REPORT BY THE

Comptroller General

OF THE UNITED STATES

The Congress Should Require Better Justifications Of Aircraft For Noncombat Missions

Since 1976 GAO has issued several reports questioning Department of Defense justifications for aircraft intended for noncombat missions, such as training, peacetime attrition, and backup during depot maintenance. They were justified based on unrealistic data and without adequate consideration of more economical alternatives.

The Congress has an excellent opportunity to save billions of dollars by limiting the number of noncombat aircraft to those that can be adequately justified. Accordingly, GAO recommends that the Congress withhold approval of appropriations requested to procure these aircraft until better justifications are provided.

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

IN REPLY
REFER TO:

B-199036

The Honorable Lloyd Bentsen
Chairman, Joint Economic Committee
The Congress of the United States

The Honorable Warren G. Magnuson
Chairman, Committee on Appropriations
United States Senate

The Honorable John C. Stennis
Chairman, Committee on Armed Services
United States Senate

The Honorable Jamie L. Whitten
Chairman, Committee on Appropriations
House of Representatives

The Honorable Melvin Price
Chairman, Committee on Armed Services
House of Representatives

Since 1976 we have reviewed Department of Defense justifications for the number of F-14, F-15, F-16, F-18, and A-10 aircraft to be purchased for noncombat missions. We have found and reported that the justifications for aircraft needed for training, peacetime attrition, and backup during depot maintenance included unrealistic data and lacked adequate consideration of more economical alternatives. Despite our findings and the fact that the Defense Audit Service also questioned the F-14 and F-15 noncombat aircraft requirements, we have seen

--virtually no change in quantities of noncombat aircraft to be procured and

--little improvement in the requirements justification for such aircraft.

Details on the aircraft remaining to be procured and the potential savings and our reasons for questioning the planned procurements are contained in the appendixes to this report. We believe the Congress has an excellent opportunity to save as much as $6.9 billion by limiting the number of noncombat aircraft to those that can be adequately justified. We further believe that justifications should respond

to the provisions of section 812, Public Law 95-79, by relating the requested appropriations for acquisition of noncombat aircraft to the effect on the readiness of the weapons systems.

We therefore recommend that the Congress require the Secretary of Defense to provide justifications for the planned procurement of noncombat aircraft that (1) are based on current and realistic data, (2) recognize the impact of the procurement on readiness, and (3) consider the modern aircraft design and improved maintenance techniques. We also recommend that the Congress withhold approval of appropriations requested to procure these aircraft until these justifications are provided.

Since this report is essentially a reiteration of our other reports, we did not ask for comments from the Department of Defense. We are sending copies of this report to the Secretary of Defense and the Director, Office of Management and Budget.

Comptroller General
of the United States

APPENDIX I

PROCUREMENT QUANTITIES

OF TACTICAL AIRCRAFT (note a)

Aircraft type	Numbers of aircraft							
	FY 1980 & prior	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	After FY 1985	Total program
A-10	627	60	46	46	46	-	-	825
F-14	425	24	24	12	6	-	-	491
F-15	639	30	30	30	-	-	-	729
F-16	425	180	120	120	120	120	303	1,388
F-18	45	48	96	147	174	191	676	1,377

a/Based on the President's FY 1981 budget estimates.

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FUNDING FOR PROCUREMENT

OF TACTICAL AIRCRAFT (note a)

Aircraft type	FY 1980 & prior	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985	After FY 1985	Total program
	(millions)							
A-10	$3,529	$495	$398	$441	$472	-	-	$5,335
F-14	6,660	691	803	528	330	$39	-	9,051
F-15	8,829	735	841	740	-	-	-	11,145
F-16	4,213	1,823	1,383	1,445	1,505	1,589	$4,380	16,338
F-18	1,414	1,449	2,147	2,707	2,931	3,272	11,421	25,341
Total	$24,645	$5,193	$5,572	$5,861	$5,238	$4,900	$15,801	$67,210

a/Based on the President's FY 1981 budget estimates.

POTENTIAL EXCESS PROCUREMENT

OF NONCOMBAT AIRCRAFT

GAO report	Aircraft type	Service	Aircraft purpose	Potential excess quantity	Potential savings (millions)
LCD-77-423 Oct. 28, 1977	F-14	Navy	Training	24	
			Attrition	31	
			Maintenance backup	21	
				a/(10)	
Total				66	$1,078
LCD-78-423 Oct. 28, 1977	F-15	Air Force	Training	49	
			Attrition	(b)	
			Maintenance backup	c/9	
Total				58	746
LCD-79-431 Sept. 6, 1979	A-10	Air Force	Maintenance backup	61	317
LCD-80-65 June 6, 1980	F-18	Navy	Maintenance backup	185	3,600
LCD-80-89 (note d)	F-16	Air Force	Maintenance backup	110	1,122
Total				480	$6,863

a/Only 66 F-14s remain to be purchased after 1980; thus, an equivalent of 10 of the potential excess has already been purchased.

b/Our report showed 71 F-15s as potentially unnecessary. See appendix III, page 7, for discussion of changes in the attrition rate.

c/We did not estimate Air Force requirements for depot maintenance backup aircraft because the F-15 had incurred only a limited amount of maintenance at the time of our review; however, the Defense Audit Service estimated that the Air Force had overstated this requirement by nine aircraft costing about $116 million.

d/Report is being prepared and should be issued in August 1980.

APPENDIX III

SUMMARY OF GAO'S FINDINGS ON THE NEED FOR NONCOMBAT TACTICAL AIRCRAFT

TRAINING AIRCRAFT

The purchase of aircraft for pilot training should be based on a realistic appraisal of the number of students to be trained, student flying requirements, and the flying capability of the aircraft. In 1977 we reported 1/ that the Air Force's F-15 and the Navy's F-14 training aircraft requirements were based on 25 percent of the operational force to be supported. This rate was developed in the mid-1960s and was the Defense limit for training aircraft quantities. We found that in arriving at the 25-percent rate, the services

--overestimated pilot replacement rates,

--overestimated student flying requirements, and

--underestimated the aircraft's flying capability.

Based on more realistic data, we estimated that the training aircraft requirements were 16 percent for the F-15 system and 17 percent for the F-14 system. These estimates resulted in a decreased requirement of 37 and 18 aircraft, respectively, costing about $770 million. Furthermore, we pointed out that if the services would use the aircraft to train on Saturdays, an additional 18 aircraft could be saved for a total savings of 73 aircraft costing over $1 billion.

We recommended that the Secretary of Defense require the services to (1) use realistic estimates of training factors to determine aircraft requirements and (2) evaluate the costs and potential benefits of flying on Saturdays. Defense did not specifically comment on our recommendations; however, it did agree that all programs must be based on realistic and supportable data. It also stated that if an ongoing Defense Audit Service study indicated that a change in planning requirements was warranted, then the appropriate change in the procurement objective should be made.

1/"Need to Strengthen Justification and Approval Process For Military Aircraft Used For Training, Replacement, and Overhaul" (LCD-77-423, Oct. 28, 1977).

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Defense Audit Service study confirms excessive requirements

In October 1978 the Defense Audit Service issued a classified report (79-003) based on its followup of our October 1977 report. The Service estimated that the Air Force and Navy overstated their training aircraft requirements by 28 F-15s and 15 F-14s, respectively. These aircraft have a combined cost of about $605 million. The Service attributed the overstatements to such factors as overestimating pilot requirements and underestimating training aircraft usage. For example, it pointed out that the Air Force

--used an abnormally high peak year of 1981 in arriving at the number of pilots to be trained,

--did not consider improvements in training courses, and

--overestimated the number of days that would be lost due to bad weather.

And, the Navy, for example

--overstated factors for aborted flights, instructor training, and aircraft testing and

--understated aircraft usage rates.

Air Force rebuttal of findings before the Congress

In testimony during fiscal year 1980 tactical aircraft hearings of the Senate Committee on Armed Services and the House Committee on Appropriations, the Air Force took exception to training aircraft aspects of the Defense Audit Service report on two grounds. First, the Air Force implied that its requirements estimate which was based on a peak year, 1981, was more appropriate than the 5-year average of requirements used in the Defense audit report. And, second, it contended the pilot training quota increased over previous estimates because of the need for the Air Force to provide experienced F-15 pilots to perform staff and other-than-cockpit assignments associated with managing the Tactical Air Force.

The Air Force recognized that there is difficulty in accurately projecting training aircraft requirements. It said that a computer model was under development, but in the meantime, the 25-percent training factor would be considered valid for determining the training aircraft requirement.

Our comments on the need for training aircraft

By adhering to the arbitrary 25-percent training aircraft factor, which we have questioned repeatedly, the Department of Defense may be investing as much as $1 billion for aircraft which may not be necessary or only marginally needed. These funds could possibly be applied to more pressing needs.

We believe several questions need to be resolved before funds are provided to purchase the potentially excess training aircraft.

--What are the tradeoffs between procuring aircraft based on the average annual training requirement and the peak year requirement? How many aircraft are being purchased solely to support the peak year requirement? What alternatives are there besides purchasing peak period aircraft? For example, could training aircraft be used 6 days rather than 5 days a week during peak periods?

--To what extent do the services need to train pilots to fill staff or other-than-cockpit assignments? What are the tradeoffs with other alternatives, such as using pilots from systems being deactivated or personnel that are not trained pilots.

--What impact do the audit findings pertaining to underestimated availability of aircraft and improvements in training courses have on the need for training aircraft?

--What are the tradeoffs with using training aircraft 6 days a week rather than 5 to reduce the quantity of aircraft required?

--What are the tradeoffs with adding more maintenance capability in order to more quickly prepare the aircraft for the next flight?

PEACETIME ATTRITION AIRCRAFT

In our October 1977 report, we pointed out two factors that need to be recognized by the military services when determining peacetime attrition aircraft requirements:

--Loss rates gradually decrease as the systems' flying hours increase.

--Newer systems have been safer than their predecessors.

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We reported, therefore, that by not adequately recognizing these factors, the Air Force and Navy overestimated their attrition requirements by 71 F-15s and 31 F-14s, respectively, which accounted for about $1.4 billion.

The Air Force, for example, used the rate for the F-4E, the F-15's predecessor, during its first 226,000 flying hours to compute the F-15 attrition requirement. Although the F-4E rate dropped from 7.1 aircraft per 100,000 flying hours to 4.52, the decrease was not recognized in the F-15 program. Thus, the 7.1 aircraft attrition rate was projected for the lifetime of the F-15 program resulting in potentially excess aircraft requirements. Similarly, the Navy's method of estimating the F-14 attrition aircraft requirement did not reflect the learning curve principle that an aircraft system's attrition rate decreases as its flying experience increases.

We recommended that the Air Force and Navy include the experience and improved safety factors in their methods for estimating attrition aircraft requirements. Furthermore, we recommended that the requirements be limited to an amount based on the long-term flying hour and loss history of the immediate predecessor aircraft until sufficient data is accumulated to more accurately project attrition requirements for the new aircraft.

As with the training aircraft requirement, Defense did not specifically comment on the attrition aircraft issue, except to say that it would study the area and make changes to the procurement objective if warranted.

Defense Audit Service study also questioned attrition quantities

The Service stated that the number of aircraft the services were acquiring to replace peacetime attrition losses could be reduced by about 74 F-15s and 26 F-14s. The Service, as we did, compared the actual data of the F-4 aircraft family with the F-15 and F-14 projections and recognized the attrition rate decreased with (1) flying-hour experience and (2) improved aircraft safety technology.

Air Force rebuttal of findings before the Congress

During fiscal year 1980 hearings before the Senate Committee on Armed Services and the House Committee on Appropriations, Air Force officials disagreed with the Defense Audit Service and our position on reducing the number of attrition aircraft. They contended that the F-15 attrition rate had

taken a turn upward from a low of 3.6 losses per 100,000 flying hours in fiscal year 1977 to an 8.47 attrition rate for the first 153,478 flying hours. And, this attrition rate established a trend quite different from the F-4E, the predecessor aircraft. Therefore, they said, it is premature to project a new attrition rate for the F-15 either by using the limited F-15 empirical data available or by applying the F-4E attrition rate.

Our comments on attrition aircraft quantities

In light of the audit reports and 1966 and 1976 Rand Corporation reports, there is credible support for the premise that the attrition rate will decline with system experience. Early in the life of the system and with the onset of the heavier organizational flying programs, the attrition rate may increase. But, as experience is gained, the rate falls. The Navy's F-14 system can illustrate this condition.

Attrition of F-14 Aircraft

	Prior to FY 1977	FY 1977	FY 1978	FY 1979	FY 1980 (note a)
Flying hours	72,913	48,798	53,684	61,578	38,303
Aircraft losses	9	9	10	5	2
Attrition rate (note b)	12.3	18.4	18.6	8.1	5.2

a/Through March 1980.

b/Equivalent aircraft losses per 100,000 flying hours.

In our 1977 report, we estimated F-14 requirements and potential savings based on a 12.0 attrition rate, which the Navy was experiencing at that time. With the onset of more intensive flying, the rate increased to above 18.0 for 100,000 flying hours and then it dropped to about 7.0 for the next 100,000 hours. With this trend, the need for F-14 attrition aircraft may fall below our original estimate. We have noted that the F-15 system has reacted similarly. After a peak attrition in 1978, the rate has been declining and still may result in a requirement significantly less than the Air Force's requirement.

MAINTENANCE BACKUP AIRCRAFT

At any given time some of the Air Force and Navy aircraft inventory will be in a nonoperating status while undergoing a depot level support process (i.e., maintenance, modifications). To keep the quantity of operating aircraft at a desired level, the services procure extra aircraft to act as backup aircraft. The services have determined the requirements for backup aircraft based on percentages applied to the quantity of combat and training aircraft. We found that these percentages were based on historical information and did not recognize improvements in technology and support concepts. In our opinion, these percentages overstated F-14, F-15, F-16, F-18, and A-10 requirements by as many as 386 aircraft costing over $5 billion.

Our report on the F-14 and F-15 aircraft

In our October 1977 report, we concluded that the number of F-14 and F-15 aircraft authorized to compensate for aircraft undergoing depot maintenance was based on questionable requirements. The use of arbitrary standards and historical data which reflected inefficient maintenance practices probably was causing the Navy and Air Force to overestimate their procurement requirements.

The Navy estimated its F-14 backup requirement as 15 percent of the operating fleet. This percentage was based on the historical monthly average of Navy aircraft in the depots for maintenance. We found, however, that aircraft awaiting maintenance had been held at depots for unreasonable periods. Therefore, the average time for aircraft in depots was inflated unnecessarily. Additionally, we found that the Navy's time analysis double-counted time for aircraft modifications. These two factors accounted for an excess F-14 requirement of 21 aircraft costing $343 million.

The Air Force applied a 10-percent factor to operating requirements to arrive at its requirement for backup aircraft. The Air Force contended that the 10-percent rate had proven to be a valid average when applied to the entire service inventory and therefore it resulted in the best estimate. We noted, however, that the F-15 has many new design features which improve its maintainability and reliability. As a result, we reported that the percentage, which was based on previous aircraft statistics, could be overstated, although we did not estimate the quantity of aircraft which might be excessive.

We also noted that the Navy and the Air Force, by using maintenance histories of older aircraft to justify the number of new aircraft to be procured for maintenance backup, were fostering aircraft procurement as a substitute for efficient maintenance practices. This is because the more time the aircraft spent in the depots in the past, the more aircraft the services would be able to justify in the future. Also, the services' policy assumed that the amount of maintenance required in the past will also be needed in the future. Improved aircraft design and maintenance techniques, however, indicate this may not be true.

We recommended that the Secretary of Defense devise methods to more accurately identify the backup aircraft requirements and adjust the procurements accordingly.

Defense, as with training and attrition requirements, agreed that realistic and supportable data should be the basis for maintenance backup requirements, and said that if a special Defense review of support aircraft requirements indicated that a change was warranted, the procurement objective would be adjusted accordingly.

Defense Audit Service supports F-14 and F-15 excesses

The Defense Audit Service, after reviewing F-14 and F-15 requirements for maintenance substitute aircraft, concluded that

--The Navy used an outdated 15-percent factor for maintenance aircraft requirements. If the Navy adopted an extended repair cycle as used on previous systems and reduced depot maintenance time to conform with Navy procedures, it could reduce requirements for maintenance support aircraft.

--The Air Force, by using a 10-percent factor, overstated its F-15 maintenance backup requirement by nine aircraft.

Air Force fiscal year 1980 testimony contradicts audit findings

The Air Force testified before the Senate Committee on Armed Services and the House Committee on Appropriations during fiscal year 1980 hearings on the need for F-15 aircraft to provide backup during depot maintenance. It contended that

despite the GAO and Defense audit findings that the 10-percent planning factor is not valid and the F-15 requirement is overstated, the factor has been surprisingly accurate as a planning factor.

The Air Force contended that the Service finding was based on limited data and did not recognize projected modification requirements. Additionally, the Air Force testified that it had increased the factor to 13 percent based on actual data and projected requirements. The Air Force implied that a major component of the factor pertained to the time F-15s would need to be in depots for improvements and modifications to take advantage of technological advances and to meet changing and increasing threats.

Our comments on F-15 backup aircraft requirements

As pointed out in our 1977 report, the 10-percent factor was based on historical averages for the aircraft inventory. The F-15, however, was designed with improved reliability and reduced maintenance requirements compared to its predecessors. Some of the more prominent new features include

--fault isolation systems for faster troubleshooting,

--quick avionics unit replacement,

--quick engine removal and lower level repair due to the modular engine configuration, and

--reduced complexity in airframe and subsystem design.

In addition, and perhaps more importantly, the Air Force's conversion to a new maintenance concept, called reliability centered maintenance (RCM), is expected to reduce aircraft time spent in depots.

In light of these reasons for reducing the quantity of backup aircraft below historical averages, we believe that probing questions are warranted into the justification for the 13-percent rate. For example:

--How has the 13-percent factor been determined?

--To what extent are improvements in maintainability and reliability included?

--To what extent is the RCM concept included?

--What is the basis for the workload (maintenance and modification) projections at the depots and in the field? What are the projections?

--What effect does the backup aircraft requirement have on material readiness?

We have also found questionable justifications to support A-10, F-16, and F-18 aircraft purchases as discussed below.

Questionable purchase of A-10 aircraft for maintenance backup

In our September 1979 report,1/ we focused on the potential procurement of 61 A-10 aircraft, costing $317 million, as substitutes for aircraft undergoing depot maintenance. We found that:

--Even though the A-10 is being procured under a concept designed to eliminate the need for depot overhaul, the Air Force is still using a 10-percent factor to justify the purchase of 61 A-10 aircraft for maintenance backup purposes.

--While Air Force criteria allow substitutes for aircraft undergoing modifications, the full extent of the modification program for the A-10 is not known.

--In developing the 10-percent maintenance backup factor, Defense has not systematically determined how quickly aircraft undergoing modification could be returned to their units under a wartime compressed work schedule at the depot and the influence of a rapid return on the requirements for maintenance backup aircraft. At the time of our review, the A-10 depot estimated that 12 of 13 A-10s in the depot could be returned to service in 20 days or less in an emergency.

As with the F-15 system, we concluded that the 10-percent planning factor is questionable and that by using it the Air Force is planning to purchase more A-10 aircraft than it apparently needs. Since the A-10 is not scheduled to undergo depot maintenance or overhaul, we questioned the justifications for the 61 A-10s.

1/"Unnecessary Procurement of A-10 Aircraft for Depot Maintenance Floats" (LCD-79-431, Sept. 6, 1979).

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We recognized that, under modification programs, the number of aircraft to be processed through the depots and the extent of modifications are uncertain. The A-10 system, however, is expected to incur most of its modifications early in its life. Thus, during most of its life, the need for backup aircraft should be minimal.

We pointed out that an important tradeoff to be considered in planning to ensure the prudent investment of service resources is whether to procure aircraft to cover interim modification in a new system or to spend these funds to increase the mission capability of existing aircraft. The A-10 is an excellent example since its mission is degraded by armament shortages, munitions loaders, and new deployment concepts. 1/ Therefore, perhaps the moneys spent on procurement of substitute aircraft could be used elsewhere to achieve improved readiness.

We recommended that the Air Force develop a data accumulation system which would provide the most realistic data for justifying the purchase of backup aircraft. We also recommended that no procurements of aircraft for maintenance backup be authorized unless they can be justified adequately.

The Defense response made two basic points regarding the need for depot maintenance backup aircraft:

--The 10-percent backup aircraft requirement is based on the need to sustain daily peacetime operations.

--It is doubtful that a precise planning factor can be determined because of the uncertainty of data covering the service life of the aircraft. In light of the unpleasant consequences of not having enough aircraft, the Air Force must allow for uncertainties. In contrast, the consequences of overestimating the requirement are benign since the excess aircraft can be used. Until the Air Force can arrive at a more supportable factor, it will continue to use the 10-percent factor.

The rationale behind Defense's stated need for aircraft to sustain daily peacetime operations is unclear. Since only a small portion of the total aircraft would be in the depot at any time, the peacetime training sorties should be accommodated with the remaining operational aircraft. Therefore, we question whether peacetime operations will justify procuring the backup aircraft.

1/See our report, "A-10 Aircraft Logistics Support Can Be Better Matched with Operational Requirements," (C-LCD-80-2, Oct. 30, 1979).

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In the A-10 report, we pointed out that Defense has not systematically developed the data which is essential for establishing an appropriate planning factor. We also explained which elements should be included in the factor. We do not understand why Defense continues to use a potentially invalid factor when the possible excess cost exceeds $317 million for the A-10 system and $5 billion when other new systems are involved. Furthermore, we do not agree that such expenditures are "benign consequences" of overestimating the maintenance backup requirement, as Defense contended in its response.

Questionable procurement of F-16 aircraft for backup aircraft inventory

The F-16, like the A-10, is designed to eliminate the need for programed depot maintenance. However, the Air Force is again applying its traditional 10-percent planning factor to determine the backup F-16 requirements. The Air Force estimates a requirement of 110 F-16s as backup for aircraft that are undergoing modifications. Current plans, however, indicate that the number of F-16 modifications required is unknown. Furthermore, the justification lacks a wartime basis. Thus, the justification for the 110 F-16s, costing about $1.1 billion, is questionable.

F-18 backup requirement based on outmoded maintenance concept

The Navy plans to procure 185 maintenance backup F-18 aircraft at a cost in excess of $3.6 billion. We question, however, the need for these aircraft.

The Navy is planning for its depots to overhaul every F-18 at 48-month intervals and to take 6.4 months to accomplish each overhaul. This is based on the Navy's operating experience with the F-18's predecessors and does not consider

--lengthened intervals and shortened overhaul times possible due to improved maintenance characteristics and techniques and

--the time required to make an aircraft carrier (which is undergoing shipyard overhaul) ready during mobilization.

The time required for the carrier is estimated to be longer than the time to get the aircraft out of the Naval Air Rework Facility.

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The F-18 was developed with reliability and maintainability features which should reduce its depot maintenance needs and eliminate the need to schedule depot overhaul at specific intervals. Two major characteristics are the corrosion prevention design features and the fault isolation and detection system. They eliminate the major need for depot overhaul and provide for quickly detecting and repairing problems in the field.

These characteristics enable the Navy to apply the RCM concept to the F-18's maintenance. Under this concept, the aircraft forgoes depot overhaul while components are removed and shipped to the depot for repair.

Additionally, the RCM concept could shorten the time an aircraft is out of service once it is sent to the depot for overhaul. As we reported in 1976,1/ application of the RCM concept to the P-3 aircraft reduced the time to complete needed depot work by about 47 percent. Assuming the use of RCM techniques could do the same for the F-18, the planned 6.4-month overhaul time could be reduced to 3.4 months, still operating on a one-shift, 5-days-a-week-schedule.

Furthermore, assuming that in an emergency these aircraft could be made ready and removed from the depot in about 20 days, as with the A-10 (see p. 12), or even as long as 90 days, the backup aircraft may not be needed at all. Considering that it could take the Navy at least 3 months, even under wartime conditions, to make the two or three aircraft carriers normally in the shipyards ready for service, F-18s could be made ready before an aircraft carrier is available to receive them.

Therefore, in light of the F-18's improved reliability and maintainability features, the potential for applying the RCM concept and the time available before carriers are able to accept the aircraft, there is serious question as to the need for F-18 maintenance backup aircraft.

1/"Management Action Needed in the Department of Defense to Realize Benefits from a New System of Aircraft Maintenance" (LCD-76-443, Nov. 10, 1976).

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