	0
Start of Full-Scale Durability Testing	01/01/85	07/31/86	-	7/31/86	19
First Flight	04/15/85	10/15/85	10/15/85	-	6

Air Force concerns resulted
in contract modification

The Air Force concerns about the overall progress of the T-46A program and the missed first test flight milestone led to a modification of the Fairchild contract in October 1985.

In a January 29, 1985, letter to Fairchild, the Air Force T-46A Systems Program Office (SPO) stated that it was becoming increasingly concerned about Fairchild's progress in several areas of manufacturing and testing. The SPO stated that schedule delays appeared to be endangering the first flight milestone of April 15, 1985, and requested Fairchild to review the situation and provide a realistic revised schedule. On February 19, 1985, Fairchild responded and stated that its review indicated a revised first flight date of April 30, 1985.

On February 11, 1985, the first test aircraft was rolled-out. Air Force officials said that required parts were missing from the aircraft and some of the installed parts were not flight worthy. The roll-out was not a contractual requirement.

In an April 17, 1985, letter to Fairchild, the SPO identified several schedule delinquencies, including the missed first flight milestone, which would severely affect the remainder of the development and production program. The SPO requested Fairchild to revise its schedule for accomplishing contract milestone requirements. During the next several months, the SPO and Fairchild discussed several revised schedules. These discussions culminated in an October 7, 1985, bilateral modification to the contract.

The contract modification listed seven contract requirements that Fairchild had not complied with, including not meeting several demonstration milestones established in the original contract, and not delivering the two development aircraft on schedule. The contract restructuring did not affect the target price but it did make the following changes.

- Established new demonstration milestone dates for conducting the first flight and starting full scale static and durability testing.
- Established four new management milestones for measuring Fairchild's progress during the remaining development program.
- Extended the planned date for exercising the second production option from December 1, 1985, to March 1, 1986. The Air Force also reserved the right to extend the exercise date for that option for a period equivalent to the longest period of delay experienced by Fairchild

in meeting any of the demonstration milestones established in the original contract.

--Extended the delivery date for the first development aircraft from March 1985 to August 1985 and the second aircraft from June 1985 to April 1986.

On February 28, 1986, the Air Force unilaterally extended the planned date for exercising the second production option from March 1, 1986, to May 31, 1986. However, the Air Force on March 28, 1986, announced its intention not to exercise that option.

Contractor management systems difficulties

Air Force reviews in May and June 1985 found that a number of Fairchild's management systems and procedures were unsatisfactory.

In May 1985 the SPO conducted a Cost Schedule Control System Criteria Subsequent Application Review to determine if Fairchild's Management Control Information System was being properly applied to the T-46A production program. The review rated Fairchild's procedures unsatisfactory. For example, the report noted that estimated completion costs appeared unrealistic and material performance measurements were questionable. The SPO requested, and Fairchild agreed to implement, corrective operating procedures by May 30, 1986. Corrective procedures have since been agreed upon and implemented or are in the process of being implemented by Fairchild.

In June 1985 the Air Force Contract Management Division conducted a detailed contractor operations review (COR) at Fairchild. This review, which focused on eight management areas, reported a total of 279 findings in the areas of manufacturing, industrial material management, contract management, industrial safety and fire protection, subcontract management, engineering, quality assurance, and product integrity. See pages 15 and 16 for further discussion of the COR.

The major COR concerns in the contract management area were inadequacies in (1) contract administration procedures to assure compliance with the terms of the T-46A contract, (2) cost schedule control systems, criteria and procedures to provide accurate cost and schedule information, and (3) the estimating system to produce current, accurate, and complete data. The COR also identified a number of concerns in the subcontract management area.

As a result of the COR, the Air Force Administrative Contracting Officer advised Fairchild on August 29, 1985, that a 50-percent withholding in progress payments would be instituted and would remain in effect until satisfactory correction of the identified deficiencies. Fairchild has taken a number of actions to correct these problems, many of which have been accepted by the Air Force. On April 21, 1986, the Air Force plant representative at Fairchild, citing progress in correcting deficiencies restored half of the withheld progress payments.

The corrective actions taken by Fairchild in response to the COR, their current status, and Air Force views on these actions are discussed in appendix II.

PRODUCTION STATUS

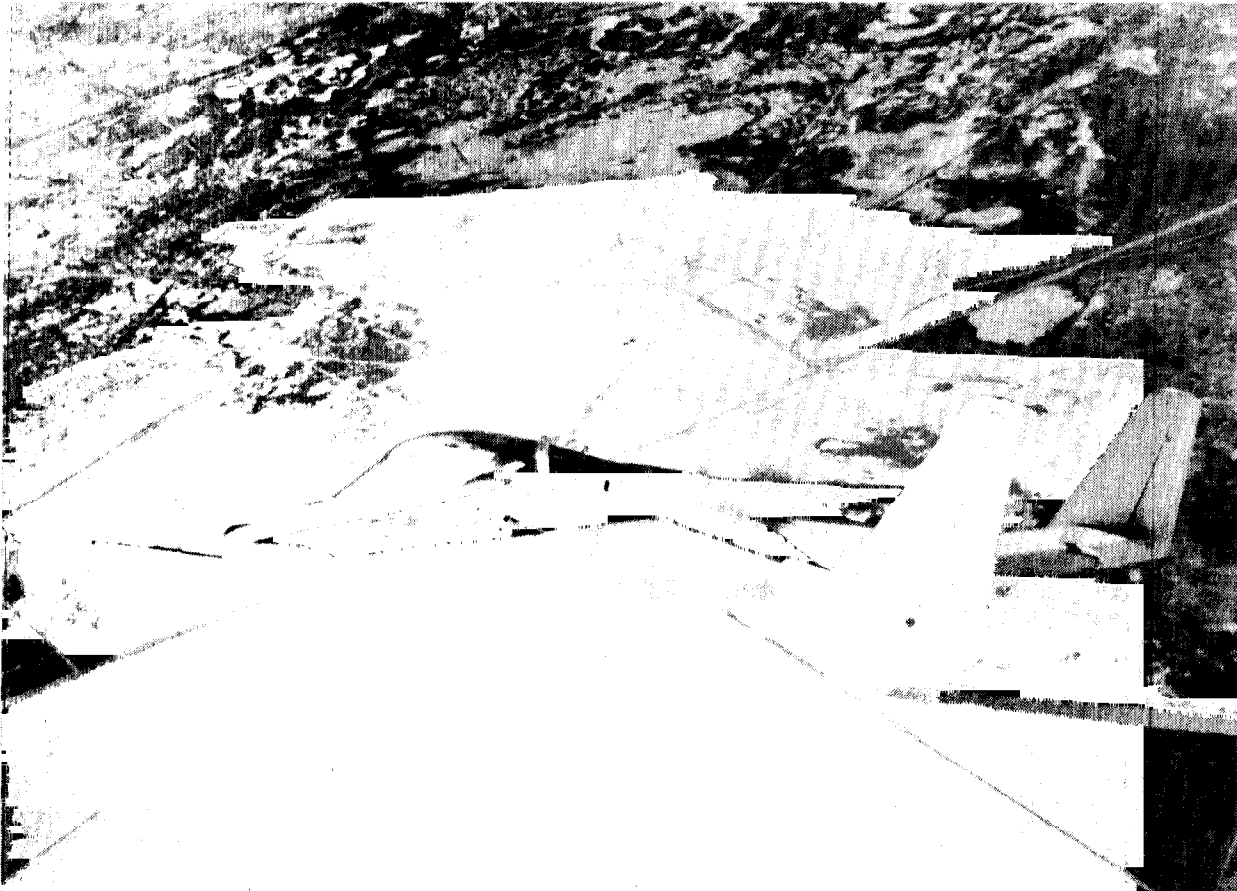
Development aircraft

Two development test aircraft will be acquired for the T-46A flight test program. The flight test program will determine how well the aircraft meets performance, maintenance, and reliability requirements.

The first T-46A was delivered in August 1985 and has been undergoing flight testing at Edwards Air Force Base, California, since October 1985. This development test aircraft will be used to test air worthiness, flying qualities, and other performance requirements.

The second development aircraft is being built. As of mid-March 1986, it was undergoing flight load calibration at Fairchild and was about a week ahead of the July 1, 1986, first flight schedule. The aircraft is scheduled to be flown to Edwards Air Force Base, California, in July 1986 for flight testing scheduled to begin on August 4, 1986. This development test aircraft will be used for air loads and climatic testing.

Figure I.1: T-46A Aircraft



Production aircraft

The first T-46A production lot is in various stages of manufacture and assembly. Fairchild noted that tooling for production is in place. The contractor's production schedule for the first production aircraft shows that the aircraft is basically on schedule to meet the contractually required delivery date of November 30, 1986. The remaining nine aircraft are to be delivered between December 1986 and July 1987. Although Fairchild representatives said that they would meet the delivery dates for the first production lot, Air Force officials believe the first aircraft delivery may not be accomplished until early 1987.

Under the terms of the contract, the second production lot option gives the Air Force the right to acquire between 22 to 44 aircraft at specified prices. The contract also gives the Air Force the right to extend the option exercise date in the event Fairchild failed to meet certain original contractual demonstration milestones. The Air Force had extended the second lot option exercise date to March 1, 1986, because, among other

reasons, Fairchild had not started the full-scale durability testing and had not made the first flight by April 15, 1985, as required. Effective February 28, 1986, the Air Force unilaterally extended the option date by an additional 3 months, to May 31, 1986. Fairchild representatives told us that if the Air Force did not order the second production lot by the end of March, Fairchild would experience a break in production. The contractor also explained that if the third production lot was not included in the Air Force budget for fiscal year 1987, it would seriously impact the production program.

The funds appropriated for T-46A production lot 2 in fiscal year 1986 were placed in a reserve account by DOD and not released to the program. The fiscal year 1987 budget does not request procurement funding for the T-46A. In March 1986, the Secretary of the Air Force held a Program Assessment Review of the T-46A program. Subsequently, the Air Force announced that it had reaffirmed the earlier decision not to seek additional funding for the program and not to exercise the contract option for the second production lot.

PRODUCTION QUALITY

The Air Force has conducted six assessments of Fairchild's production capability before and during development and initial production. These assessments identified a number of deficiencies relating to or impacting production quality that required corrective actions. The three assessments conducted by the Air Force T-46A program office recommended that the production program be continued. The other three assessments did not contain recommendations regarding program continuation. The results of these reviews are summarized below.

Pre-award contract assessment

In February 1982, prior to contract award, an Air Force Aeronautical Systems Division review team evaluated the Fairchild facilities in Farmingdale, New York, and Hagerstown, Maryland. The team concluded that Fairchild was qualified to produce a high quality trainer aircraft within the proposed cost and schedule. Although the team found that Fairchild met or exceeded minimum requirements in 12 of the 13 production areas reviewed, there was concern that Fairchild was not adequately considering producibility requirements during the design stage of the aircraft. A SPO official noted that extensive Fairchild producibility studies since contract award could result in cost savings.

Production readiness reviews

In June 1983 and September 1984, T-46A SPO personnel conducted Production Readiness Reviews at Fairchild. The June 1983 review was performed at Fairchild's Farmingdale and

Hagerstown facilities. SPO personnel evaluated Fairchild's manufacturing and quality assurance systems and assessed the adequacy of Fairchild's overall planning efforts to meet the T-46A production requirements. The SPO identified a number of deficiencies that required corrective action but recommended continuation of development.

The September 1984 review was conducted only at Fairchild's Farmingdale plant to assess Fairchild's capability to begin low rate production. It identified a number of deficiencies that needed corrective action but concluded that they were not critical enough to delay funding approval for the first or second production lot. The review noted, among other deficiencies, that design instability was affecting manufacturing and procurement and that the development schedule was success oriented with no reserve time. It noted, however, that application of additional Fairchild resources could make it achievable. Fairchild officials stated that such additional resources were provided starting in January 1985.

Independent manufacturing assessment review

From December 20, 1983, to January 10, 1984, the Aeronautical Systems Division assessed Fairchild's manufacturing and production quality. It did not find any manufacturing issues which would delay long lead funding for initial T-46A production. However, there were concerns about the potential manufacturing cost and schedule impact of design changes that might be necessary to control system weight growth or to accommodate an engine inlet relocation. The contractor was required to and has taken corrective actions regarding these concerns.

Contractor operations review

As stated earlier, the Air Force's June 1985 COR at Fairchild identified major concerns in manufacturing, industrial material management, contract management, industrial safety and fire protection, subcontract management, engineering system, quality assurance, and product integrity. All eight functional areas reviewed were rated unsatisfactory.

Concerns in the product integrity area included

- failure to flow down contractual requirements to drawings and instructions,
- lack of accept/reject criteria for soldering,
- an excessive amount of nonconforming products being produced and not detected by inspection,

- failure to record nonconformances, and
- an apparent lack of consideration for the consequences of manufacturing debris and potential foreign object damage in electrical/mechanical and fuel compartments and systems.

Fairchild has since developed and begun implementing an extensive corrective action plan. In developing this plan Fairchild identified seven underlying causes to its problems. These included reduced investment levels in plant facilities and equipment and inadequate emphasis on quality, safety, and schedule. This plan and Fairchild's progress is discussed in detail in appendix II.

Manufacturing assessment review

In December 1985 SPO personnel conducted a manufacturing assessment review at Fairchild's Farmingdale plant. They evaluated Fairchild's development and initial production performance and their readiness to continue producing the T-46A. They identified high-rate production and manufacturing risks which could be expected to adversely affect schedules and costs. Program personnel evaluated a total of 20 areas in 5 categories. The team rated 10 areas satisfactory, 7 marginal, and 3 unsatisfactory. One of the three unsatisfactory ratings was rescinded, the other two areas were engine/manufacturing design interface and manufacturing engineering. The review team found that these risks and weaknesses could be reduced or negated if the contractor implemented the corrective actions recommended. They concluded, however, that Fairchild was adequately prepared to continue low-rate production and that the manufacturing effort was not at risk technologically. A SPO official said that Fairchild has made many production quality improvements since the review was conducted.

QUALITY OF AIRCRAFT PERFORMANCE

As shown in table I.3 below, Fairchild's predicted performance for the T-46A exceeds seven of the eight performance requirements established by the Air Force Air Training Command. However, Fairchild does not expect to meet six of the more demanding contract performance requirements. The more demanding contract requirements were proposed by Fairchild when competing for the T-46A contract. The table also shows that the Air Force's predicted T-46A performance is somewhat different than Fairchild's. Both are preliminary and based on early test data.

Table I.3: T-46A Performance Predictions

<u>Characteristics</u>	<u>Air Training Command requirement</u>	<u>T-46A Contract specification</u>	<u>Fairchild estimated performance as of January 15, 1986</u>	<u>Air Force estimated performance at maturity</u>
Critical field length (take-off) (feet)	5,000(+)	4,800(+)	4,589	4,260
Landing distance (feet)	5,000(-)	4,930(-)	5,208	4,870
Rate of climb (feet per minute at 25,000 feet)	2,000(+)	2,390(-)	2,256	2,010
Sustained G force at 25,000 feet)	2.50(+)	2.70(-)	2.59	2.30
Cruise speed (at 25,000 feet)	300(+)	376(-)	369	345
Cruise altitude (feet)	35,000(+)	42,000(+)	42,000	39,800
Take-off climb gradient (1 engine %)	3.50(+)	3.70(-)	3.57	3.20
Go-around climb gradient (1 engine %)	2.0(+)	2.7(-)	2.63	Not estimated

Note: (+) Requirement met based on Fairchild's estimated performance.

(-) Requirement not met based on Fairchild's estimated performance.

The T-46A began first test flights on October 15, 1985, at the Air Force Flight Test Center, Edwards Air Force Base, California. The aircraft is being used to test flying qualities and other performance requirements. The second aircraft, expected to be delivered in July 1986, will be used for air loads and climatic testing beginning in August 1986.

Plans call for 221 test flights (including contractor and Air Force flights) for the first test aircraft. As of March 31, 1986, 74 flights and 110 flight hours had been completed using 19 Air Force and contractor pilots.

The Air Force SPO and Flight Test Center officials, as well as the contractor test pilot, said that the T-46A's performance tests have been successful. They also said that technical tests have been outstanding and reliability and maintainability significantly better than predicted. They believe the T-46A's air worthiness is excellent.

According to Air Force and contractor officials, T-46A test flights have produced some results which exceed expectations. For example, Air Force flight test personnel originally believed 20 hours of flight testing per month to be optimistic. However,

because of rapid turnaround and high aircraft availability, they now believe it is possible to complete 26-29 hours of flight testing per month. Also eight maintainability and reliability parameters are expected to be exceeded, including maintenance hours per flight hour, a key measure of maintenance performance.

A Fairchild summary of an Air Force preliminary report on the T-46A testing, issued in December 1985, shows the aircraft performed well. The Air Force reported ease of flight, take-off, landing, and ground handling.

An Air Force Training Command official stated that the T-46A meets its needs for a modern trainer. He also stated that based on logistic readiness and maintenance experience to date, the T-46A would save millions of dollars in yearly maintenance cost.

Problems Identified

Although tests results have been good, several problems have emerged. An Air Force official said the number and type of deficiencies were not unusual in testing a new development aircraft. Furthermore, both Air Force and Fairchild officials believe that these problems can be readily solved without major aircraft changes or modifications and within the scope of the contract. The deficiencies are discussed below.

High drag

The most significant problem is the aircraft's drag which is higher than the Air Force desires and could impact aircraft performance and fuel consumption. Fairchild is developing changes which could be incorporated into the production line to reduce this problem. Air Force officials believe this condition can be reduced and are closely monitoring Fairchild's corrective action.

Lack of adequate stall warning

The T-46A does not give an adequate warning to the pilot when the air speed reduces to a point where the aircraft may stall. Many aircraft shake or vibrate when they are close to a stall situation. This serves as a warning to the pilot to take necessary action to prevent the stall. Although required by the specifications, the T-46A does not give timely warning to the pilot.

T-46A flight testing is continuing with its mild stall warning because experienced pilots are flying the aircraft. A more adequate stall warning is needed for use in student flight training. Fairchild plans to solve this deficiency by

installing a warning device on the aircraft. The T-37B, the Air Force's current primary trainer, has such a device on it.

Primary flight controls

The Air Force is concerned with the primary flight controls, such as roll trim which involves the flight stability of the aircraft. Fairchild is studying trim devices which could be added to the aircraft to correct the residual trim problems.

Speed brake buffet

The Air Force is concerned about the aircraft's speed brakes because when extended to slow the aircraft they create unacceptable buffet levels that shake the aircraft. Although this problem has not been totally solved, Air Force officials believe there are possible solutions which should be effective. Fairchild has proposed a solution which it plans to start testing in April 1986.

Weight increases

The expected weight of the first production T-46A is expected to be about 900 pounds more than Fairchild originally estimated. Air Force officials said this is not unusual for a new aircraft. Fairchild has a weight reduction program to reduce the weight of production aircraft. SPO officials said there is no specification weight for the T-46A but it is important to keep weight at a minimum because of the impact on other performance requirements.

USE OF FISCAL YEAR 1986 FUNDS

For fiscal year 1986, the Congress appropriated \$169.9 million for the second production lot of T-46A airframes and engines as well as for advance purchases for the third lot of airframes and engines. Since the Air Force decided not to request additional T-46A procurement funding for fiscal year 1987, the production funds appropriated for fiscal year 1986 have been withheld from the program. According to an official of the Office of the Secretary of Defense, those funds have been placed in an account entitled "Resources Available for Reprogramming."

Air Force program office information as of April 31, 1986, showed that for fiscal year 1986, \$48.7 million of the \$49.9 million research, development and testing appropriation for the T-46A airframe and engine had been released to the program office. These amounts reflect reductions mandated by the Balance Budget and Emergency Deficit Control Act of 1985. About \$25.4 million of the funds released have been committed to be

obligated. This left an uncommitted balance of \$23.3 million. The program office plans for the uncommitted balance are shown in table I.4.

Table I.4: Planned Use of Uncommitted T-46A Research and Development Funds for 1986

<u>Use</u>	<u>Amount</u>
	(millions)
Airframe contract--Fairchild	\$ 3.9
Engine contract--Garrett	14.6
Mission support	1.9
Government furnished equipment	0.6
Test centers	<u>2.3</u>
Total	<u>\$23.3</u>

Air Force program office information as of January 31, 1986, shows the following status for the T-46A airframe and engine production funds.

Table I.5: Status of T-46A Production Funds

<u>Fiscal year</u>	<u>Funds released to program office</u>	<u>Obligated funds</u>	<u>Committed to be obligated</u>	<u>Uncommitted balance</u>
----- (millions) -----				
1984	\$ 6.1	\$ 6.1	\$ -	\$ (a)
1985	126.0	97.2	8.6	20.2

^aLess than \$100,000.

AIR FORCE CONTRACTOR OPERATIONS REVIEW
OF FAIRCHILD MANAGEMENT

From June 3 to 14, 1985, the Air Force Contract Management Division, Kirtland Air Force Base, New Mexico, conducted a detailed contractor operations review (COR) at Fairchild's Farmingdale, New York, plant. This review was made to evaluate the overall effectiveness of Fairchild's management systems and the capability of these systems to meet contractual requirements.

As stated earlier the review identified 279 findings in the eight functional areas reviewed. Fairchild did not agree with 60, or about 22 percent, of the findings. However, in response to the COR results, Fairchild has developed and is implementing actions to correct all items reported.

In developing corrective action plans, Fairchild identified 218 specific causes and 7 underlying causes. An analysis of the 218 specific causes showed that about one-third represented inadequate procedures and two-thirds represented noncompliance with existing procedures.

The seven underlying causes included:

- High turnover rate of senior management and organizational changes.
- Reduced reinvestment levels in recent years in plant facilities, equipment, and centralized capabilities.
- Deteriorated employee morale and dedication in recent years.
- Inadequate emphasis on quality, safety, and schedule in some products and systems.
- Failure at most levels in the work force to meet productivity targets.
- Optimism in forecasting, particularly in new program proposals, has caused overruns and schedule delays from the onset.
- Failure to follow management development and succession plans.

STATUS OF CORRECTIVE ACTIONS

The contractor has established a continuous process to plan, implement, and resolve all COR related findings under the

direction of a vice president who reports directly to the company president and interfaces with the AFPRO commander.

According to Fairchild the following corrective actions have been taken:

- Appointed a new company president experienced in running an aerospace company.
- Promoted capable employees from within.
- Sold \$200 million of corporate assets to provide funds.
- Invested an additional \$46 million in the T-46A program.
- Devoted additional personnel to the program.
- Ordered some new major equipment items.
- Improved communication from top management to middle management.
- Increased skills and supervisory training.
- Increased emphasis on quality, safety, and schedule rather than on cost only.
- Strengthened the quality function.

Corrective action plans have been submitted by Fairchild to AFPRO. The status of corrective actions as of March 31, 1986, are shown in the following table.

Table II.1: Corrective Actions in Process and Completed

<u>Actions</u>	<u>Number</u>	<u>Percent</u>
Fairchild:		
Corrective actions completed and submitted for AFPRO approval	231	83
Corrective actions in process	<u>48</u>	<u>17</u>
Total	<u>279</u>	<u>100</u>
AFPRO:		
Corrective actions approved and completed	141	61
Corrective actions in process	<u>90</u>	<u>39</u>
Total	<u>231</u>	<u>100</u>

We noted that AFPRO approvals were about 60 to 90 days behind Fairchild submissions. An AFPRO official said that this represented the time needed to schedule and perform its review and an allowance of time after implementation to be sure Fairchild's correction was still in effect.

Fairchild representatives said that correction programs have been instituted and significant progress made in correcting all deficiencies. They said resolution of 97 percent of all deficiencies should be completed by September 30, 1986.

Requests for copies of GAO reports should be sent to:

U.S. General Accounting Office
Post Office Box 6015
Gaithersburg, Maryland 20877

Telephone 202-275-6241

The first five copies of each report are free. Additional copies are \$2.00 each.

There is a 25% discount on orders for 100 or more copies mailed to a single address.

Orders must be prepaid by cash or by check or money order made out to the Superintendent of Documents.

United States
General Accounting Office
Washington, D.C. 20548

Official Business
Penalty for Private Use \$300

First-Class Mail
Postage & Fees Paid
GAO
Permit No. G100