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BY THE COMPTROLLER GENERAL

# Report To The Congress

OF THE UNITED STATES

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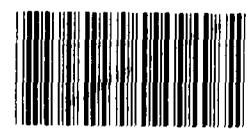
## Is The AV-8B Advanced Harrier Aircraft Ready For Full-Scale Development?

In 1979 the AV-8B Advanced Harrier aircraft will reach the decision milestone for going into full-scale development.

The Secretary of Defense has tentatively selected another aircraft, the F/A-18 Hornet, to satisfy the mission need. The Secretary proposes to conduct a flyoff between the AV-8B and the F/A-18, but there is no evident justification for the flyoff. An additional \$1.2 billion will have been invested in the AV-8B before the results of the flyoff become available.

GAO believes that full-scale development of the AV-8B should not begin unless and until the Secretary is committed to deploy it operationally.

As this report was being prepared for issuance, GAO was advised by Department of Defense officials that the President and the Secretary of Defense had decided not to request any fiscal year 1980 funds for the AV-8B program and that the Under Secretary of Defense for Research and Engineering has refused to permit the Navy to obligate \$108 million of the \$123 million in full-scale development funds that was appropriated for fiscal year 1979. Unless this action is reversed by the Congress, GAO was told, the AV-8B program has effectively been terminated.



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

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

This report presents our views on the major issues concerning the AV-8B Advanced Harrier aircraft program. A draft of this report was reviewed by agency officials associated with the program, and their comments are incorporated as appropriate.

For the past several years we have annually reported to the Congress on the status of selected major weapon systems. This report is one of a series of reports that we are furnishing this year to the Congress for its use in reviewing fiscal year 1980 requests for funds.

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

A handwritten signature in black ink, appearing to read "Thomas B. Heath".

Comptroller General  
of the United States



D I G E S T

In 1979 the Secretary of Defense is planning to authorize full-scale development of the AV-8B. However, he will do so not because the AV-8B will have been selected as the new Marine Corps light attack aircraft, but because a model of the AV-8B will be needed to conduct a test the Secretary has directed. If this happens, more than \$1 billion will be expended on the plane before a deployment decision is made. In GAO's opinion, it would be less costly to use available assets for such a test and to defer the start of full-scale development until after it has been decided to select the AV-8B for the Marine Corps.

PROGRAM STATUS

The AV-8B program started as a prototype development effort in 1976 to create a new model which would perform better than the currently deployed AV-8A. The Navy incorporated certain airframe modifications in two existing AV-8A Harrier aircraft which began flight testing on November 9, 1978, 6 weeks ahead of schedule. These flight tests are designed to demonstrate that it will be possible to double the range/payload capability of the AV-8A Harrier without developing a new engine for the plane. (See p. 1.)

Wind tunnel and other laboratory testing has given the Navy a great deal of confidence that the prototype flights will confirm the predicted improvement in performance. Assuming the prototype flight testing proceeds as the Navy anticipates, there should be little uncertainty about the degree of range/payload capability the AV-8B would be able to achieve if it is deployed. (See p. 2.)

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There is, however, no present commitment to deploy the AV-8B. The Marine Corps operates eight squadrons of light attack aircraft to provide close air support to its ground combat units. In the 1980s the Marine Corps must acquire 336 new aircraft to replace those which the eight squadrons now have. The replacement aircraft must have more capability--particularly in the area of range/payload--than the AV-8A Harriers with which three of the squadrons are now equipped.

Beyond this the Marine Corps insists that the replacement aircraft be capable of operating from small ships and short, austere bases which can be hastily established ashore. This additional qualification would rule out any conventional takeoff and landing aircraft, and, in effect, mean that only the AV-8B would qualify. (See p. 5.)

In 1977 the Secretary of Defense decided that the F/A-18 Hornet, a conventional takeoff and landing aircraft being produced to replace certain other Navy and Marine Corps aircraft, would be acquired as the Marine Corps' new light attack aircraft unless the AV-8B could be shown as a more cost-effective alternative. (See p. 7.)

A Marine Corps analysis indicated that the AV-8B would be more cost effective in a close air support role. The Secretary of Defense did not believe that this analysis conclusively demonstrated that the AV-8B was the more cost-effective alternative, and he has directed that a flyoff, or side-by-side comparative operational test and evaluation, be performed using a developmental model of each aircraft. (See p. 7.)

The AV-8B prototypes are not equipped with the subsystems that would be required in a realistic test of this nature, and the Secretary has proposed to authorize full-scale development of the AV-8B so that an engineering model can be obtained to participate in the flyoff. If this is authorized, about \$1.2

billion may be spent on development and production of the AV-8B before the results of the flyoff become available. (See p. 8.)

### CONCLUSIONS

The results of the cost and effectiveness analyses to date do not indicate that either the AV-8B or the F/A-18 would be substantially superior to the other. If these results are considered insufficient to make a judgment, additional testing or operational exercises may be necessary to improve the data base. However, none of the officials GAO interviewed identified any data base inadequacies which the Secretary's flyoff proposal would resolve.

In GAO's opinion, full-scale development of the AV-8B should not be authorized unless and until a definite need has been established for this aircraft and there is an intention to deploy it operationally. The Secretary should either terminate the program or identify critical elements of uncertainty. These elements could then be resolved promptly through further analysis supported by additional testing or operational exercises using existing aircraft.

### RECOMMENDATIONS

The Secretary of Defense should not authorize full-scale development of the AV-8B unless and until he is prepared to select it as the new Marine Corps light attack aircraft.

If selection of the AV-8B for this role depends on resolution of critical elements of uncertainty, any additional test and evaluation should be done with existing assets. In addition, resolution should be accomplished as quickly as possible to minimize potential delay in delivery of production aircraft.

If the Secretary of Defense eventually selects the AV-8B and decides to authorize

full-scale development, production of the aircraft before development phase testing is complete should be authorized only after the risk of concurrent development and production has been thoroughly analyzed.

#### AGENCY COMMENTS

A draft of this report was reviewed by Department of Defense and Office of Federal Procurement Policy officials. Their comments have been incorporated as appropriate.

According to Department of Defense officials, there are no critical elements of uncertainty about the relative cost effectiveness of the AV-8B that could not be resolved through further analysis. If additional data was needed to support further analysis, they said, the necessary testing probably could be accomplished with existing aircraft. (See p. 9.)

#### RECENT BUDGET ACTION

As this report was being prepared for issuance, GAO was advised by Department of Defense officials that the President and the Secretary of Defense had decided not to request any fiscal year 1980 funds for the AV-8B program and that the Under Secretary of Defense for Research and Engineering has refused to permit the Navy to obligate \$108 million of the \$123 million in full-scale development funds that was appropriated for fiscal year 1979. Unless this action is reversed by the Congress, GAO was told, the AV-8B program has effectively been terminated.

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	<u>ABBREVIATIONS</u>	
CTOL	conventional takeoff and landing	
DSARC	Defense Systems Acquisition Review Council	
GAO	General Accounting Office	
IOC	initial operational capability	
VSTOL	vertical/short takeoff and landing	







## CHAPTER 1

### INTRODUCTION

The Harrier is a fixed-wing aircraft which can take off and land vertically or with a short ground roll. The aircraft was originally developed and produced in the United Kingdom, where it began operational service with the Royal Air Force in 1969.

In the early 1970s, the U.S. Navy purchased 102 AV-8A model Harriers principally for use as Marine Corps close air-support aircraft. The last AV-8As were delivered in 1977, and since that time the Marine Corps Light Attack Force has been operating three 20-plane squadrons. This Force also operates five squadrons of conventional takeoff and landing (CTOL) A-4M Skyhawk aircraft. The Marine Corps plans to begin modernizing all eight of these squadrons in the 1980s and would like to do so by equipping the squadrons with AV-8B Advanced Harriers.

The Marine Corps wants a vertical/short takeoff and landing (VSTOL) aircraft like the Advanced Harrier because it can operate close to amphibious combat units from ships which are not equipped with large flight decks, catapults, and arresting gear as well as from short, austere bases which can be hastily established ashore. However, according to the Commandant of the Marine Corps, the Corps needs an aircraft with more range/payload capability than the AV-8A.

### PROTOTYPE DEVELOPMENT

In March 1976, the Navy reported to the Defense Systems Acquisition Review Council (DSARC) that it would be possible to achieve substantial improvement in the Harrier's range/payload capability without developing a new engine. For the most part this improvement was to be achieved by (1) fitting the plane with a larger redesigned wing and flap assembly, (2) installing lift improvement devices on the bottom of the fuselage, and (3) modifying the inlet configuration. The Navy identified other design changes, principally in the area of avionics subsystems, which could be made to further enhance operational effectiveness.

Following this DSARC review, the Deputy Secretary of Defense authorized the Navy to incorporate the design features promising improved range/payload capability in two existing AV-8As. After these prototype aircraft were flight tested, the plan called for a second review by DSARC

and a determination as to whether the program should proceed to the second, or full-scale development, phase.

As prototype fabrication and flight testing proceeded, the Navy was to study additional design changes for consideration at the second DSARC review.

In conformity with the schedule proposed at the DSARC meeting in 1976, the prototype effort is now nearing completion. The first prototype aircraft began a 7-month period of flight testing in November 1978, 6 weeks ahead of schedule.

#### PLANNING FOR FULL SCALE DEVELOPMENT AND PRODUCTION

Wind tunnel and other laboratory testing has given the Navy a high degree of confidence that flight testing will confirm achievement of all prototype performance objectives. As a consequence, in January 1979, the Navy's program management office expected to obligate about \$40 million in long-lead funding for the full-scale development effort. A few months later a DSARC II is planned to consider full-scale development and pilot production of the AV-8B Advanced Harrier.

In the course of full-scale development, four engineering models of the AV-8B will be fabricated and tested. The first of these is scheduled to begin flight testing in 1981. A third DSARC review, IIIA, is scheduled to be held in 1982. Assuming that testing performed up to that time reflects satisfactory progress in achieving performance objectives, additional commitment to production (24 aircraft) will be considered.

If this schedule of events is followed, the Marine Corps should receive delivery of the 30th production aircraft--a program event referred to as initial operational capability (IOC)--in 1985.

When all of the second phase development and operational testing is complete, a fourth DSARC review, IIIB, will be held in 1983 to consider authorizing production of the remaining aircraft needed to modernize the Light Attack Force.

#### COST AND FUNDING ASPECTS

About \$144 million will have been obligated to the prototype effort by the time it is complete in 1979. The

Navy currently estimates that an additional \$698 million will be required for full-scale development and another \$4,934 million for production of 336 aircraft if IOC is to be achieved in 1985. A funding profile is shown in appendix I.

There has been considerable growth in the estimated cost to develop and produce the AV-8B. The dimensions of this growth are reflected in appendix II. The Navy's program management office was unable to provide a comprehensive explanation for this cost growth because of differences in estimating techniques, but cited the following major causes:

- Configuration differences between the prototype and full-scale development models not reflected in the original estimates.
- Changes directed by the Deputy Secretary of Defense in approving initiation of the prototype effort.
- Increases in the rates used to project the effect of inflation.

According to Department of Defense acquisition policy, during the early phase of an acquisition, systems are not adequately defined and cost, schedule, and performance parameters are uncertain. It is not until a program arrives at the point of transition to full-scale development that estimates for these parameters should be considered firm.

Chapter 2 of this report deals with the question of whether the AV-8B program is ready to make the transition to full-scale development.

#### PARTICIPATION OF FOREIGN COUNTRIES

The Navy will obtain the engines for AV-8B full-scale development models from the British producer, Rolls-Royce Limited, under the terms of a Memorandum of Understanding with the British Ministry of Defense. The memorandum was still being negotiated in January 1979. The prime contractor, McDonnell-Douglas Corporation, is planning to subcontract with British Aerospace for about \$51 million in supplies and services required for full-scale development.

At this early stage of development, it is difficult to precisely predict the foreign military sales of the AV-8B. However, there have been indications that several countries will be interested in purchasing AV-8Bs. The contractor and the Navy's program officials believe that about 750 aircraft

will eventually be sold to foreign governments, but the number could range from 500 to 1,000. As yet, there have been no aircraft sales negotiations with foreign governments.

#### SCOPE OF REVIEW

In the course of our review of the AV-8B program, we interviewed Government and contractor officials involved in the administration and management of the program. We also examined reports, correspondence, and other documentation having a bearing on the status of the program and its readiness to make the transition to full-scale development.

## CHAPTER 2

### FULL-SCALE DEVELOPMENT

#### OF THE AV-8B IS UNJUSTIFIED

In 1979 the Secretary of Defense is planning to authorize full-scale development of the AV-8B. However, he will do so not because the AV-8B will have been selected as the new Marine Corps light attack aircraft, but because a model of the AV-8B will be needed to conduct a test the Secretary has directed. If this happens, more than \$1 billion will be expended on the plane before a deployment decision is made. In our opinion, it would be less costly to use available assets for such a test and to defer the start of full-scale development until after it has been decided to select the AV-8B for the Marine Corps.

#### COMPETING ALTERNATIVES

OMB Circular A-109 establishes policies to be followed by executive branch agencies in the acquisition of major weapon systems, and Department of Defense Directive 5000.1 is the implementing regulation applicable to system acquisition activities of Defense. These documents require competitive exploration of alternative design concepts early in the acquisition process and continuation of competition as far along in the acquisition process as is economically beneficial. A-109 also requires that a system move into full-scale development only after the program risks have been reduced to a level that can be accommodated and after the mission need has been reaffirmed. The AV-8B program has progressed through prototype tests on a single concept, sole source basis. These actions were not consistent with A-109. However, the AV-8B program has progressed too far to apply the principles of A-109 which are applicable to early contractual competition for concepts and demonstrations.

In October 1975, the Commandant of the Marine Corps transmitted the requirement document which underlies the AV-8B program to the Chief of Naval Operations. This document was never officially approved by the Chief, but it serves as the only statement of operational need for the capability that is being developed in the AV-8B program.

The Commandant's needs statement explicitly states that a VSTOL aircraft is required, and this rules out the alternative of acquiring CTOL aircraft to modernize the Light Attack Force. However, at the time of DSARC I, the Director, Defense Research and Engineering, stated that the Marine Corps

requirement for an all VSTOL Light Attack Force should remain an open issue and that alternatives to the AV-8B should not be rejected before DSARC II. In the Director's view, the AV-8B prototype effort was the vehicle for maturing and demonstrating one of several competing alternatives.

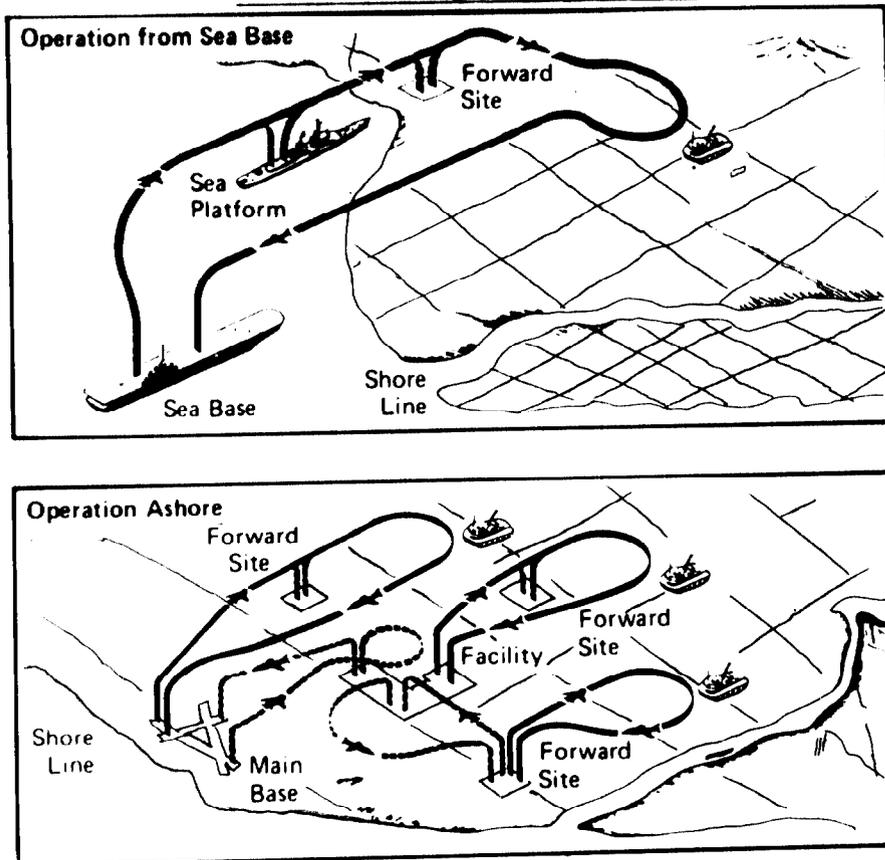
The Director also mentioned the alternative of acquiring more A-4M aircraft. This CTOL aircraft comprised 60 percent of the Light Attack Force at the time of DSARC I. However, Defense officials said that it went out of production in 1978 when it became apparent that the Congress would not provide funds for additional procurement.

Another alternative is the F/A-18 Hornet. The F/A-18 is a CTOL aircraft which the Navy began procuring in 1978 to replace certain Navy fighter and attack aircraft as well as squadrons of Marine Corps fighter aircraft.

Several life-cycle cost comparisons of the F/A-18 and AV-8B alternatives have been made. While these comparisons do not all agree as to which alternative is less costly, the Secretary of the Navy believes that the margin of difference can generally be considered as being within the tolerance for estimating error. Consequently, the Secretary of the Navy believes that the life-cycle costs of the two alternatives are essentially equal.

Neither the F/A-18 nor the A-4M can operate from the kinds of small ships and austere shore bases from which it would be feasible to operate the AV-8B. Therefore, the Marine Corps would have to sacrifice basing flexibility (see following diagram) if a CTOL aircraft like the F/A-18 is chosen as the system to modernize the Light Attack Force. If CTOL bases are not available in an area of amphibious operations, however, the flexibility of the AV-8B could be very valuable.

## AV-8B Basing Flexibility



### TENTATIVE SELECTION OF F/A-18 AS NEW MARINE CORPS LIGHT ATTACK AIRCRAFT

In late 1977, about 1-1/2 years before DSARC II was scheduled, the Secretary of Defense decided the F/A-18 would be procured to modernize the Light Attack Force unless the AV-8B could be demonstrated superior in cost and effectiveness. Accordingly, the Secretary directed the Marine Corps to immediately analyze the relative cost effectiveness of the two aircraft.

### Cost-effectiveness analysis inconclusive

The Marine Corps completed its analysis in October 1977 and concluded:

--The life-cycle costs of the two alternatives for modernizing the Light Attack Force were equal.

- Overall relative effectiveness of the two systems is heavily dependent on scenarios and employment assumptions.
- In the target scenario analyzed, the AV-8B was substantially more effective than the F/A-18 and, due to its basing flexibility, is likely to be more effective on a scenario-independent basis.

Consequently, the Marine Corps recommended that its Light Attack Force be modernized with the AV-8B.

The Assistant Secretary of Defense (Program Analysis and Evaluation) reviewed the Marine Corps' analysis. In reporting on his review, the Assistant Secretary questioned several features of the Marine Corps' analysis, including

- the way in which the comparative cost estimates were developed,
- the reasonableness of certain key assumptions,
- the various aspects of the analytical methodology,
- the failure to consider certain superior performance capabilities of the F/A-18, and
- the failure to consider the additional logistics burden of supporting dispersed AV-8B bases.

The Marine Corps responded to the Assistant Secretary's criticism in a point-by-point rebuttal.

In any event, the Secretary of Defense apparently felt that the cost-effectiveness issue had not been resolved to his satisfaction. In July 1978, he called for a flyoff, or side-by-side comparative operational test and evaluation, of the two aircraft.

The AV-8B prototypes are not equipped with the subsystems needed in a realistic test of this nature. Consequently, the fourth full-scale development model of the AV-8B has been designated as the aircraft to participate in the flyoff. That particular model of the AV-8B is not scheduled for delivery until late 1981. Therefore, the flyoff probably cannot be completed until sometime in 1982, and then only if the AV-8B is released to full-scale development in 1979.

## Objectives of flyoff uncertain

We discussed the flyoff requirement with Navy and Marine Corps officials who were responsible for management and other aspects of the AV-8B program, as well as with Office of the Secretary of Defense personnel familiar with the AV-8B program and the flyoff requirement. None of these officials identified any data the flyoff might provide which would be needed to resolve cost-effectiveness questions. Nor were these officials able to describe in any detail how the flyoff would be performed. On the other hand, many of these officials questioned the merits of the flyoff proposal. For example, they mentioned:

- The problems involved in making the test conditions realistic, particularly if only one model of each aircraft is used and especially in light of the different takeoff and landing modes involved.
- The sufficiency of performance data that is already available on the two aircraft as well as the data that can be obtained from further independent testing.
- The questionable nature of the results obtained in a previous flyoff with another set of competing aircraft models.
- The cost of a flyoff, in terms of both the expense of the test and the effect it may have on delaying program milestones.

In discussing their comments on a draft of this report, Department of Defense officials said there were no critical elements of uncertainty about the relative cost effectiveness of the AV-8B that could not be resolved through further analysis. If additional data was needed to support such analysis, they said, it could probably be obtained through test and evaluation of existing aircraft.

## Cost to proceed with AV-8B development--about \$1 billion

Approximately \$144 million will be spent in the prototype development phase of the AV-8B program. More than 70 percent of that amount--about \$104 million--will have been obligated since September 1977, when the Secretary of Defense tentatively selected the F/A-18 to satisfy the Marine Corps' need for a new light attack aircraft.

It is difficult to determine the cost of conducting the flyoff itself. Personnel in the Office of the Secretary of Defense expected the flyoff test to cost only \$10 million; but AV-8B program management officials prepared an estimate indicating that when the potential effect on the program is considered, the ultimate cost to conduct the flyoff could be more than \$600 million.

As noted in the preceding chapter, the estimated cost to conduct full-scale development of the AV-8B is \$698 million. By March 1982, when the results of the flyoff may be available, more than 90 percent of that sum, or \$654 million, may have already been obligated. In addition, about \$436 million may have been obligated for production aircraft by that time. Therefore, it seems likely that as much as \$1,234 million will have been invested in the AV-8B program before the results of the flyoff become available.

#### Potential concurrency of development and procurement efforts

Fiscal year 1979 is the first time funds are required for the full-scale development phase of the AV-8B program. Coincident with his tentative selection of the F/A-18 as the new Marine Corps light attack aircraft, the Secretary of Defense decided to request only \$35.6 million in fiscal year 1979 funds for full-scale development of the AV-8B. This was only about 29 percent of the \$123 million the Navy believed would be needed to achieve IOC in 1984, and the reduction meant a 1-year slip in IOC.

In its action on the Defense Authorization Bill for fiscal year 1979, the Congress sought to restore the AV-8B development schedule to achieve IOC in 1984 by providing \$123 million in full-scale development funding. The Navy's AV-8B program manager is convinced that with the additional funding provided by the Congress, it is still possible to achieve IOC in 1984. However, to do so would entail a considerable degree of concurrency in the course of full-scale development. Regardless of which IOC objective is selected, full-scale development phase test and evaluation will not be completed until September 1983. If IOC is to be achieved in 1984, however, 90, rather than 36, production aircraft will be on order when this testing is complete. (See app. III.)

Concurrency poses an element of increased risk. In the past we reviewed several programs where the Department of Defense engaged in concurrency, and we found that it usually resulted in either the system's performance being degraded

and/or the incurring of additional costs to bring the system to the required level of performance.

In the near term, commitment to the earlier IOC objective would translate into the need for \$257 million, rather than \$202 million, in fiscal year 1980 funding. (See app. I.) The Navy has decided not to include the additional \$55 million in its fiscal year 1980 budget request. As a consequence, the present IOC objective is 1985. Should the start of full-scale development be delayed, even achievement of the 1985 objective would be jeopardized. Because there is an impending shortfall in the inventory of Marine Corps light attack aircraft, there is likely to be renewed interest in resorting to an approach which entails increased concurrency.

### CONCLUSIONS

The Secretary of Defense has established relative cost effectiveness as the criteria for selecting the new Marine Corps light attack aircraft. The results of the cost and effectiveness analyses which have been accomplished to date do not indicate that either aircraft would be substantially superior to the other in this regard. If these results are considered insufficient to make a judgment, it may be necessary to conduct additional testing or to perform operational exercises to improve the data base. However, none of the officials we interviewed identified any data base inadequacies which the Secretary's flyoff proposal would resolve. Consequently, the need for an aircraft to participate in the flyoff does not, of itself, justify full-scale development of the AV-8B.

In our opinion, full-scale development of the AV-8B should not be authorized unless and until a definite need has been established for this aircraft and there is an intention to deploy it operationally. If the Secretary does not believe available information justifies such a commitment, he should either terminate the program or identify critical elements of uncertainty. These elements could then be resolved promptly through further analysis supported by additional testing or operational exercises using existing CTOL and VSTOL aircraft. Thus, even if it would be necessary to retrofit the AV-8B prototype aircraft with some subsystems to make the test realistic, we believe this would be much less costly than going into full-scale development to get a test aircraft.

## RECOMMENDATIONS

We recommend that the Secretary of Defense not authorize full-scale development of the AV-8B unless and until he is prepared to select it as the new Marine Corps light attack aircraft.

If selection of the AV-8B for this role depends on resolution of critical elements of uncertainty, we recommend that any additional test and evaluation be done with existing assets. In addition, resolution should be accomplished as quickly as possible to minimize potential delay in delivery of production aircraft.

If the Secretary of Defense eventually selects the AV-8B and decides to authorize full-scale development, we recommend that commitment to any accelerated schedule entailing concurrency be authorized only after the risk of concurrency is thoroughly analyzed.

## RECENT BUDGET ACTION

As this report was being prepared for issuance, we were advised by Department of Defense officials that the President and the Secretary of Defense had decided not to request any fiscal year 1980 funds for the AV-8B program and that the Under Secretary of Defense for Research and Engineering has refused to permit the Navy to obligate \$108 million of the \$123 million in full-scale development funds that was appropriated for fiscal year 1979. Unless this action is reversed by the Congress, we were told, the AV-8B program has effectively been terminated.

FUNDING PROFILES FOR AV-8B PROGRAM:FULL-SCALE DEVELOPMENT AND PRODUCTION

On September 1, 1978, the Navy AV-8B program management office provided us with the following funding profiles to indicate the funding that would be required for full-scale development and production of the AV-8B, depending on whether the IOC objective is 1984 or 1985.

## AV-8B FUNDING PROFILES: FULL-SCALE DEVELOPMENT AND PRODUCTION

IOC FISCAL YEAR		(\$ MILLIONS)												
		1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989		
1984	FULL SCALE DEVELOPMENT	123.0				20.0								678.0
	PRODUCTION (QUANTITY OF PRODUCTION AIRCRAFT)		32.0	386.9 (12)	431.4 (24)	693.6 (54)	697.7 (54)	654.8 (54)	691.7 (54)	688.9 (54)	343.7 (30)	--	4620.7 (336)	
	TOTAL	123.0	257.0	586.9	541.4	713.6	697.7	654.8	691.7	688.9	343.7		5298.7	
1985	FULL-SCALE DEVELOPMENT	123.0	202.0	212.0	117.0	34.0	10.0						698.0	
	PRODUCTION (QUANTITY OF PRODUCTION AIRCRAFT)			33.7	440.4 (12)	461.4 (24)	753.3 (54)	738.0 (54)	690.1 (54)	729.1 (54)	726.1 (54)	362.3 (30)	4934.4 (336)	
	TOTAL	123.0	202.0	245.7	557.4	495.4	763.3	738.0	690.1	729.1	726.1	362.3	5632.4	

AV-8B PROGRAM COST GROWTH FROM 1976 to 1978

This table reflects the growth which has occurred in estimated acquisition cost since the program was reviewed at DSARC I.

	<u>Estimate</u>		<u>Cost Growth</u>	<u>Percent increase</u>
	<u>Jan. 1976</u>	<u>Sept.1978</u>		
	------(000,000 omitted)-----			
Prototype development	\$ 119	\$ 144	\$ 25	21.0
Full-Scale development	<u>337</u>	<u>698</u>	<u>361</u>	107.1
Total development	<u>a/456</u>	842	386	84.6
Production (336 aircraft)	<u>b/3,753</u>	<u>4,934</u>	<u>1,179</u>	31.4
Total program	<u>\$4,209</u>	<u>\$5,776</u>	<u>\$1,565</u>	37.2
Program unit cost	\$12.37	\$16.89	\$4.52	36.5

a/The January 1976 estimate was based on fabrication of two, rather than four, engineering models during the course of full-scale development.

b/An earlier, less carefully developed, constant 1975 dollar estimate of \$1,967 million was presented at the DSARC I review. In constant 1975 dollars, the \$3,753 million figure is about \$2,060 million.

This table reflects the growth which has occurred in each of the various components of the full-scale development cost estimate.

	<u>Estimate</u>		<u>Cost growth</u>	<u>Percent increase</u>
	<u>Jan. 1976</u>	<u>Sept. 1978</u>		
	----- (millions) -----			
Airframe	\$253.4	\$498.9	\$245.5	96.9
Engines	4.4	6.8	2.4	54.5
Electronics	4.1	7.8	3.7	90.2
Armament	.1	12.9	12.8	128.0
Ground support equipment	22.9	26.4	3.5	15.6
Navy field activities	28.4	59.0	30.6	107.7
Other support	14.1	71.0	56.9	403.5
Spares	<u>9.8</u>	<u>15.6</u>	<u>5.8</u>	59.1
Total full-scale development	<u>\$337.2</u>	<u>\$698.4</u>	<u>\$361.2</u>	107.1

This table reflects the growth which has occurred in each of the various components of the production cost estimate.

	<u>Estimate</u>		<u>Cost growth</u>	<u>Percent increase</u>
	<u>Jan. 1976</u>	<u>Sept. 1978</u>		
	----- (000,000 omitted) -----			
Airframe/ contractor	\$1,736	\$2,717	\$ 981	56.5
Allowance for changes	81	124	43	53.1
Engine and accessories	657	768	111	16.9
Armament	42	94	52	123.8
Electronics and other govern- ment-furnished equipment	291	414	123	42.3
Nonrecurring cost	<u>17</u>	<u>31</u>	<u>14</u>	82.4
Total (flyaway cost)	2,824	4,148	1,324	46.9
Support	513	515	2	0.0
Spares	<u>416</u>	<u>271</u>	<u>-145</u>	-35.1
Total production	<u>\$3,753</u>	<u>\$4,934</u>	<u>\$1,181</u>	31.5
Production unit cost	\$11.17	\$14.68	\$3.51	31.4

TRAINER AIRCRAFT

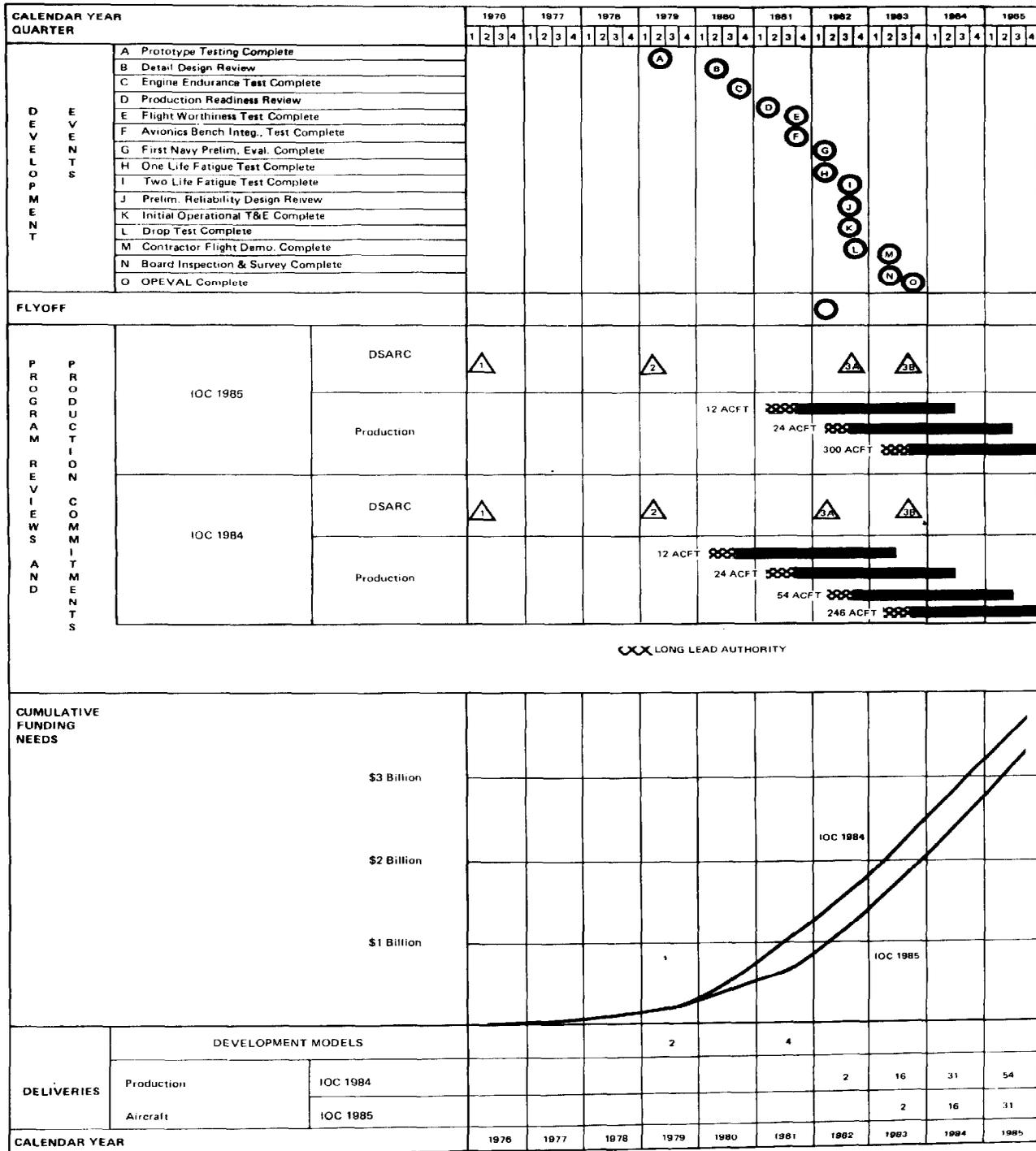
In 1975 the Commandant of the Marine Corps stated a need for an additional 25 two-seat trainer aircraft, but the additional cost--more than \$400 million--to develop and produce TAV-8B trainers is not reflected in the cost estimates shown above. A 1977 analysis of AV-8A accidents led to a change in the Marine Corps' approach to training new Harrier pilots in a way that emphasizes the need for increased training in two-seat aircraft. This change would seem to support the stated need for two-seat VSTOL trainers. However, according to program management officials, it is not clear that such a trainer would have to conform to the AV-8B configuration. Therefore, it may be that two-seat VSTOL training could be performed in TAV-8A trainers. Eight TAV-8As were acquired as part of the original purchase of AV-8As from the United Kingdom, and it may be possible to purchase additional ones for considerably less than it would cost to develop and produce the TAV-8B.

ARMAMENT SUBSYSTEMS

The development and procurement cost estimates shown in this appendix are supposedly based on an assumption that the AV-8B will be equipped with a 25-millimeter gun capable of a relatively high rate of fire and an electro-optical angle-rate bombing subsystem. The anticipated cost of these subsystems, however, is now expected to be substantially greater than the allowances that were made in developing the above estimates.

Consequently, the program management office is expected to recommend that DSARC II consider equipping the AV-8B with the 30-millimeter gun system currently installed on the AV-8A. The office is also considering the possibility of equipping the AV-8B with a less costly weapons delivery subsystem.

COMPARISON OF IOC 1984/1985 SCHEDULES





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