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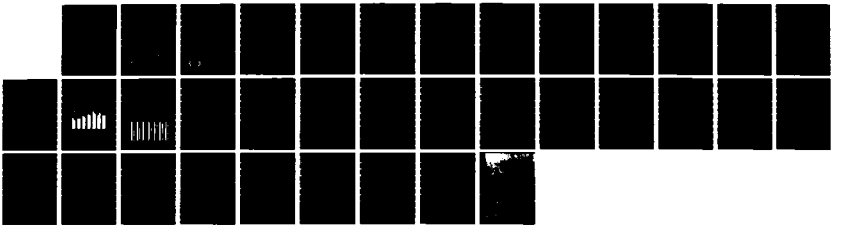

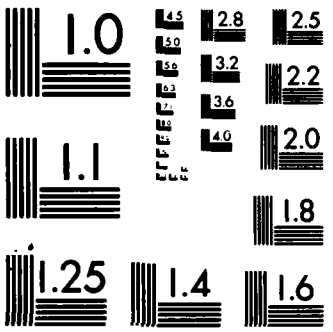

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BY THE U.S. GENERAL ACCOUNTING OFFICE

Report To The Secretary Of Defense

The Navy Can Reduce Its Stated Requirements For F/A-18 Weapons Tactics Trainers

The Navy has proposed purchasing additional weapons tactics trainers to support F/A-18 training. GAO's analysis of F/A-18 training plans indicates that changes which have occurred in several key factors used by Navy planners would reduce projected requirements for weapons tactics trainers, thereby reducing the Navy's proposed F/A-18 simulator investment by an estimated $110 million.

GAO recommends that the Navy reassess the need for additional weapons tactics trainers and also suggests some management initiatives which can increase the trainers' availability during peak training periods.

UNITED STATES GENERAL ACCOUNTING OFFICE

GAO/NSIAD-84-84
APRIL 11, 1984

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

NATIONAL SECURITY AND
INTERNATIONAL AFFAIRS DIVISION

B-196883

The Honorable Caspar W. Weinberger
The Secretary of Defense

Dear Mr. Secretary:

This report discusses how Defense can avoid spending millions of dollars for the Navy F/A-18 Weapon Tactics Trainers and support. It recommends reexamining trainer requirements and using management initiatives suggested by GAO to provide the increased availability during the limited peak training periods instead of obtaining additional trainers.

We made our review as part of our continuing effort to address training needs throughout the services.

As you know, 31 U.S.C. 720 requires the head of a federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the Director, Office of Management and Budget; the Chairmen, House Committee on Government Operations, Senate Committee on Governmental Affairs, and House and Senate Committees on Appropriations and on Armed Services; and the Secretaries of the Navy, Army, and Air Force.

Sincerely yours,

Frank C Conahan

Frank C. Conahan
Director

GENERAL ACCOUNTING OFFICE REPORT TO THE SECRETARY OF THE NAVY

THE NAVY CAN REDUCE ITS STATED REQUIREMENTS FOR F/A-18 WEAPONS TACTICS TRAINERS

D I G E S T

GAO made this review to find out if the Navy has adequately established its requirements for F/A-18 weapons tactics trainers (WTT), one of three types of simulators being built to train F/A-18 pilots. GAO visited Lemoore Naval Air Station, California, which received the first F/A-18 WTT and the following organizations involved in F/A-18 training: Chief of Naval Operations, Marine Corps Head-quarters, Naval Air Systems Command, Naval Training Equipment Center, and El Toro Marine Corps Air Station. Program officials were interviewed at each of these organization locations to determine (1) how requirements for F/A-18 weapons tactics trainers were established and (2) the extent to which the Navy has supported and documented these requirements. GAO did not visit Cecil Field Naval Air Station, Florida, because it had not yet received its first WTT.

WHAT DID GAO FIND?

Navy planning documents show WTT requirements for each of its training sites, Lemoore Naval Air Station and Cecil Field Naval Air Station, are not adequately justified. GAO found that the Navy's projected demand for the trainer does not reflect the following changes that would reduce WTT requirements and thereby reduce planned costs by an estimated $110 million ($78 million for procuring the WTTs and $32 million in associated costs). (See p. 10).

--The Navy's WTT requirements are based on training 15 active carrier airwings. Yet, only 14 carrier airwings are currently proposed; this reduces the annual demand on the WTTs by as much as 9.3 percent. (See p. 4).

--The Navy's projected demand for WTTs included initial or introductory F/A-18 training for the Marine Corp pilots. However, because the Marine Corps plans to have its own F/A-18 training squadron with one WTT at El Toro, the demand on the Navy's WTTs could be substantially reduced. (See p. 5).

GAO also found that WTT availability will be more variable and somewhat higher than currently projected because (1) Navy's projections for WTT availability do not accurately reflect the proposed operations and maintenance contract provisions for this trainer, and (2) the need to use both WTT cockpits to train one pilot will not be as great as projected.

Based on lower demand and greater WTT availibility, GAO projects that WTT training demand would not exceed the availability provided by the two WTTS already under contract at each of the two Naval Air Stations, except for Lemoore's 1992 peak training period. During this peak, less than two percent of an additional WTT's capability would be needed to meet planned training. GAO believes that an additional WTT at each base, as currently planned by the Navy, could be unnecessary. (See pp. 7-9).

Additionally, GAO suggests some management initiatives, that could help meet peaks in F/A-18 training. These suggestions include

--shifting the demand for peak training between training sites to make better use of WTT availability,

--scheduling 6-day training weeks during peak training years to increase WTT availability, and/or

--using training alternatives to meet temporary surges in training demand. (See pp. 11-13).

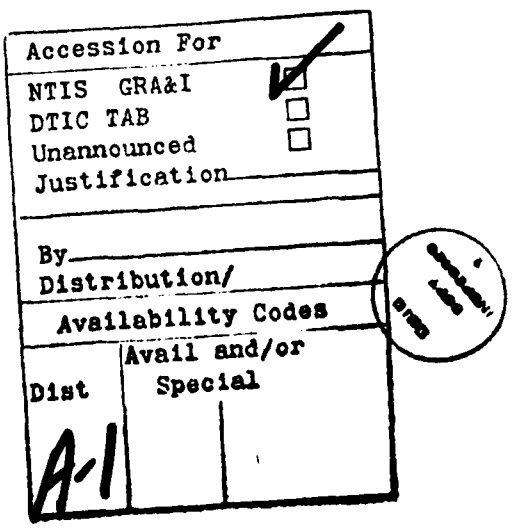
RECOMMENDATIONS

GAO recommends that the Secretary of the Navy (1) reexamine the need for more than two each WTTs at Lemoore and Cecil Field and (2) determine whether the suggested management initiatives to control peak demand would be more cost effective than procuring additional WTTs.

AGENCY COMMENTS AND GAO'S EVALUATION

On February 13, 1984, GAO met with Department of Defense (DOD) and Navy officials to obtain their comments on the draft report. DOD agreed with our recommendation that the Navy re-examine the need for more than two each WTTs at Lemoore and

Cecil Fields. DOD also partially concurred with our recommendation that the Secretary of the Navy determine whether the suggested management initiatives to control peak demand would be more cost effective than procuring additional WTTs. They added, however, that at the present time DOD does not believe the suggested management initiatives are viable as planning factors; rather they are among those management initiatives which would be considered to cope with unforeseen, temporary, and emergency-type situations. GAO's position has been, and continues to be, that initiatives suggested were intended for peak training periods which would be temporary and not permanent. DOD officials stated they would, in conjunction with the 1987 budget planning cycle, determine whether the suggested management initiatives would be more cost effective than procuring additional WTTs.



Contents

CHAPTER 1

INTRODUCTION

To insure an adequate number of properly trained aircrews are available, the Navy has developed a F/A-18 training system supported by three types of simulators: A part task trainer (PTT), an operational flight trainer (OFT), and a weapons tactics trainer (WTT). The PTT is a two-trainee station simulator that provides initial familiarization with the F/A-18 cockpit layout. The PTT is also used to train pilots in hands-on throttle and stick operations, limited radar intercept geometry, and display interpreting symbols. The OFT is a single-trainee station simulator which replicates the F/A-18 cockpit and provides a computer-generated visual imagery of the system. By providing training in aircraft control, instrument procedures, and aircraft and engine systems control, this simulator includes training in such areas as emergency operating procedures, dusk and night takeoffs and landings (carrier and land), and limited weapons delivery.

The third simulator, the WTT, has two trainee stations, each consisting of a F/A-18 cockpit inside a 40-foot spherical dome with a computer-generated visual system. The WTT trainee stations can operate in either an independent or integrated mode and provide training in such areas as radar and visual air combat, air-to-air and air-to-ground weapons delivery, and aircraft emergency operations. A more detailed description of each simulator is provided in appendix I.

The Navy is proposing to invest more than $350 million in the F/A-18 simulator program. The average unit and total projected costs for the simulators already under contract are presented in the following table.

Average and Total Projected Costs for F/A-18 Simulators Under Contract

Simulator Type	Number Contracted	Average Unit Cost	Total Projected Cost
PTT	2	$ 6.8 mil.	$ 13.7 mil.
OFT	5	12.1 mil.	60.6 mil.
WTT	4	28.5 mil.	114.0 mil.

The Navy's future funding proposal for F/A-18 simulators includes adding one PTT, three OFTs and three WTTs. One OFT was included in the 1984 budget for $11.5 million. In 1985, the Navy plans to purchase the PTT and one OFT at an estimated cost of $23 million. The remaining OFT is planned for fiscal year 1986 at an estimated $15 million. The three WTTs planned for fiscal years 1987 and 1988 are expected to cost $113 million.

In addition to the cost of simulator hardware, other program costs include simulator facilities, contractor operations and maintenance support, and future modifications to the simulators' capabilities.

How Need for Simulators Was Projected

Initially, the types, capabilities, and numbers of simulators needed to train F/A-18 aircrews were analyzed through an Instructional System Development (ISD) process contracted to the aircraft manufacturer, McDonnell Douglas. McDonnell Douglas recommended 16 WTTs as part of the total F/A-18 simulator package. According to Navy officials, its review of this recommendation showed that certain tasks assigned to the WTT for training could be trained on other, less costly, simulators. As a result, the Navy reduced its requirement to 11 WTTs. Subsequently, a change in Marine Corps training plans decreased the Navy's projected training demand, which has further reduced the requirements to seven WTTs (one Marine Corps and six Navy).

The demand to use these trainers and their availability have been the primary factors the Navy used to determine WTT requirements. Critical factors to determine the demand for each simulator are the number and type of pilots to be trained and the timing in which aircrews must be trained. To assess availability, two essential factors are the simulator's operational and maintenance environment and the training mode in which the simulator is operated.

OBJECTIVE, SCOPE AND METHODOLOGY

Due to the cost and quantity of F/A-18 WTT planned for procurement, we made this review to determine whether the Navy has adequately estimated its need for WTT to support planned F/A-18 aircrew training. We limited our review to the Navy's requirements for the WTT because of the complexity and newness of this simulator's technology and the large amount of funds involved in its procurement. Our review focused only on the number of WTTs needed to meet the Navy's projected level of aircrew training; it did not attempt to evaluate aircrew training effectiveness, individual simulator effectiveness, or the overall simulator mix established by the ISD process.

Our review was conducted in accordance with generally accepted government audit standards. Our field work was performed from March through June 1983 at the offices of

--The Chief of Naval Operations, Washington, D.C.,
--Marine Corps Headquarters, Washington, D.C.,
--Naval Air Systems Command, Washington, D.C.,
--Naval Air Forces Command (Atlantic), Norfolk, Va.
--Naval Air Forces Command (Pacific), San Diego, Ca.,
--Naval Training Equipment Center, Orlando, Fl.,
--Lemoore Naval Air Station, Ca.,

--El Toro Marine Corps Air Station, Ca.,
--Chief of Naval Reserves, New Orleans, La., and
--Hughes Aircraft Company, Los Angeles, Ca.

To assess the need for additional WTTs, we interviewed key Navy and industry officials concerning two critical factors: the demand for using simulators (affected by syllabus hours and number of pilots to be trained) and availability (affected by the number of available days determined by the operations and maintenance contract provisions and the training mode for operating the simulator). Additionally, we analyzed the Navy's process for projecting F/A-18 simulator requirements and reviewed the following pertinent F/A-18 documents, files, and reports:

--The Aircrew Training Program Master Plan,
  Operational and fleet readiness squadron flight syllabuses,
--The Navy's Instructional System Development process,
--Simulator specifications documents and engineering change proposals,
--The Contractor Operations and Maintenance of Simulators Statement of Work,
--Budget documentation to include present and out-year Program Objective Memorandums,
--The Five-Year Development Plan, and
--Naval Audit Service reports and other GAO reports concerning the flight simulator program.

We did not visit Cecil Field Naval Air Station because it had not yet received its first WTT.

CHAPTER 2

WTT NEEDED TO SUPPORT AIRCREW TRAINING OVERESTIMATED

While Navy projections indicate that Lemoore and Cecil Field Naval Air Stations (NAS) will each require a third WTT to support F/A-18 training, this expansion could result in underutilized trainers. A reduction in the number of pilots needing training and an increase in WTT availability could allow four WTTs to meet projected training needs. By not purchasing the additional two WTTs, the Navy could avoid $110 million in the cost of initial hardware and associated operating costs.

DEMAND FOR TRAINING IN WTTS COULD BE LESS THAN PROJECTED

Crucial in determining WTT demand is the number of F/A-18 pilots (such as new, replacement, transition and operational) needing training. Even though the Navy considered the number of pilots, its projection does not reflect all the changes underway or planned for aircrew pilot training. For instance, the Navy's estimate for WTT demand will be less because the Navy will have one less carrier airwing and the Marine Corps is planning to provide its own WTT training.

Total F/A-18 operational squadrons less than planned

The projected number of Navy operational squadrons to require WTT training was based on the Navy deploying 15 active carrier airwings, 8 at Lemoore and 7 at Cecil Field. According to Navy plans, this would have involved training and developing 34 F/A-18 squadrons of 20 pilots each by 1994. However, the Navy currently plans to deploy only 14 active carrier airwings, thus, reducing to 32 the number of operational squadrons requiring initial and continuation training.

This reduction in operational squadrons would reduce the demand for training in both the training squadron and the operational squadrons at Lemoore by as much as 18 percent in 1983. For instance, the training squadron would initially experience a one-time reduction in transitional pilot training of about 40 pilots in 1993. With two fewer operational squadrons, the training squadron would also have 14 fewer replacement pilots to train annually. Beginning around 1992 continuation training for the operational squadrons would also be reduced by 40 pilots

annually. Since these factors do not affect Cecil Field's WTT requirements, the reduction expressed Navy-wide (Lemoore and Cecil Field) would be 9.3 percent.

Marine Corp training squadron could reduce training planned for Navy's WTTs

The Navy's projection for training pilots is also overstated because it includes training that is planned to be done by the Marine Corps. The Marine Corps is anticipating that its own training squadron will be providing WTT training at El Toro Marine Corps Air Station by 1988. In fact, the Marine Corps is already planning support facilities for pilots and one WTT.

This training squadron would give the Marine Corps the capability to train its own transition and replacement pilots. By the Marine Corps training its own aircrews, the Navy's projected WTT training workload would be reduced at Lemoore and Cecil Field by nearly 700 pilots from 1988-1994. Based upon the Navy's F/A-18 training schedule, the following table indicates the maximum reduction on the Navy's training demand at Lemoore and Cecil Field which could result when the Marine Corps starts providing its own training.

Marine Corps Pilots Requiring Training
That Could Be Trained At El Toro

Presently Planned Training Location	Marine Corps Pilots to be trained							
	1988	1989	1990	1991	1992	1993	1944	Total
Lemoore	41	48	62	62	[a]42	42	42	319
Cecil Field	48	55	42	62	42	[a]62	42	353
TOTAL	89	103	104	104	84	104	84	672

[a]=Indicates the respective NAS peak WTT workload year.

Even if the Marine Corps training squadron could not initially absorb all of its training, achieving this objective by the Navy's peak training years (1992-93) would substantially reduce the Navy's training workload. This reduction, expressed as a percentage of each training squadron's workload, equates to 16 percent at Lemoore and 25 percent at Cecil Field. While this percentage represents a considerable reduction in demand on the Navy's WTTs, the Marine Corps WTT utilization at El Toro would range from 79 to 94 percent.

NAVY PLANS COULD RESULT IN MORE WTT AVAILABILITY THAN NEEDED

In projecting the number of WTTs needed at the two training sites, the Navy considered both the demand for simulator training and the availability. In analyzing these two elements, the Navy estimated that each site will require three WTTs to meet peak demand, even though the third WTT would be rarely needed at other times.

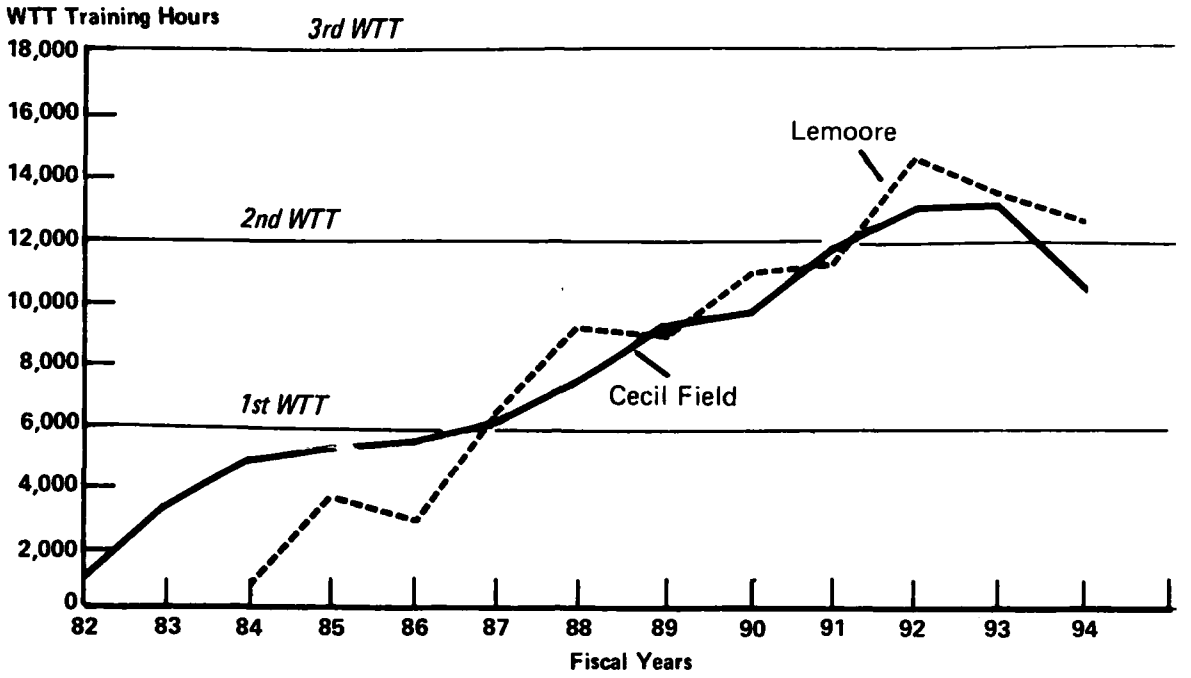
The Navy had projected a gradual buildup to 15 active carrier airwings which would require 34 operational squadrons. It had also planned to provide all initial pilot training for both the Marine Corps and all F/A-18 reserve squadrons. Such a buildup puts a considerable demand on the training squadrons since all pilots have to receive initial F/A-18 flight training. In determining this training demand, the Navy plans on each squadron training 20 pilots, both during F/A-18 transition and continuation training. The Navy also estimates each squadron will annually require seven replacement pilots. Considering these factors, plus the timing of when squadrons must be available to meet carrier airwing needs, the Navy projected its training demand would peak for Lemoore in 1992 and for Cecil Field in 1993. The training demand during these peak years is reflected in the following table.

PROJECTED PEAK YEAR TRAINING DEMAND

Training Site	Peak Year	Number of Pilots to Train			
		Operational Squadron	Training Squadron		Total
			Transition	Replacement	
Lemoore	1992	200	115	147	462
Cecil Field	1993	160	112	140	412

The Navy's plans also reflect the number of hours each F/A-18 pilot is expected to use the WTT. Continuation training for operational squadrons will annually require 27.6 hours of WTT training per pilot and the training squadron's initial pilot training is expected to require 35 hours of WTT training. As a result, the Navy has projected peak-year requirements at Lemoore to be 14,690 WTT training hours and 13,236 WTT training hours at Cecil Field. Anticipating each WTT will provide 6,000 training hours, the Navy estimates that during these peak years six WTTs would be needed to support the Navy's F/A-18 aircrew training. The following chart shows the Navy's projections for training hour demand at each training location and the limited extent the third WTT at each location is needed to meet demand.

NAVY'S PROJECTED WTT DEMAND AND AVILABILITY



According to the Navy's projection, the third WTT at Cecil Field would be needed for only a 2-year period. During this short period, maximum utilization of the third WTT is not expected to exceed 20 percent, with an average utilization of only 12 percent. Even though the need for at third WTT at Lemoore is higher its utilization after 2 years levels out to just over 12 percent.

GAO ANALYSIS OF NAVY'S PROJECTED NEED FOR WTTS

Analyzing the Navy's projection for needed WTTs indicates that factors have changed or are likely to change that will affect the number of pilots to be trained (demand), and simulator availability (supply), thus reducing the need for the numbers of WTTs proposed.

WTT demand will decrease

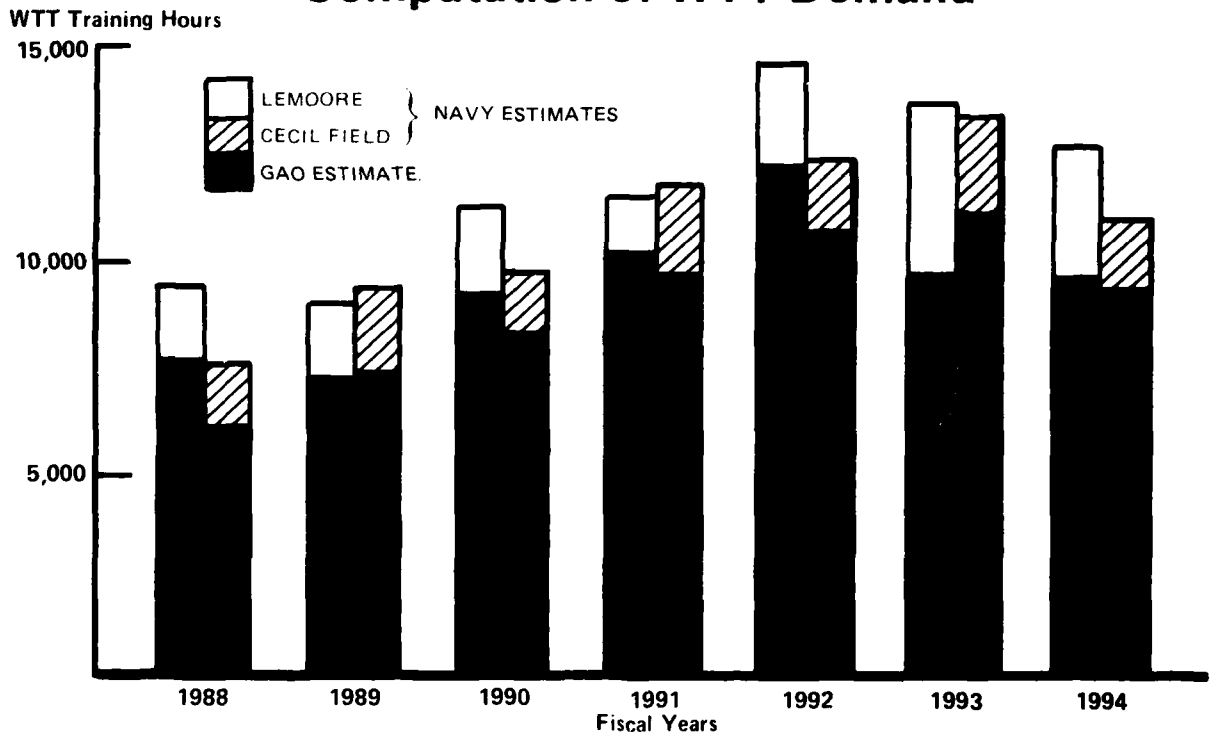
Our analysis shows Navy demand projections are based on the training squadron providing 35 WTT hours during initial pilot training and 27.6 hours annually for operational squadron's continuation training. Therefore, training one less carrier airwing would initially reduce the Lemoore training squadron's planned WTT use by 1,400 hours during the 1993 training period. Use of the WTT to train replacement pilots for this squadron would also be reduced annually by 490 hours.

Additionally, beginning around 1992, Lemoore's projected WTT use for operational squadrons should decrease by about 1,100 hours annually.

While fewer carrier airwings will only affect Lemoore's proposed WTT demand, the Marine Corps' plans to train its own aircrews could further reduce the Navy's projected WTT demand annually by at least 1,400 hours at each Navy training site. Marine Corps replacement pilot training during peak years would reduce WTT training by 1,470 hours at each Navy training site. In addition, Marine Corps transition pilot training would further reduce Cecil Field's peak year usage by 700 additional hours.

The following chart shows how our projection (shaded portion) results in lower demand compared to Navy estimates

Comparison of Navy and GAO Computation of WTT Demand



These reductions to the Navy's projected WTT demand would average 20 percent at Lemoore and 16 percent at Cecil Field. Peak year WTT demand will be reduced at Lemoore by 2,574 hours and at Cecil Field by 2,170 hours.

WTT availability will increase

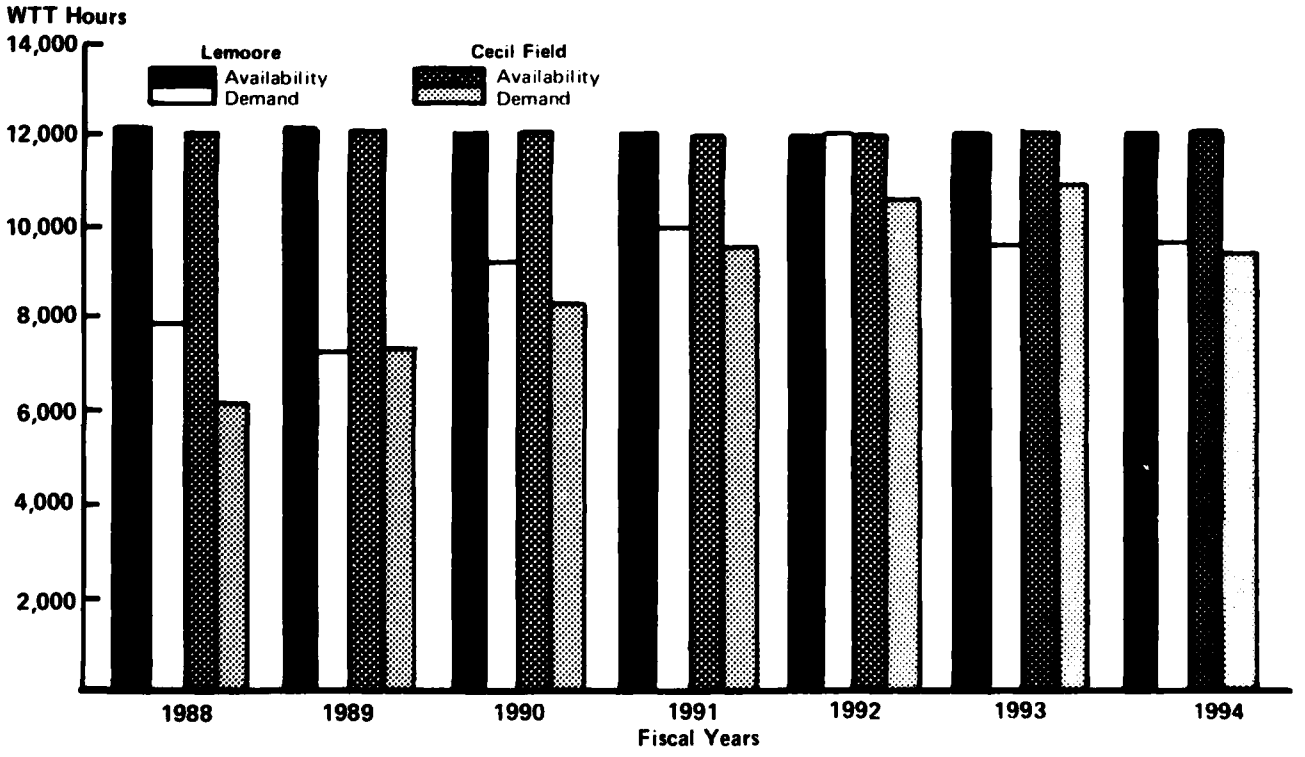
Our analysis indicates that WTT availability will vary and could be slightly above the Navy's 6,000-hour annual projection. The Navy's projected WTT availability does not accurately reflect the standards set in the WTT's operations and

maintenance contract proposal nor the use of both WTT cockpits to train one pilot. Also, the Navy's availability projection does not account for non-productive simulator time due to pilot changeover. As a result, each WTT's availability during peak training years is projected to be 6,017 hours at Lemoore and 6,037 hours at Cecil Field. WTT availability is further discussed in Appendix II.

How changes will reduce WTT requirements

Our analysis shows that changes in the Navy's WTT demand and availability clearly support a requirement for only four WTTs to meet the Navy's planned aircrew training. Only during Lemoore's peak year would demand exceed the capacity of two WTTs. While peak year training at Lemoore amounts to 12,116 hours, only 82 hours or 2 percent of an additional WTT's capability could not be provided. Prior to and after the peak year, Lemoore's two WTTs could provide 2,000 or more hours than required for scheduled training. On the other hand, the capacity of the two WTTs at Cecil Field exceeds even the peak year demand of 11,066 hours by over 1,000 hours. After this period, its two WTTs could provide more than 2,000 hours over what is required to meet planned training. With this additional capacity, contingencies, such as training additional pilots or more training hours, could be accommodated. The following chart shows the revised projections of demand for training hours at both Lemoore and Cecil Field and the extent their WTTs can meet these demands.

REVISED WTT DEMAND AND AVAILABILITY



WTT program costs can be reduced

Reducing the Navy's planned requirement for WTTs from six to four can save a projected $78 million in procurement costs for the simulators. Other costs associated with the WTTs that would also be reduced are facility costs, operational and maintenance costs, and the cost of incorporating future engineering changes. These factors could reduce the cost of theF/A-18 simulator program by an estimated $32 million for a totalcost avoidance of approximately $110 million as shown below.

Estimated Program Costs For Third WTTs

Cost Items	Estimated Costs (millions)
WTTs (2)	$ 78
Simulator Facilities (2 locations)	8
10-year Operation and Maintenance Support (2 locations)	8
Engineering Changes	16
	$110

The projected cost for constructing the proposed two facilities for Lemoore and Cecil Field is between $3 and $4 million for each simulator. A Navy official responsible for F/A-18 simulator operational and maintenance support, estimated this support will cost approximately $400,000 annually for each WTT. Over the minimum expected 10-year life of the WTT, the operations and maintenance support cost could then be about $4 million per WTT. The engineering changes for the first four WTTs could average an additional $12.5 million. Even though production of later WTTs will incorporate these engineering changes Navy documentation indicates these last two simulators could require an estimated $8 million each in future changes.

CHAPTER 3

MANAGEMENT INITIATIVES COULD RESULT IN BETTER USE OF WTT AVAILABILITY

Although the need for additional WTT capability to meet scheduled training is most critical during peak training periods, these periods only last for about 2 years. The Navy's proposal for third WTTs at each Navy training site could, therefore, result in substantially more training capacity than needed after these peak training years. Several management initiatives are available that could help the Navy meet its peak training without the need for third WTTs. These initiatives include (1) using available WTT hours at one location to reduce the demand at another, (2) using a 6-day instead of 5-day training week to increase availability during peak demand periods, and (3) employing other short-term training alternatives to meet temporary surges in training demand.

SHIFTING TRAINING BETWEEN LOCATIONS COULD HELP LEVEL PEAK DEMANDS

Cecil Field and Lemoore's peak training periods occur at different times and last only about 1 year each. As can be seen in the chart on the page 9, when either Lemoore or Cecil Field reach its training peak, the other has more WTT hours available than needed to meet its planned training workload. Also, the Marine Corps' WTT at El Toro would have more than enough available training hours to meet its training demand and could, if necessary, provide some Navy training during both Lemoore and Cecil Field's peak years. Since the Navy's training sites peak in different years, shifting some of the training demand to a location with additional WTT availability could help eliminate the need for a third WTT at each training site.

Using available WTT training capacity at one location to help level peak training demand at another has advantages and disadvantages. An advantage would be that improved utilization of available WTT training capacity could minimize the need for additional WTTs. For example, during Lemoore's peak training year, Cecil Field's two WTTs will have an excess of 1,400 hours available. As a result, approximately 40 replacement pilots could receive training at Cecil Field rather than Lemoore, while only 21 of these replacement pilots would level the WTT training demand between these sites. The disadvantage would be the costs and logistical problems associated with training pilots at locations differing from their later assignment. Navy officials expressed concern about temporary duty costs and logistical problems in moving entire transitioning squadrons to different training sites. While these problems are valid for moving transitioning squadrons, costs could be reduced by moving individual replacement pilots to level demand. According to an official from the Naval Air Forces, Atlantic Fleet, A-7

replacement pilots have already been moved between Lemoore and Cecil Field with few problems. Selectively, shifting F/A-18 aircrew training between training locations, therefore, may be a viable alternative to meeting short-term peaks in training demand.

USING 6-DAY TRAINING WEEKS CAN INCREASE AVAILABILITY

To meet the majority of its training demand, the Navy plans to operate the WTTs on a 5-day a week schedule. Plans for using simulators on weekends are currently limited to one WTT at Lemoore being used one weekend a month to meet the reserves' training requirements. By using the remaining WTTs for a 6th day, the Navy has another option to increase availability during peak training demand. A 6-day training week could increase the WTT's ability to meet scheduled training by as much as 20 percent, or approximately 1,200 additional hours annually. The following chart shows how a 6-day training week increases availability during the peak demand years at Lemoore and Cecil Field. (The reserves' use of the WTT has been considered in computing the additional available hours at Lemoore.)

WTT Utilization Rates During Peak Demand Based Upon 5- and 6-day Work Weeks

Work Week	Lemoore 1992		Cecil Field 1993	
	Unscheduled Training Hours	Utilization Rate	Unscheduled Training Hours	Utilization Rate
5-DAY WEEK	(82)	101%	1,008	92%
6-DAY WEEK	2,174	85%	3,408	76%

Although the Navy expressed some opposition to a previous GAO report (LCD-80-65) that recommended extending the training week, a senior Naval command official indicated that a 6-day training week is already being periodically used to meet the current WTT training demand. Therefore, we see no reason why a 6-day WTT training week could not be used to meet future peak year training.

USING OTHER TRAINING ALTERNATIVES CAN REDUCE PEAK YEARS' TRAINING DEMAND

Since 1982, some pilots have been completing their initial F/A-18 training requirements at Lemoore without using a WTT. In these cases, the training plan's requirement for approximately 23 hours of WTT use has been met by other means, such as other simulators or using the aircraft itself. In some instances, training was delayed until the pilot was assigned to an operational squadron. While training officials agreed a WTT would provide the most desirable training, they told us the pilots were sufficiently trained before being assigned to an operational squadron by using training alternatives. Shortening and/or combining individual training events could provide the Navy with yet another alternative to help meet training requirements with fewer WTTs.

CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Due to reduced WTT training demand, increased WTT availability, and management initiatives, the Navy could save an estimated $110 million by not acquiring the last two proposed WTTs. As a result of changes in demand and availability, we believe that the Navy's F/A-18 aircrew training can be supported by the four Navy WTTs, two each at Lemoore and Cecil Field. The Navy has proposed six WTTS primarily based on peak training demand exceeding the capacity of two WTTs at each training site. However, we believe the peak training demand will only exceed the availability of two WTTs at Lemoore for 1 year and then only by about 1 percent. Cecil Fields' peak training demand on the other hand, never exceeds the availability of two WTTs. At times other than peak demand years, WTT availability far exceeds that needed to meet planned training for each location.

The Navy's projections for WTT training demand have not been recalculated although several factors influencing demand projections have changed. First, Navy training projections do not recognize the reduced demand resulting from 14, rather than 15 active carrier airwings. Second, its demand projections include Marine Corps training that could be handled by the Marine Corps own training squadron which should be operational by 1988.

We also believe that the Navy's WTT availability estimates do not accurately reflect those standards included in the operations and maintenance contract proposal. WTT availability will also be greater because the Navy's assessed need for using both cockpits to train one pilot was overstated.

We further believe that several management initiatives could reduce projected Navy WTT requirements. With unused trainer availability at Navy and Marine Corps training sites and peak training demands varying among these sites, shifting pilot training to sites with additional WTT availability during peak demand could level the training peaks for WTT training. Using a 6-day training week during peak years could provide additional WTT availability. Alternative training options, such as those used prior to the Navy having a WTT, could also be used during peak years if sufficient WTT training is unavailable. Each of these initiatives offers the Navy alternatives to manage the short-term need for additional WTT training availability in lieu of purchasing an additional simulator.

RECOMMENDATIONS

In light of our analysis showing that the demand for WTT use could be significantly lower than currently projected by the Navy, we recommend that the Secretary of the Navy (1) reexamine the need for more than two each WTTs at Lemoore and Cecil Fields and (2) determine whether the suggested management initiatives to control peak demand would be more cost effective than procuring additional WTTs.

AGENCY COMMENTS AND OUR EVALUATION

On February 13, 1984, we met with Department of Defense (DOD) and Navy officials to obtain their comments on the draft report. DOD agreed with our recommendation that the Navy re-examine the need for more than two each WTTs at Lemoore and Cecil Fields. DOD also partially concurred with our recommendation that the Secretary of the Navy determine whether the suggested management initiatives to control peak demand would be more cost effective than procuring additional WTTs. They added, however, that at the present time DOD does not believe the suggested management initiatives are viable as planning factors; rather they are among those management initiatives which would be considered to cope with unforeseen, temporary, and emergency-type situations. Our position has been, and continues to be, that initiatives suggested were intended for peak training periods which would be temporary and not permanent. DOD officials stated they would, in conjunction with the 1987 budget planning cycle, determine whether the suggested management initiatives would be more cost-effective than procuring additional WTTs.

DOD officials added that while generally agreeing with GAO's recommendations, they did not agree with some of GAO's findings. We recognize that the F/A-18 program is dynamic and that many factors which shape the program are subject to change. In view of this, we believe it is important to highlight changing factors, both real and potential, that have been presented by the Navy during our review and our assessment of the impact these changes could have on the Navy's current projected WTT requirements. DOD's comments and positions on the findings as well as our evaluation are presented below.

COMMENT #1

DOD commented that a reduction from 15 to 14 airwings would result in only a 5.88 percent decrease in projected WTT training requirements rather than 18 percent cited in the GAO draft report.

GAO EVALUATION

Our reduction in WTT demand was developed using January 1983 Navy projections. These projections, which extended through

1994, were adjusted to reflect the impact of the airwing reduction. The 18 percent reduction in projected WTT use, in the draft report, reflected the maximum reduction anticipated at Lemoore Naval Air Station, which occurs in 1993. Since this factor does not affect Cecil Field's WTT requirement, the reduction expressed Navy-wide, (Lemoore and Cecil Field), should be reduced to 9.3 percent. We have made this change in the digest and on page 5 of the report. The Navy has not fully explained the 5.88 factor and our analysis indicates it must be related to the larger continuation training requirement used by the Navy discussed in comment #4.

COMMENT #2

The Navy demand calculation used 37 hours rather than the 35 hours of initial/replacement pilot training shown in the training syllabus.

GAO EVALUATION

We asked the Navy to provide support for 37 hours, since we had not seen any documents showing other than 35 hours. The Navy advised us several days later that 35 hours is correct and they would adjust their calculations accordingly.

COMMENT #3

In the Navy's comments, they indicate that eight replacement pilots are needed annually per operational squadron.

GAO EVALUATION

Navy planning documents showed a need to train 5.79 replacement pilots annually per squadron and was rounded up to eight by the Navy to adjust for attrition. The Navy's increase to eight replacement pilots per operational squadron increases WTT demand 1,120 hours annually during steady-state years. While, we requested further support for the eight, the Navy has not provided any further explanation. In the absence of additional information, the report data continues to be based on the seven shown in official Navy planning documents.

COMMENT #4

The Navy officials commented that steady-state demand after peak training years will be considerably higher than GAO showed, perhaps double the GAO projection.

GAO EVALUATION

WTT usage projections provided by the Navy showed that with a reduction in one airwing at Lemoore NAS, only eight operational squadrons would be on-board for training at each Lemoore and

Cecil Field NAS during steady-state years. This was based on the Navy's planning documents which stated that each of the 32 operational squadrons would be deployed 6 months each year. The Navy's planning documents projected continuation training to require 2.3 WTT hours per month per operational pilot available for training or 8,832 WTT hours annually each steady-state year. The Navy's comments on usage projections were that WTT use during continuation training would increase by 100 percent. Using the Navy planning information that operational squadrons are still to deploy 6 months annually, then the Navy's latest calculation has increased WTT usage during continuation training to 4.6 hours per pilot, per month. The Navy did not provide any additional support for this increased WTT usage during continuation training even though, we requested it at the meeting on February 13, 1984. Therefore, we are unable to verify the Navy's estimates.

COMMENT #5

GAO failed to consider other factors such as foreign military sales, USN Reserve Forces, increased syllabi, and downtime for simulator modifications.

GAO EVALUATION

Our evaluaton considered the above factors. Comments by the Navy officials during our review indicated these factors were not significant. Navy officials told us during our review that neither foreign military sales nor USN Reserve use of the WTT would be significant or provide a basis for justifying any additional simulators. We were also told that significant increases in syllabi training, while possible, were not very likely to materialize.

While the Navy may be required to train some foreign military service cadre, the extent of this training is largely unknown. Navy officials involved in foreign military sales said that foreign military training is so uncertain and temporary that it should not be used as a basis for buying simulators. Instead, a conscious decision should be made to provide foreign military training with existing training resources.

USN Reserve use of WTT beyond initial transition training is uncertain. Current, F/A-18 plans would place only one reserve squadron each at Lemoore and Cecil Field Naval Air Station. A representative from the Chief of Naval Reserves said that based on this concept, which they support, only a minimal use of Lemoore's and Cecil Field's WTT is anticipated beyond initial transition training.

As the WTT matures, a significant increase in the WTT syllabi is possible but only with major alterations to the existing F/A-18 training program, according to Navy F/A-18 training

officials. According to these officials, any increase in the WTT syllabi beyond 35 hours would require a change in the current F/A-18 training program. These changes could take the form of shifting hours away from other training media, (i.e., other simulators, lectures, and computer assisted training) adding to the length of initial training or more instructor pilots to deliver the training. WTT availability calculations do not include factors such as Marine Corps, Foreign Military Sales, and U.S. Navy Reserve training and downtime for simulator modifications.

We found simulator modifications are anticipated to require minimal disruption in simulator training due to downtime. The majority of the modifications planned are software changes, which we were told could be made offsite and/or during nontraining hours. Hardware modifications, although requiring some simulator downtime, would be minimized by in-plant development. This would remain possible as long as the manufacturers production facilities are maintained. Also, the future of modification to the simulator are quite uncertain both in feasibility and funding.

COMMENT #6

The establishment of a third Fleet Readiness Squadron (FRS) is only under consideration (El Toro or elsewhere) and has not been approved, but such a decision would reduce the $78 million cost avoidance projected by GAO.

GAO EVALUATION

Our report was based on official documents, which show that a third FRS at a Marine Air Station has been programmed for some time, although a final decision of where it will be has not been made. Navy F/A-18 training plans, dated June 1983, and the F/A-18 Operator Training Requirement/Acquisition Plan dated March 1983, reflected a third FRS for Marine training. during our review, we were told by Navy and Marine Corps officials that a third FRS would be established and most likely it would be El Toro. In fact, El Toro, upon our visit, was building a WTT facility and planning housing facilities for FRS personnel. Regardless of what Marine Corps Air Station the third FRS is established, the reduction on Lemoore and Cecil Field's WTT requirements should be approximately the same.

A third FRS was planned in addition to 3 WTTs each at Lemoore and Cecil Field. The cost of establishing a third FRS would only be a reduction to the $78 million cost avoidance if the third FRS has been planned in lieu of WTTs at Lemoore and Cecil. Simulators, a PTT, an OFT, and a WTT have all been

programmed for the third FRS and are included in documentation to the Navy's 1985 POM. Thus, the cost of establishing a third FRS would not affect the cost avoidance from eliminating a WTT at each Navy FRS location as we projected.

COMMENT #7

The Navy WTT availability calculations appropriately included all factors that would impact on the simulators availability for training, including 100 percent availability.

GAO EVALUATION

Navy documentation showed availability calculations were based on 52 weeks training annually, 90 percent availability due to unscheduled maintenance and downtime, and 19 percent reduction in training time available due to the requirements for a single student to employ both domes (cockpits). The use of these factors was explained in detail by Navy officials involved in the F/A-18 simulator program. During DOD's oral comments, Navy officials said they factored no unscheduled maintenance and downtime, in calculating WTT availability, even though anticipated in the development of the contractor operations and maintenance concept. The Navy officials estimated a 15 percent reduction in simulator training availability for non-productive student turn-around time and a 12 percent reduction in available training time due to a single student employment of both WTT domes. The Navy's current training plan for the F/A-18 does not address these factors. It only states that simulators will be used 16 hours per day, 5 days per week and 50 weeks per year. We requested additional support from the DOD officials for the differences but we have not received any.

COMMENT #8

Contractor operations and maintenance of simulators is untested, thus, its availability goals should not be used in planning F/A-18 WTT requirements.

GAO EVALUATION

It is true, that contractor operations and maintenance of simulators (COMS) on a large scale is new for the Navy. However, the Navy's organic operations and maintenance experience and the 95 percent availability goal for COMS would be less speculative than the Navy's current assumed 100 percent availability. Therefore, we believe the best data available in operating availability should be used as a basis for budget planning on the F/A-18 WTT.

COMMENT #9

GAO's projected $110 million cost savings is more correctly stated as cost avoidance and would be offset by the cost of implementing suggested management initiatives.

GAO EVALUATION

We concur with DOD's position that the $110 million is a cost avoidance rather than a cost savings and have changed the statements in the report to reflect their position. Furthermore, any additional cost incurred in carrying out the suggested management initiatives would reduce the cost avoidance. However, these initiatives are only intended as measures to cover short-term shortfalls in WTT training, not permanent measures. As such, we see no evidence that the cost of the management initiatives would be significant in relation to the $110 million cost avoidance.

COMMENT #10

The management initiatives suggested by GAO should not be used for planning WTT requirements.

GAO EVALUATION

The management initiatives are measures we suggested to be considered by the Navy only to cover the short-term shortfall in WTT training which is anticipated during the Navy's peak training years. These measures were not intended as long-term solutions to WTT training requirements. In this light, we continue to believe these suggested measures as well as others that may exist, should be actively considered in planning Navy requirements for WTTs. We did not attempt to address the pros and cons of each of the management initiatives identified, but instead, we recommended that the Navy actively consider these measures and determine if they would present a more cost effective approach to meeting short-term shortfalls in WTT training than procuring additional WTTs.

COMMENT #11

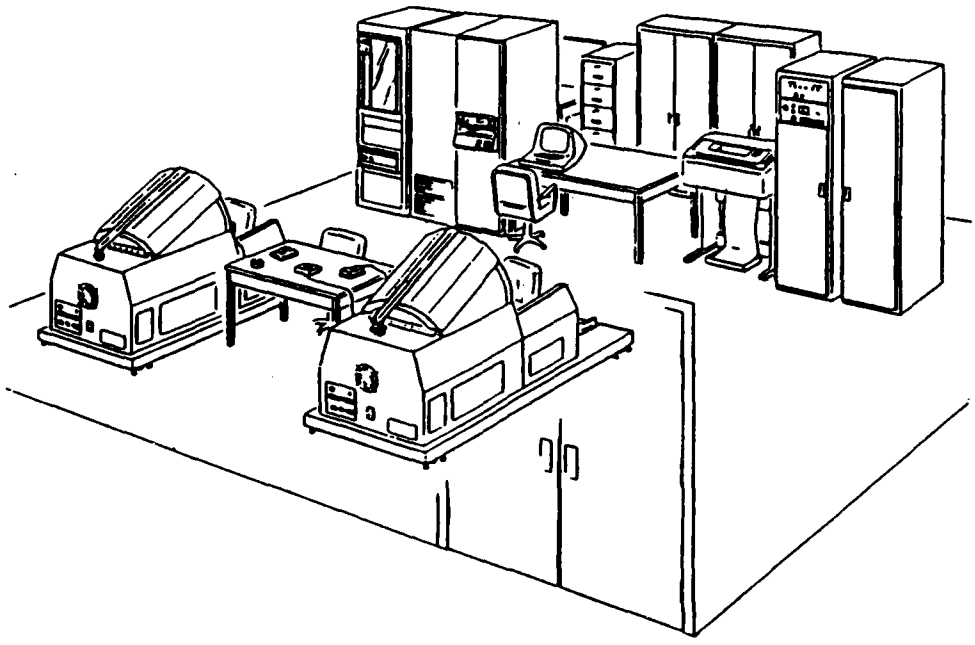
Navy officials commented that it was not appropriate at this time to remove WTTs #6 and 7 from the Five Year Defense Plan (FYDP) as recommended by GAO.

GAO EVALUATION

We have not recommended removal of any WTTs from the Navy's FYDP. However, we recommended that the Navy continue to reexamine their need for the two WTTs in question recognizing real and potential reductions in WTT training requirements identified in this report.

DESCRIPTION OF F/A-18 AIRCREW SIMULATORS

PART TASK TRAINER (PTT)
DEVICE 15C13

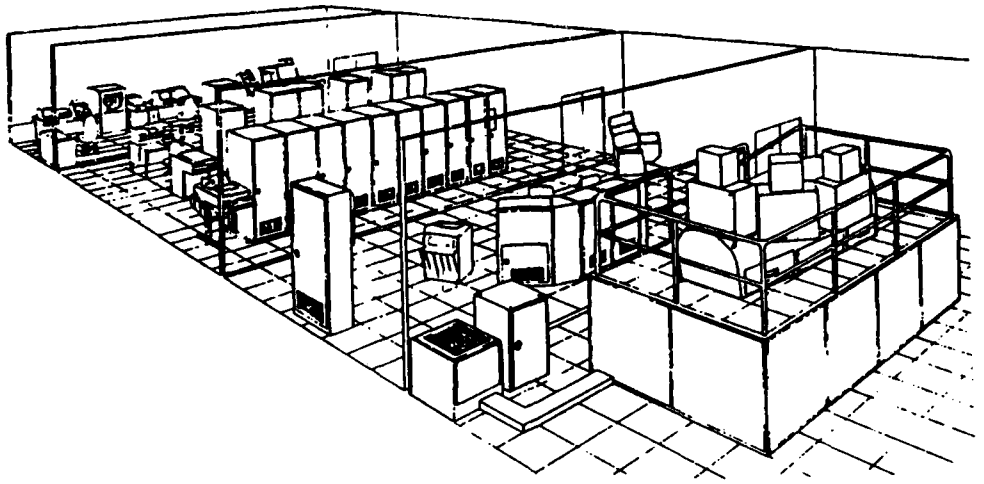


F/A-18 Part Task Trainer

Intended use: The PTT will be used to provide pilots with hands-on experience for throttle and stick operation, limited radar intercept geometry, and interpretation of display symbols. It also introduces pilots to the basic capabilities and integrated use of the F/A-18 weapon systems. The controls and displays provide tactile and visual responses which accurately simulate those in the aircraft. The PTT can simulate operations in both ground and flight modes. The Navy projects that by using the PTT to develop the psychomotor skills required to effectively operate the advanced control concepts of the F/A-18, training in more costly simulators and the aircraft can be better optimized.

Physical description: The PTT is a two-trainee station simulator. Each station consists of a full-size replica of the F/A-18 cockpit mounted on a fixed base.

OPERATIONAL FLIGHT TRAINER (OFT)
DEVICE 2F132

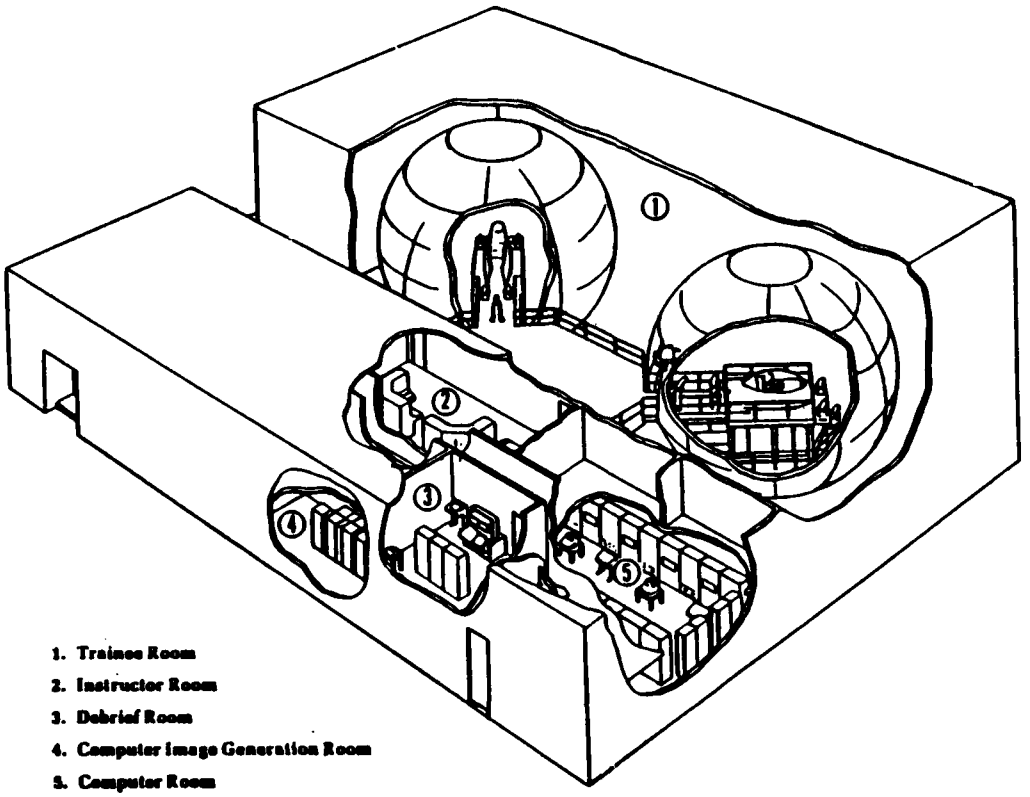


F/A-18 Device 2F132 Operational Flight Trainer

Intended Use: The OFT provides training which develops the skills and techniques used to fly the F/A-18 aircraft. The trainer has the capability to simulate the F/A-18 performance navigational flight, landing, engine shutdown, and post shutdown procedures. Training on the OFT can be provided under normal and emergency conditions to develop proficiency in operating controls, interpreting instruments and displays, operating navigations and communication systems, and performing limited air-to-ground weapons delivery exercises. The OFT also simulates flying conditions during dusk and night periods involving both shore and carrier operations.

Physical description: The OFT consists of a full-size replica of the F/A-18 cockpit mounted on a fixed base. The trainer complex also includes a narrow computer-generated imagery system, an instructor/operator console, a digital computer complex, and a power distribution station all housed in a permanent structure. Acceleration and deceleration are simulated through a g-suit and g-seat. The instructor/operator console incorporates cathode ray tubes, an intercom system, a programmed malfunction control, and functional keyboards providing data entry, problem initiation, and control.

WEAPONS TACTICS TRAINER (WTT)
DEVICE 2E7



Layout of Weapons Tactics Trainer, Device 2E7

Intended use: The WTT provides pilot training in air-combat maneuvering, aircraft armament, weapons delivery, radar imagery, aircraft control, and normal and emergency procedures. Provisions were also made for adding electronic counter measures and full air-to-ground weapons delivery. For air-combat maneuvering training, the two-trainee stations are capable of integrated operation in both one-on-one and two-on-one modes and also capable of simultaneous independent one-on-one operation. In the WTT, pilots can practice both radar and visual air combat. Full simulation is provided for weapons delivery in the air-to-air mode. In the air-to-ground mode, only the radar-related training will not be provided. The WTT is designed to eventually generate a maximum of 20 targets. Five of the 20 targets to be incorporated in the initial WTTs will be air targets, while the sixth will be a surface-to-air missile. Pilots will be able to develop the operational skills to

recognize system faults, failures, and malfunctions and to correct the problems or use alternate back-up means to complete the training exercise.

Physical description: The WTT consists of two fixed-base F/A-18 cockpits situated in separate 40-foot spherical domes. An instructor station exists for each cockpit or trainee station. A computer-generated imagery system projects the visual scenes on the dome's surface. The WTT has a general purpose digital computer system to control the various simulator functions. Motion cues are controlled by the g-suit and g-seat. The computer system is equipped with computer processing units, memory units, mass storage units, input-output processors, special interface equipment, display and visual system processors, and all integrated power supplies and software programs.

APPENDIX II

PROBLEMS WITH THE NAVY'S WTT AVAILABILITY PROJECTION

In addition to the discussion about availability throughout this report three less significant problems were also noted. Each of these problems is discussed below.

CONTRACT PROVISIONS ARE NOT ACCURATELY REFLECTED

The Navy has not updated its availability projections to reflect expectations shown in the operations and maintenance contract proposal with a private company. In this contract proposal, the Navy has established the annual operating hours and the extent unscheduled maintenance would be allowed. The Navy's availability projection, however, overstates both the annual operating hours and the level of unscheduled maintenance, as reflected in the current contract proposal.

The Navy has projected eight more operational days than the contract proposal has established. While each proposes a 16-hour day and 5-day week for training, the availability projection and contract proposal use different criteria to determine the annual number of training days. The Navy's projection assumes 52 weeks per year or 260 days. The contract proposal establishes a 21-day month or 252 days annually. The 8-day difference equates to a 128-hour overstatement per cockpit or 256 hours per simulator.

Along with simulator operations, the contractor will be expected to maintain the various simulator systems to ensure that the minimum amount of scheduled training can be accomplished. The Navy's simulator availability projections allow more unscheduled maintenance than is established in thecontract proposal. The projection permits 10 percent of scheduled training to go uncompleted due to unscheduled maintenance; whereas, the contract proposal allows only five percent. Although some Navy officials questioned whether the simulator could be maintained to meet 95 percent of scheduled training, both the Naval Training Equipment Center and the simulator's manufacturer expressed confidence in attaining this level of maintenance reliability. Their confidence was based on past experience and the requirement that only those simulator systems needed for scheduled training must be operable. The remaining systems would be available for contractor maintenance.

THE REQUIREMENT FOR TWO COCKPITS TO TRAIN ONE PILOT IS OVERSTATED

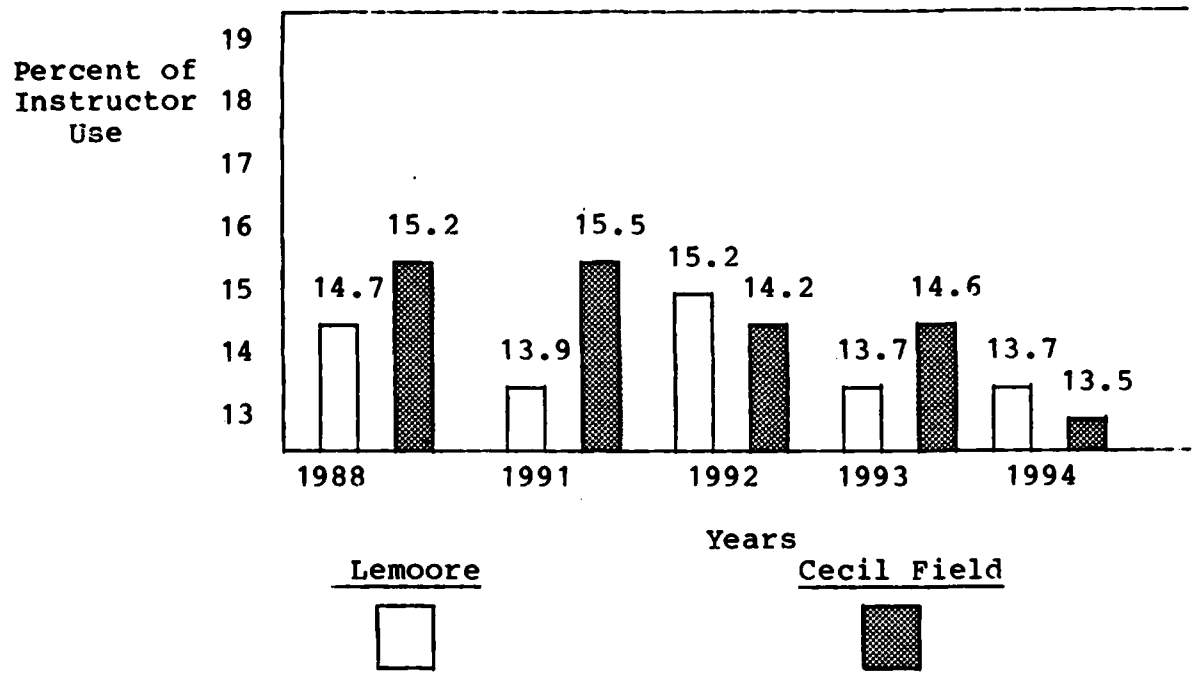
The two cockpits or trainee stations on each simulator can be used to train one pilot with an instructor occupying the

remaining cockpit or the cockpits can simultaneously train two pilots, each meeting different training requirements. The Navy determined that those training events which require an instructor in the second cockpit would reduce the simulator's annual training-hour availability by 19 percent each year. However, our review indicated that the extent both WTT cockpits will be required to train one pilot is variable, not fixed, and the rate will likely be less than the Navy's projection.

The percent of available simulator hours used by instructors to assist pilot training varies yearly. The training and operational squadron's training requirements determine the extent two cockpits will be needed to train a pilot. Training squadron pilots, because of their more limited F/A-18 flying experience, have a greater need for an instructor occupying the second cockpit than do the operational squadron pilots. According to information provided by the Navy, instructors will assist training squadron pilots during 21 percent of their 35 training hours. The rate is much lower for operational squadron pilots, i.e., 5 percent of their annual 27.6 hour training requirement. The number of instructor hours is also affected by the ratio of operational and training squadron pilots to be trained each year. Because this ratio changes, the rate in which an instructor will occupy the second cockpit will also change.

In addition to the need for two cockpits to train one pilot being variable, it will also be less than the Navy's projected 19 percent. During the earlier years of F/A-18 aircrew training, training squadrons require the major portion of the simulator's available hours. This training demand causes the rate in which two cockpits are required to train one pilot to be at its highest level, but still less than 19 percent. As more operational squadrons are formed, their reduced need for an instructor in the second WTT cockpit causes the rate to generally decrease. During and beyond the peak demand years, the shift in WTT demand between training and operational squadrons causes this rate to range from 13.5 percent to 15.5 percent, as shown in the following chart.

Percent of Simulator Availability Required for Two Cockpits to Train One Pilot



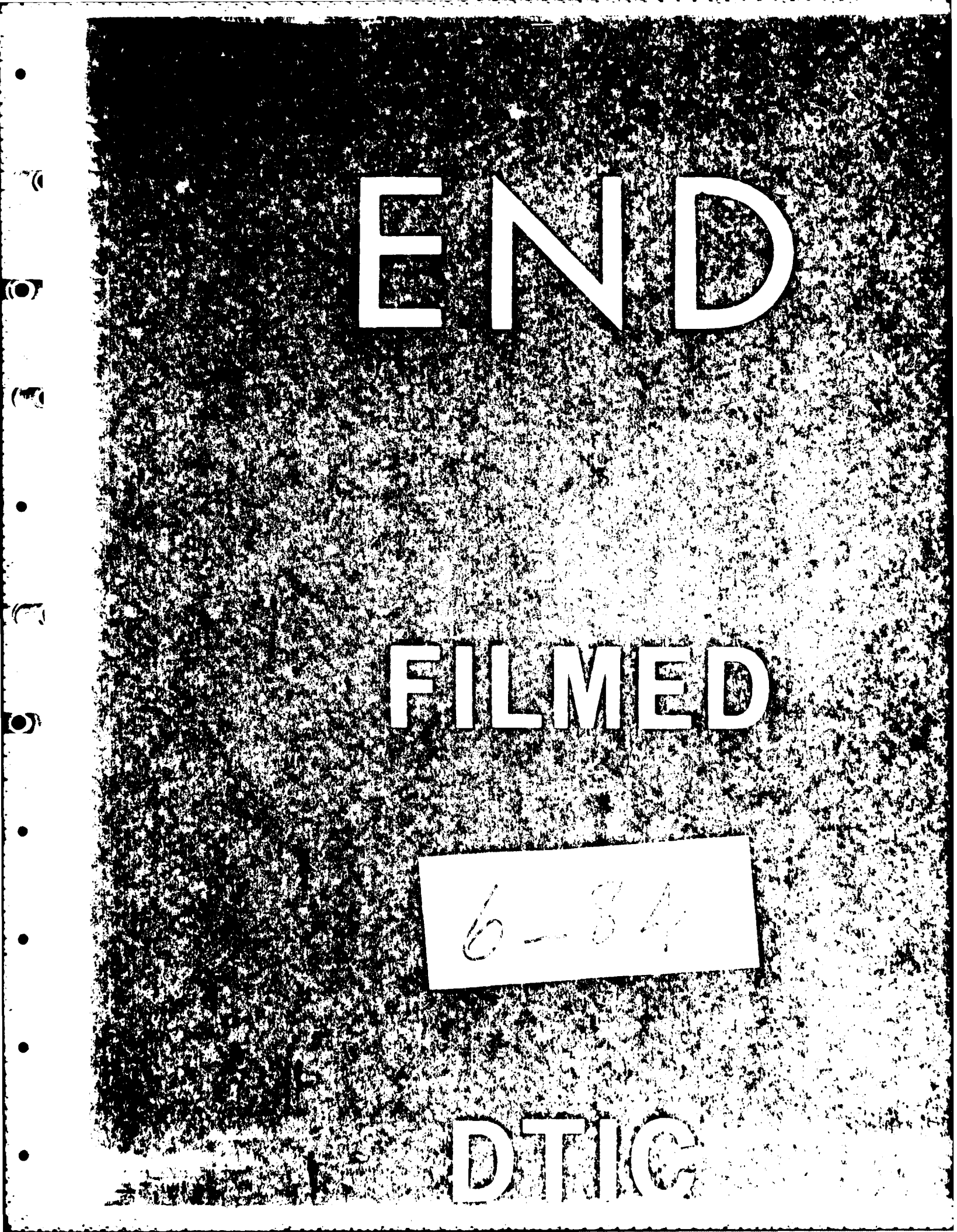
PROJECTION DOES NOT REFLECT HOURS REQUIRED FOR PILOT CHANGEOVER

For each training session, pilots require time to get into the cockpit, prepare for the mission, and exit the area at the end of a mission. The Navy's annual availability projection did not consider this lost time. Because actual training has not been conducted on a WTT, the amount of lost time has been estimated at 15 percent of the simulators scheduled training hours. Thus, the Navy's projected 6,000 hours of WTT availability would have been further reduced to 5,100 had this lost time been considered. However, when applied to other factors which increase WTT availability (as noted in the text) the 15 percent would still leave 6,000 or more hours per simulator remaining available to meet the pilot training demand.

CORRECTED PROJECTION REVEALS ADDITIONAL AVAILABLE HOURS

The availability of the WTT will vary and be somewhat higher than originally projected because Navy's assessment does not reflect current operating and training factors. The current contract proposal for operations and maintenance increases each

WTT's availability for scheduling training by approximately 173 hours annually. Simulator availability is further increased because the demand for two cockpits to train one pilot is expected to be less than the 19 percent level projected by the Navy. Although this rate varies between years and training sites, during the peak training years Lemoore's rate will be 15.2 percent and Cecil Field's rate will be 14.6 percent. As a result, WTT availability during these peak years would be 7,079 at Lemoore and 7,102 at Cecil Field, instead of the Navy's 6,000 hour projection. When these projections are changed to reflect nonproductive pilot changeover time, the WTT availability during Lemoore and Cecil Field's peak training year is 6,017 and 6,037 hours, respectively. The hours slightly exceed the Navy's 6,000-hour projected availability. However, if the Navy's availability projection were adjusted for nonproductive time, its 6,000-hour WTT availability would have been reduced to 5,155 hours.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