Defense Systems Management College
Fort Belvoir, Virginia

Evaluation of the Effectiveness of the Defense Systems Acquisition Review Council (DSARC)

Volume II, Part 1:
Appendices C through I

April 1983

Prepared for the
Defense Systems Management College
by
Information Spectrum, Inc.

Defense Systems Management College
Fort Belvoir, Virginia

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VOLUME II, Part 1: Evaluation of the Effectiveness of the Defense System Acquisition Review Council (DSARC) - Appendices

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APPENDIX C

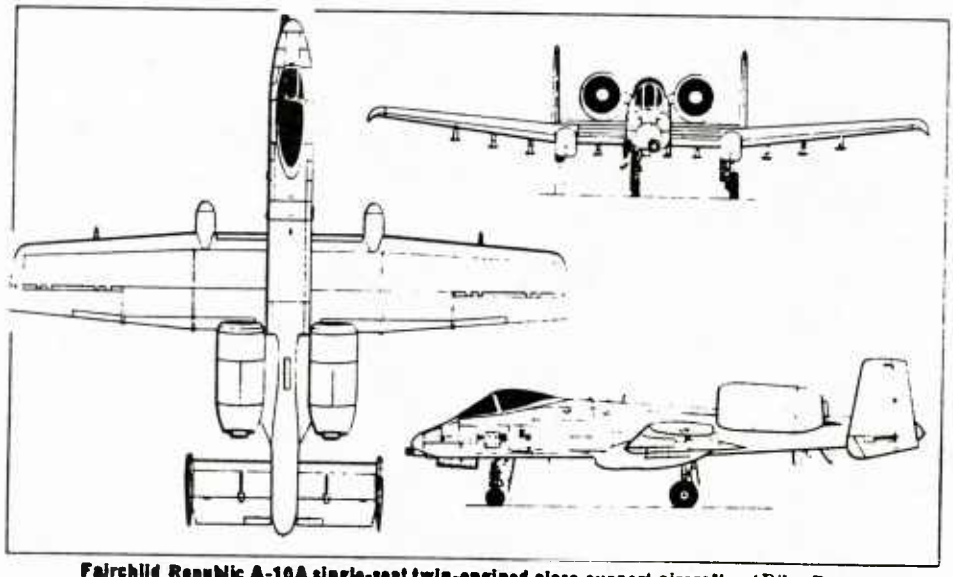
A-10
PROGRAM STUDY REPORT

I. SYSTEM DESCRIPTION

The A-10A has been designed as a highly manueverable aircraft that can destroy heavily armored vehicles. The A-10 could, with appropriate avionics, fill the same requirement for day and night operations. This aircraft has been specialized for the close air support mission with improved combat survivability provided by a titanium armor-plated cockpit (bathtub), redundant primary structural elements, self-sealing fuel cells, and back-up manual flight controls. The aircraft is equipped with an internally mounted, seven barrel gatling gun (GAU-8). The 30mm gun system has a magazine capacity of 1350 rounds and a dual fire rate of either 2,100 or 4,200 rounds/minute. The ammunition load is a mix of Armor-Piercing Incendiares (API) and High Explosive Incendiares (HEI). The A-10 can carry up to 16,000 pound of mixed ordnance from eleven stores stations.

Specifications

Max. T.O. Weight	-	46,624 lbs.
Wing Span	-	57 ft. 6 in.
Length, overall	-	53 ft. 4 in.
Height, overall	-	14 ft. 8 in.
Performance:		
Cruise speed @ S/L		300 knots
Combat speed (5K ft w/6-Mk 82)		343 knots
T.O. Distance max weight		3780 ft.
Operational radius, Close Air Support		250 nm (2.2 hr loiter, 20 min. reserve)



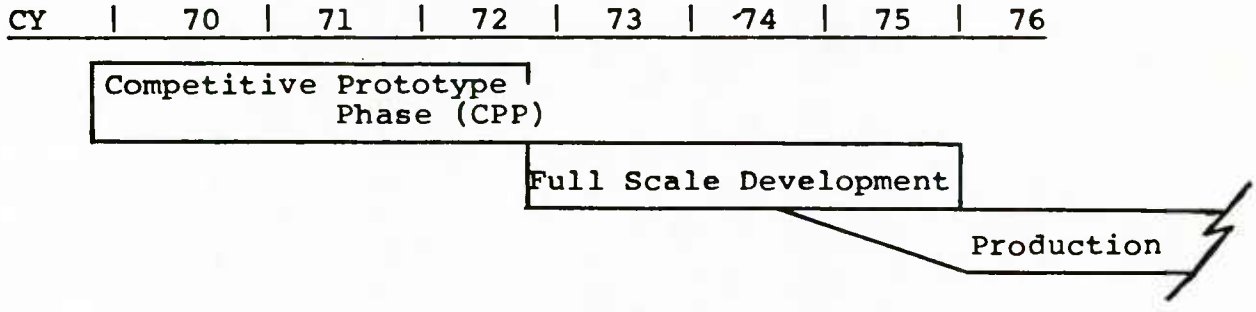
Fairchild Republic A-10A single-seat twin-engined close-support aircraft. (*Pilot Press*)

II. INITIAL PROGRAM SUMMARY

The A-10 aircraft had its genesis in the mid 1960s. On January 7, 1965, Secretary of Defense Robert McNamara requested that the Air Force examine the requirements for an aircraft to be used in close air support and other ground attack missions. Both near-term and long-term development requirements were to be considered. In November 1965, the Air Force recommended the acquisition of the A-7D, a varient of the Navy A-7, as the interim close-air support aircraft. The next month the Air Force was authorized to proceed with the acquisition.

After an additional year of study and discussion, the Air Force issued a Requirements Action Directive (RAD) on December 22, 1966 for a specialized close-air support aircraft and designated it the A-X. The next seventeen months were involved in contractor system studies and the development of the Concept Formulation Package (CFP). On May 29, 1968 the A-X System Program Office (SPO) cadre was formed. Six months later, DCP 23 was submitted to OSD. It is reported that DDR&E reluctantly signed the document on December 14, 1968 and two days later the DepSecDef approved inclusion of $12M in the FY 70 budget.[1] The funds were for Contract Definition, contingent on the Air Force completing supplemental studies to the CFP. By September 1969, the supplemental studies on weight, sizing, avionics, and survivability had been completed and forwarded to OSD. The program was proceeding along the "classic" route for weapon system development.

On October 10, 1969, the Secretary of the Air Force, Robert C. Seamans, Jr., approved the reorientation of the A-X program to a competitive prototype approach. These changes would be the initial attempts at implementing the Packard initiative of May 1969. The revised program would contain a competitive prototype phase, then a Full Scale Development (FSD) effort with limited production starting in latter phase of FSD. The following is a generalized presentation of the program plan:



[1] "The A-X Specialized Close Air Support Aircraft: Origins and Concept Phase, 1961-1970(U)." AFSC Historical Publication, Secret. pg ix.

III. PROGRAM EVOLUTION

A. Program Initiation - Competitive Prototype

The change in OSD management philosophy for weapon system acquisition from that originally contemplated in the A-X program required a major revision to DCP 23. Specific details concerning the preparation for the DSARC I were not available from files available to the study team. The DSARC I Review was held on December 19, 1969 to consider the draft DCP 23A and the Air Force proposal to transition the A-X program from Concept Formulation to Contract Definition (See Figure C1). Dr. Foster, DDR&E, chaired the meeting and requested the following actions:

- Determine cost/effectiveness of force mix with A-X versus multi-mission aircraft.
- Consider integration of Maverick on aircraft.
- Request Army specify missions for A-X support.

The DCP 23A was updated to incorporate the above information and to address the following sub-issues:

- Affordability: Is acquisition of a single purpose aircraft wise in view of budget limitations which would reduce available TACAIR for air superiority and interdiction?
- Is A-X capable of meeting Army needs?
- Should conventional Contract Definition Phase or competitive fly off between prototype be acquisition strategy?

The Deputy Secretary of Defense, David Packard, on April 6, 1970 approved DCP 23A and the competitive prototype approach termed "Parallel Undocumented Development". The Air Force issued the Systems Management Directive (SMD) on April 10, 1970 formally authorizing the A-X program. The A-X SPO was officially established on April 27, 1970 and the Program Director, Colonel James E. Hildebrandt, was appointed three weeks later.

It has not been possible to identify exactly when the concept of Design-to-Cost (DTC) was introduced into the program. This was a newly developing discipline in systems acquisition and at some time during 1970 the A-X program was selected to be the first weapon system development governed by DTC principles.

On December 17, 1970 the A-X Program Director presented a source-selection briefing to the DSARC (See Figure C2). This presentation was preceeded by a series of pre-briefs to Commander

Principals	Dr. J.S. Foster, Jr.	DDR&E
	Mr. B. Shillito	ASD (I&L)
	Mr. C. Rosotti for	ASD (SA)
	Mr. J. Sherick for	ASD (C)
ODDR&E	C.A. Fowler	
	C.F. Horton	
	T.C. Muse	
	N. Augustine	
	Col. S.H. Carpenter (USMC)	
OASD (C)	D. Vanderschaaf	
	W. Stitt	
OASD (I&L)	M/Gen. A.T. Stanwix-Hay (USA)	
	J.M. Malloy	
	Capt. R. McLain (USN)	
	Col. J. Loudermilk (USAF)	
	Lt. Col. J. Reed (USAF)	
OASD (SA)	M.A. Margolis	
	P. Sprey	
	Lt. Col. E. Volgenau	
	H. Manetti	
JCS	B/Gen. R. Berg (USAF)	
	Col. H. Bruce (USMC)	
OASD (ISA)	None	
Air Force	Dr. R. Seamans (Sec AF)	
	Dr. J.L. McLucas	
	P. Whittaker	
	G. Hansen	
	Gen. J.C. Meyer (USAF)	
	M/Gen. O.J. Glasser (USAF)	
	M/Gen. W. Moore (USAF)	
	Sgt. R.E. Dickens (USAF) (Projectionist)	
Army	Mr. T. Beal (U/Sec A)	
	C. Poor	
	M/Gen. R. Williams (USA)	
	H. Woodall	
	Lt. Col. B. Harrison (USA)	
Navy	Capt. H.D. Arnold (USN)	
	Capt. F.X. Timmes (USN)	
	Col. E.H. Finlayson (USMC)	
	Cmdr. W. Bentley (USN)	
Executive Secretary	E.J. Nucci	

Figure C1
A-10 DSARC I
Attendance List
December 19, 1969

ODDR&E	Hon. J.S. Foster, Jr. (Chairman)
	V/Adm. V.P. dePoix
	D. Heebner
	D. Fredricksen
	Col. S. Carpenter
OASD (C)	Hon. R. Moot
OASD (I&L)	Hon. B. Shillito
	V/Adm. E. Reich
	J.M. Malloy
OASD (SA)	P. Odeen
	J. Ahearne
HCS	B/Gen. W. Bevan
Navy	R/Adm. D. Davis OP51
Army	Hon. R. Johnson
	Lt/Gen. R. Williams
Air Force	Hon. R. Seamans SecAF
	Hon. J. McLucas U/SecAF
	Hon. P. Whittaker ASAF (I&L)
	Hon. G. Hansen ASAF (R&D)
	Hon S. Shedler ASAF (FM)
	Mr. J. Stempler Gen. Counsel AF
	Gen. J. Meyer VCSAF
	Gen. G. Brown AFSC
	Lt. Gen. O. Glasser DCS (R&D)
	Col. J.E. Hildebrandt (Briefer)
	Lt. Gen. A. Russell AVCSAF
	Lt. Col. L. Johnson AFRDQ
Briefing Team	Col. J.E. Hildebrandt, PM/AX
	Lt. Col. B. Dula
	C. Adams
	G. Alterr
	Maj. Chipman
Executive Secretary	E.J. Nucci

Figure C2
A-10 DSARC Source Selection Review

December 17, 1970

ASD, Commander AFSC, Commander AFLC, Commander TAC, Air Force Council, and Secretary of the Air Force. The day after the DSARC Review, the Secretary of the Air Force announced the selection of both the Fairchild Hiller Corporation and the Northrop Corporation for the competitive prototype fly-off. Two prototype aircraft were to be provided by each contractor for flight evaluation. The Air Force placed a limit of $85.4 million on the Competitive Prototype Phase, (CPP) distributed as follows:

FY 70	FY 71	FY 72	FY 73
$ 2.0	$ 27.9	$ 47.9	$ 7.6

The major program objectives were defined as follows:

- Establish the DTC goal as $1.4 million in CY 70 dollars, based on unit recurring flyaway and a production of 600 aircraft, at the rate of 20 per month.
- Develop a Close Air Support System capable of performing the mission within established cost goals.
- Maintain healthy and fair competition between the two competitors.
- Assure Air Force visibility of contractor's progress and conversely the contractor's visibility of Air Force program goals.
- Define procedures used in the conduct of the CPP effort for the benefit of other programs using a similar management approach.

Design-to-Cost became one of the major aspects that drove the program. Early studies had indicated that all the desired CAS capabilities could be achieved with a low cost aircraft and the Program Director gave the two contractors wide latitude in making the necessary cost/performance trade-offs to meet DTC goals. Further, to insure maximum contractor freedom and minimize government intervention, the SPO did not grow as usually happens when a program is initiated. The program office was maintained at less than thirty people, including user liaison personnel and administrative support personnel. Technical support was drawn from the Aeronautical Systems Division, when required, as well as from the Plant Representatives.

Concurrent with the initiation of the A-X Program, the Air Force had been evaluating the characteristics for an appropriate aircraft gun system. The Study Group's final report in September 1969, recommended development of a 30mm internally-mounted Gatling gun together with a family of ammunition especially for close air support. There are indications that DDR&E initially felt that the Air Force "could not afford" the Gatling gun deve-

lopment. However, by May 1971, when DDR&E was briefed on the competitive development program between GE and Philco-Ford, his position had changed.

On June 1, 1971, DDR&E conducted a Management Review of the A-X Program. The following key issues were discussed:

- Dr. Foster indicated "doubts about the wisdom of proceeding on the competitive prototype approach on the A-X". He solicited arguments to further substantiate this acquisition strategy.

- Additional discussion was needed on 30mm gun competition before funds were released. A desire to include Oerlikon gun as one of the contenders was indicated.

- The method for defining the avionics package was questioned. It was suggested that if avionics cost became too high, the total cost of A-X plus avionic would make other solutions more attractive.

- Support costs also were a concern. The indication was that a high unit cost might be acceptable if it resulted in a measureable "reduction in the 10 year life-cycle costs".

- The estimate of $195 million for the follow-on development program was questioned by the entire staff. Feeling was that this effort was not really development. The Air Force was requested to scrub these costs; however, it was thought that this might pose a problem with Congress.

Five days later, on June 6, 1971, the Secretary of the Air Force proposed including the Oerlikon gun in the evaluation along with the guns proposed by GE and Philco-Ford. DDR&E agreed that this would make the evaluation more meaningful, that there be a competitive shoot-off, that the ammunition be developed concurrent with gun development, and that there be a flight test of the gun system in the prototype aircraft. Funds were released for the prototype gun development on June 15, 1971. The Secretary of the Air Force announced in October 1971, a modification to the program to demonstrate the winning gun in the winning A-X aircraft prior to the production decision.

B. Full Scale Development

The specific details concerning the preparation for the DSARC II review could not be ascertained by the study team from the remaining available files. The files did indicate, however, that the A-X Program Office was very busy. This small office, which was originally structured to manage the competitive prototype phase, was now reaching the peak of activity with the flight testing of both contractors' aircraft. Added to this was the

accomplishment of the source selection process to pick a contractor for FSD and the preparation for the Milestone II Review by the DSARC in January 1973. Workload was expanding and so was the organization.

Both contractors initiated flight evaluations in May 1972. A Procurement "Murder Board" was held on July 18 and 19, 1972 to review the details of the FSD procurement. This is a normal action accomplished prior to the release of RFPs. Personnel from Aeronautical Systems Division, Headquarters Air Force Systems Command, Headquarters Air Force, Office of the Secretary of the Air Force, and Tactical Air Command Headquarters were in attendance.

There are indications that in September 1972, OSD staff members were requesting source selection sensitive data in preparation for the DSARC II Review. It appears that the Air Force vigorously objected to these requests, especially the cost information. A final agreement was reached, in which a draft DCP would be submitted by November 15, 1972. The fly-off at Edwards AFB between the two aircraft, now designated YA-10 for Fairchild and YA-9 for Northrop, occurred between October 10, and December 9, 1972.

Briefings on December 21 and 22, 1972 were presented to the Source Selection Advisory Committee. On January 3, 1973 the Source Selection briefing was presented to the Commanders of AFSC, TAC, and AFLC. The Chief of Staff and the Secretary of the Air Force were briefed on January 9, 1973. Available files did not provide specific details on the briefings prior to these dates; however, normal policy required pre-briefings at the Command level and below prior to presentation at this level. The DSARC pre-briefings were presented to the Senior Air Staff Officers on January 12, 1973, and to the Chief of Staff and the Secretary of the Air Force on January 16, 1973. By this same time, the OSD CAIG, the DDR&E (T&E) and the ASD (I&L) had also been briefed by various elements of the Air Force.

The issues being formulated by the time of DSARC II are best summarized by an ASD/SA memo to DDR&E of January 12, 1973. The following summarizes these points:

- Can A-X effectively destroy tanks?
- Can A-X survive?
- What is the cost?
- Is A-X better than A-7/A-4?

The DSARC II Review was held on January 17, 1973, with the personnel shown in Figure C3 in attendance. The Air Force reported selection of the A-10 and requested permission to enter

ODDR&E	Dr. J.S. Foster, Jr.(Chairman)
	D. Fredericksen
	L/Col. J. Metzko
OASD (I&L)	B. Shillito
	J. Malloy
	F. Randall
OASD (C)	B. Brazier
	D. Liebermann
OASD (SA)	Dr. J. Cristie
	Dr. J. Ahearne
	H. Manetti
	Dr. P. Berenson
ASD (I)	Dr. M. Malkin
	P. Parker
JCS	R/Adm. S. Cooley
	Col. J. Romack
CAIG	D. Srull
Army	C. Poor
	B/Gen. B. Maddox
DDR&E (T&E)	Lt. Gen. A. Starbird
	B/Gen. Sylvester
	Capt. McNerney
Air Force	Dr. R. Seamans, SecAF
	G. Hansen, ASAF (R&D)
	C. Hargis, OASAF (R&D)
	L. Turner, ASAF (I&L)
	Gen. J. Ryan, CS
	Gen. G. Brown, AFSC/CC
	M/Gen. W. Evans, DCS (R&D)
	Lt/Gen. J. Stewart, ASD
	M/Gen. J. Burns, RDQ
	M/Gen. H. Collins, DCS (R&D)
	Mr. Adams, SPO
	L/Col. Chipman, AFPEM
	L/Col. J. Bode, AF (Studies & Analysis)
	Col. Hildebrandt, P/M
	Col. P. Odgers, SPO
	Maj. G. Lynch, Edwards AFB
	Col. R. Tulberg, AFSC
Executive Secretary	Mr. E.J. Nucci

Figure C3
A-10 DSARC II
Attendance List
January 17, 1973

Full Scale Development. Figures C4 and C5 summarize the program schedule and initial financial plans.

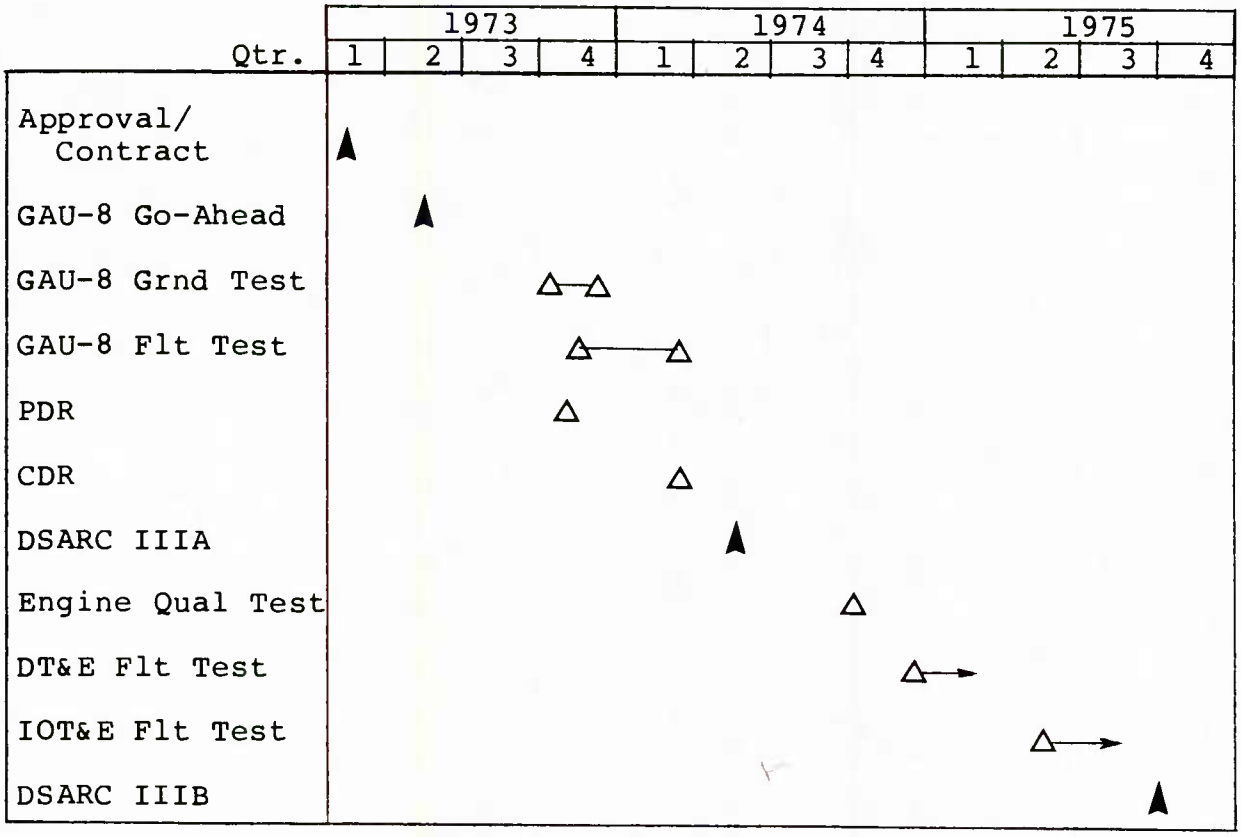


Figure C4
A-10 Program Schedule

On January 18, 1973 the DepSecDef, Mr. Keneth M. Rush, authorized the Air Force to make the source selection announcement and to proceed with contract negotiations to include Design-To-Cost objectives. He further directed the CAIG to continue the review to determine the cost of the entire A-10 program. The Air Force was prohibited from signing an FSD contract until after the CAIG results were reviewed by the DSARC. The CAIG review, on February 8, 1973, estimated that flyaway cost in FY 70$ would be $1.7 million with an uncertainty range of $1.5 to $2.0 million. The Air Force estimate was $1.5 million, which the CAIG felt had minimal probability of being achieved. After this review the DSARC recommended that the Air Force be authorized to proceed into FSD with the following provisoes:

- Engine contract should contain a demonstration milestone for successful completion of qualification test (QT).
- The exercise date of Option II of the engine contract, the first major production option, should not precede QT completion.

Initial Annual Budget Comparison
($Then Year Million)

	FY73	FY74	FY75	FY76	To Comp	Total
RDT&E						
Approved	40.5	112.4	48.0	41.4	9.9	$252.2
A-10 Require.	35.0	118.0	65.0	30.0	3.0	251.0
Production (48 A/C)						
Approved	--	30.0	144.0	63.0		237.0
A-10 Required	--	25.0	126.0	83.0*		234.0

*Does not include $20.0M for advance buy on later FY 76 engines.

Total Procurement Requirement
(Most Probable $ M)

	Then Yr $	FY 70 $
Air Vehicle (729 A/C)	$ 1,539.0	$1,061.0
Perculiar Support	180.0	124.0
Initial Spares	232.0	161.0
TOTAL	1,951.0	1,346.0
Unit Recurring Flyaway	2.008	1.380
Procurement Unit Cost	2.676	1.846

Figure C5: A-10 Initial Financial Plans

- o A "delay options" clause keyed to Option II should be included.

- o The DTC goal should be $1.5 million (FY 70$) with contractual incentives to force costs far below this figure.

- o Airframe and engine contracts should apply special attention to remain within DTC guidelines.

- o Procurement program should plan on the CAIG's estimate of $1.7 million (this includes DOD programming documents and SARs).

During this DSARC deliberation period, the Congress indicated some interest. On February 3, 1973, the House Appropriation Committee Chairman, Congressman Mahon, expressed concern about the cost estimates, the timing of the aircraft and gun, the capabilities of the A-10 in comparison to other aircraft in the inventory, and avionics. The Congressman specifically requested that "no contract award be made until further studies, including those ordered by Congress, can be completed". It appears that a formal response was prepared and possibly sent to Congressman Mahon, but a copy was not available in the files reviewed by the study team. Apparently, the DepSecDef felt that the Congressional issue had been satisfied because on February 28, 1973, he approved the A-10 FSD and authorized award of contracts consistent with the DSARC recommendations. Within twenty-four hours (AF/CC 012216Z Mar 72), Air Force Systems Command was authorized and did award the contracts to Fairchild and GE for the airframe and engine, respectively.

Formal program direction was issued by Headquarters, Air Force on PMD R-P-3034(1) dated May 17, 1973. By June 1973, the A-X SPO organization had evolved into the Deputy for A-10, with Brigadier General Thomas M. McMullen designated as the new Program Director. The increasing workload since the approval of FSD required continual organizational growth. Figure C6 depicts an estimate of the size of the program office in relation to time.

Concurrent with the start up activities of the A-10 FSD, the program office had to support the GAU-8 program's efforts to prepare for its DSARC II. This review was held on June 5, 1973 (See Figure C7), and the GAU-8 received approval from DDR&E on June 21, 1973, to proceed into FSD with the following specific guidance provided on the ammunition:

- o Initiate competition by introducing a second ammunition developer under contract to the gun developer.

- o First ammunition contractor should immediately start combat round development.

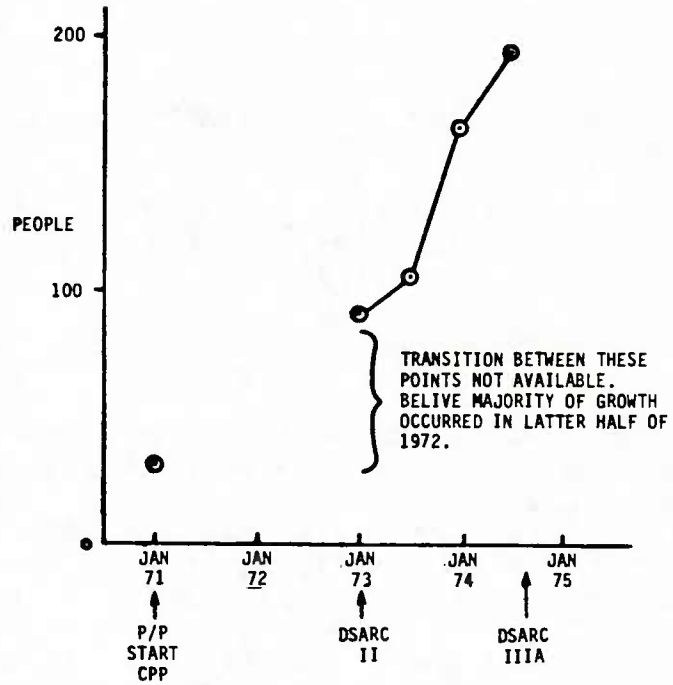


Figure C6
A-10 Program Office, Assigned Persons

ODDR&E	Dr. J.S. Foster, Jr. (Chairman)
OASD (I&L)	H. McCullough
OASD (C)	T. McClary
ODDPA&E	L. Sullivan
JCS	Col. F. Roseman
ODDR&E (T&E)	B/Gen. W. Daniels
CAIG	D. Srull
DIA	L. Bradley
Air Force	J. Jones, OASAF (R&D)
AMRAD	Col. M. England

Figure C7

GAU-8 DSARC II
DSARC Principals
June 5, 1973

- o Ammunition subcontractors should be required to have component competition.

- o A trade-off analysis should be conducted that considers cost and effectiveness implications of various High Density Penetrator (HDP) designs.

- o Alternative methods should be developed for manufacturing HDPs.

Concurrent with DDR&E's approval, the Air Force announced the award of the development contract to General Electric. Because the gun was an essential part of the A-10 weapon system, the original management structure had to be changed. The Armament Development and Test Center (ADTC), Eglin AFB, would no longer manage the gun program,instead the Deputy for A-10 would take over this responsiblity, while ADTC continued to provide the engineering support. The exact time of this responsibility transfer was not determined from the files reviewed.

In July 1973, the Senate Armed Services Committee cut the FY 74 request for A-10 preproduction aircraft from 10 to 6, and recommended a fly-off between the A-10 and A-7D. The budget cut resulted in several adjustments in the schedule besides the immediate stop work order on four aircraft. Specifically, the DSARC IIIA would slip to July 1974, delivery of initial operational test aircraft would slip three months to September 1975, the first production aircraft would be delayed four months to March 1976, and delivery of support equipment and IOC would slip by four months.

The issue of a fly off between the A-10 and the A-7D was not new; the Congress had expressed an interest in such a test during early hearings on the FY 74 Budget. Both OSD and the Air Force had testified against pursuing this activity. As Secretary of Defense Elliott L. Richardson said in testimony before the SASC on March 28, 1973, it was "difficult to see how a fly-off would provide meaningful new information". He also said that the test "would not develop further information on the ability to operate from badly damaged field, nor was fly off considered cost effective for the information it would yield". However, given the Congressional budget action, the Air Force had no alternative but to agree to a fly-off between the A-7D and the A-10.

C. Low Rate Production

The Congressional directed A-7D/A-10 fly-off was accomplished between April 15, 1974 and May 9, 1974. The results demonstrated that the A-10 was the more effective aircraft. In addition, analysis concluded that the A-10 was less costly than the A-7D both in terms of acquisition cost and life cycle cost. Based on these results, in June 1974, the DefSecDef recommended to the SAC Chairman, Senator John L. McClellan, that he approve the FY 75 A-10 program.

Review of SAR data for the Spring of 1974 indicates that the A-10 Program was restructured to accommodate the Congressional denial of FY 74 Advanced Procurement funds and the Congressional direction to transfer 4 RDT&E aircraft to procurement funding. Additionally, the time required to prepare and accomplish the directed A-7/A-10 fly-off had caused the approved program to slowdown. Also, as a result of the restructure there was an increase in the FY 76 long lead time requirement from eighteen to twenty months. The following highlights some of the briefings accomplished prior to the DSARC IIIA Review:

Date	Purpose
May 17, 1974	Supportability briefing to AFLC/CC
June 4, 1974	Program Assessment Review (PAR) to AFSC/CC
June 6, 1974	PAR to Air Force Council
June 6, 1074	Secretarial Program Review (SPR)
June 17, 1974	DSARC Pre-brief to ASD Commander
June 18, 1974	DSARC Pre-brief to AFSC Headquarters
June 18, 1974	DSARC Pre-brief to Air Staff, DCS level
June 21, 1974	DSARC Pre-brief to Chief of Staff and Secretary of the Air Force
June 19-25, 1974	OSD Pre-briefs to CAIG, ASD(I&L), DDR&E (T&E) and DDR&E. Approximately 20 people attend each session.
July 9, 1974	DSARC IIIA (See Figure C8 for attendance)

The issues identified for consideration by the DSARC were as follows:

- Should low rate production be authorized?
- What is the quantity of ammunition to be authorized?
- Should approval be granted to use depleted uranium in the API round?

The alternatives provided for consideration were:

- Initiate low rate initial production by:
  - oo Authorizing procurement of 52 aircraft;

OSD (I&L)	Mr. Mendolia (Chairman)
	Mr. Gansler
	Mr. Blumberg
	Mr. Myers
	Lt. Col. Van Meter
	Mr. Smith
DDR&E	Dr. Currie
	Mr. Heibner
	Mr. Frederickson
	Mr. Sutherland
	Lt. Col. Cabell
OSD (C)	Mr. McClary
	Mr. Cove
	Mr. Eaton
	Mr. Jackson
	Mr. Trodden
OSD (PA&E)	Mr. Sullivan
	Mr. T. Christie
	Col. A. Price
	Maj. Morin
	Mr. Pyatt
AMRAD	Capt. D. Marshall
DD(T&E)	Gen. Starbird
	B/Gen. Daniels
	Capt. McNearney
CAIG	Mr. Margolis
	Mr. Manetti
JCS	Adm. Hannifin
	Lt. Col. Voorhees
Air Force	Secretary McLucas
	Mr. Shrontz
	Lt. Gen. Hudson
	Lt. Gen. Stewart
	Lt. Gen. Evans
	M/Gen. Russell
	M/Gen. Lukeman
	B/Gen. McMullen
	Mr. Adams
	Col. Casey
	Mr. Hinders
	Mr. Joers
	Col. Strand
	Mr. Ross
	Lt. Col. Cupfender
	Lt. Col. Heye
	Lt. Col. Chipman
	Mr. D'Ippolito
	Maj. Adams
	Maj. Ketter
	Capt. Cote
Army	Dr. Payne
	Mr. Poor
	Mr. Trainor
	M/Gen. Camm
	Col. Sharp

Figure C8
A-10 DSARC IIIA
Attendance List
July 2, 1974

- oo Authorizing procurement of 28 aircraft (minimum number per contract option); or

- oo Release long lead of $39M

- o Delay production decision but continue development.

- o Terminate the program.

The Air Force reported that technical status was known, contractors were ready for production, government/contractor management teams were ready, and production costs and schedules were defined. Therefore, the Air Force recommended that OSD approve these items:

- o Procurement of 52 aircraft.

- o Procurement of initial 30mm ammo option.

- o Use of DU in WRM procurements.

The DSARC identified no major issues in the area of production readiness, but did express some concern about the estimated increase in the cost of the first 48 production aircraft. The CAIG indicated, however, that the unit cost estimate of $1.7 million (FY 70$) still appeared to be valid and that the Air Force did a commendable job on the operating and support cost estimate. The CAIG expressed concern about escalation estimates: the SAR rate was 4.9% while Air Force was using 6.8%.

The key issue identified at the DSARC was testing. DDR&E (T&E) indicated that the Program Office had actually accomplished more testing than had been scheduled. Over 400 flight hours of development testing of the prototype aircraft had been completed. Earlier deficiencies had been corrected and the Air Force had met the critical milestone of demonstrating the compatability of the prototype GAU-8 gun and the A-10 aircraft.

It was felt, however, that several critical tests still remained, and the DDR&E (T&E) recommended that the DSARC keep the Air Force's production commitment on the A-10 to a minimum until more testing was done. The DDR&E (T&E) also recommended releasing the $39 million long lead funding but retaining the option for a minimum quantity (28 aircraft) until November 1974 when another test review should be held.

Based on the DSARC recommendation, the DepSecDef, in his memorandum of July 31, 1974 authorized the Air Force to:

- o Proceed with initial production using $39 M long lead funding.

- o Procure 52 aircraft subject to the provision that contractor options to procure a smaller quantity (28

aircraft) be kept open until the following milestones were accomplished:

- oo GAU-8 Gun & Armor Piercing Ammo CDRs
- oo GAU-8 gun test at depressed angle
- oo GAU-8 firings, including tests for gun gas concentration, with measured barrel length and Phase II (production) ammo with plastic rotating band.
- oo Air loads and performance tests with aircraft wing extensions.
- oo Approach to stall, stall and spin avoidance tests.
- oo Completion of engine qualification test.
- oo Egress system sled tests.
- oo Dry in-flight refueling.
- oo Additional stores certification.

- o Proceed with the initial options for GAU-8 ammunition and for the use of depleted uranium (DU) in the produciton of API rounds.

The DepSecDef noted that a DSARC Review was set for November 1974, at the completion of all the above milestones, to make the decision for full funding of the initial production quantity. The Air Staff issued directions to AFSC on July 31, 1974, to immediately award the low rate production contracts.

Again, details of the preparation for the DSARC Review in November 1974 are sketchy. However, events that may have, in some degree or another, effected the program were as follows:

- o Between September 4 and September 22, 1974 the Air Force conducted a major review of the A-10 Program. The review was directed by Air Force Vice Chief of Staff with a general officer panel chaired by the Vice Commander, Tactical Air Command.
- o Approximately late summer 1974, Congress cut the A-10 FY 75 Production Budget request by $20 million, and the program was restructured. Only 22 aircraft could be procured in FY 75 (4 aircraft cut). Deliveries were stretched out to show slower buildup to the goal of 20 aircraft per month.
- o On November 9, 1974, Colonel Jay R. Brill was appointed A-10 System Program Director.

Pre-briefings at the Air-Staff and OSD staff occurred during November 12 to 15, 1974, Colonel Samuel J. Kishline, the A-10 Deputy Director, accomplished the briefings because of the recent change in Program Directors. On November 19, 1974 he briefed the DSARC on the programs progress and reported that all tasks identified as program milestones, except the CDR for 30mm API round, had been completed. That milestone would be completed by December 24, 1974.

In a December 19, 1974 memorandum, the DepSecDef authorized the Air Force to proceed with production of FY 75 and 76A quantity of 52 aircraft and FY 75 buy of 30mm ammunition after completion of CDR. In recognition of extending lead times, OSD also authorized the release of $20 million (FY 76) for production increments beyond the 52 authorized aircraft. This was to insure production line continuity until the DSARC IIIB. The memo also provided the following direction and test milestones:

- Conduct a "should-cost" study on API Ammo
- Reassess the 30mm Combat Ammo Mix
- Examine the Design Trade Off Study
- Complete the Stall/Post Stall/Spin Test
- Complete Additional Stores Certification
- Conduct Operational Suitability Evaluation (Capability in Threat; Target Acquisition & Attack, Re-Attack)
- Complete A-10/GAU-8 Compatibility/State Accuracy Evaluation
- Complete Predicted Aircraft Performance Analysis
- Demonstrate Bomb Accuracy
- Complete Initial Evaluation of Countermeasure Adequacy
- Complete Evaluation of TF-34-GE-100 engine
- Conduct Initial Evaluation of R&M
- Complete Critical Static Loads Demonstration
- Complete One Lifetime Fatigue Test
- Conduct Evaluation of Target Logistics Effects.

The A-10 program was accomplishing its technical milestones on schedule, but program changes were occurring for external reasons. Congressional action on the FY 74 budget had caused re-

structuring of the program. The FY 75 Congressional Budget cuts may be partly attributed to OSD's protracted (July - December 1974) low rate production decision which required further production schedule adjustments and which inevitably produced upward pressure on unit procurement cost. The trial program for DTC was being slowly but surely forced away from its objectives - 20 aircraft a month and complete procurement in FY 79.

D. Full Rate Production

In February 1975 the A-10 SPO received the contractors' proposals for the FY 76B (31 aircraft) and FY 77 (33 aircraft) procurements. The prices were considerably higher than the Air Force had anticipated just a few months earlier at the November 1974 DSARC Review.

The A-10 SPO immediately initiated a Joint Operations Technical Review (JOTR) to see what could be "scrubbed out" of the requirements while still retaining performance. All elements of the Air Force participated in this review. The JOTR concluded that the DTC program had put discipline into the acquisition of the A-10. The Review identified the major problem as being the underestimation of the effects of inflation. The Economic Price Adjustment (EPA) clause on the FY 75 contract already required $14.5 million (by August 1976 this had grown to $15.7M when Congressional Reprogramming was requested). To stay within existing FY 76B and FY 77 funding levels the Review recommended quantities be reduced to 23 and 20, respectively. These lower quantities in the front end would mean a slower production ramp-up and therefore would force a lower quantity in FY 77. Lower production rates and procurement of aircraft at a later time with more inflation would impact the total program cost by an estimated $500 million.

On July 23, 1975 a DSARC planning meeting, entitled "shirt-sleeves DSARC", was hosted by DDR&E (LW) (See Figure C9 for attendees). This was the second such meeting; however, no record could be found of the first meeting or of any subsequent ones. A broad range of topics were discussed in this meeting with action items assigned. The feeling was that most of the issues would be resolved prior to the DSARC which was tentatively scheduled for November 25, 1975. The following were identified as potential issues for the DSARC:

- Verification of 2 second gun burst accuracy
- 100% air loads test completion
- "Other Avionics" candidates for A-10
- Design-to-Cost: Traceability and rationale from $1.5M DTC goal.

NAME	ORGANIZATION
Mr. J.E. Smith	OSD(I&L)
Mr. J.M. Cobb	OSD(I&L)
Maj. J.K. Glenn	AF/RDPM
Maj. G.W. Burkley	OSD(PA&E)
Mr. T. Christie	OSD(PA&E)
Maj. W. Crabtree	AF/SAGF
Mr. F.C. Bachmann	AF/XOOFA
Maj. Jack Stitzel	TAC/DRF
L/C N.G. Anderson	AFSC/SDNA
Mr. Jack P. Etchison	ASD/YXP
Ms. Zada M. Branscome	ASD/YXP
Maj. Ronald S. Joyner	ASD/YXD
LTC Ronald W. Yates	ASD/YXT
Mr. Urban A. Hinders	ASD/YXE
Col. Samuel J. Kishline	ASD/YX
Col. George G. Hupp	AFTEC/A-10 Test Force
Maj. Jay N. Mitchell	AFTEC/TET
Capt. J.O. Rigg	DDR&E/T&E
Mr. D. Dillon	OSD(I&L)
LTC T. Van Meter	OSD(I&L)
Maj. Robert T. Pinizzotto	AF/LGYY
Mr. G. Sutherland	ODDR&E
Mr. Joe Krushinski	AF/ACMC
Mr. John Dorsett	AF/ACMC
Mr. John Dinsmore	AF/LGYW
Mr. John F Hirshmann	OASD(PA&E)
Capt. C.J. Profilet	DDR&E(SAM)
LTC Chuck Cabell	ODDR&E(LW)

Figure C9
A-10 Planning Meeting
July 23, 1975

- o Program Costs: Air Force position on inflation anticipated for the A-10 program.
- o Ammunition costs
- o Cost reduction plans during production
- o Fairchild's capitalization plans
- o Verification of Fairchild's maximum produciton rate capability
- o Subcontractor losses due to economic escalation

The meeting also discussed alternative production strategies which could be reflected in the DCP. Some of the alternatives for consideration were as follows:

- o Build slowly to the currently planned production rate of 20 per month and live within present budgets through FY 77.
- o Build to a lower production rate (such as 15).
- o Plan the production to maintain a "constant work force" as suggested at the previous DSARC.

Because of a need to complete some specified tests before the DSARC, the date was finally set as December 16, 1975. On December 13, 1975 the DSARC principals decided not to have a formal review, but expressed a preference for a more informal approach. The result was a series of specialized briefings by the Air Force to provide evidence that the test objectives had been accomplished. DCP 23B, dated January 7, 1976, was submitted for review by the DSARC principals and was approved without dissent.

On February 10, 1976 the DepSecDef gave full production approval by signing the DCP and authorized the Air Force to "proceed with production of the A-10 in accordance with Alternative #1 described in the DCP". The DepSecDef characterized the alternative as a "good compromise" which considered "anticipated funding...".

Alternative I reduced the baseline program from 20 aircraft per month proposed by the Air Force for its FY 77 budget to a maximum rate of 15 per month in September 1979. This rate would then continue until program completion. It was expected that the reduced rate would provide confidence that the contractor could finance and effectively manage the production program without major difficulty. The following is a comparison between the baseline the Air Force proposed and the DepSecDef decision (Alt. #1):

	FY 75	FY 76	FY 7T	FY 77	FY 78	FY 79	FY 80	TOTAL
Baseline Program								
Qty.	22	53	20	159	230	249		733
Cost ($M)	181.4	360.7	76.0	793.8	869.6	790.8	18.3	3090.6
Alt. #1								
Qty.	22	53	20	100	173	180	185	733
Cost ($M)	181.4	360.7	76.0	575.9	863.9	805.5	738.5	3601.9

The DepSecDef also directed that the Air Force:

- Submit an updated change to the DTC goal based on this decision.
- Report to DD(T&E) the results of GAU-8 gun gas test, fatigue test, etc., and submit in time for review prior to release of full funding for the FY 77 buy.
- Investigate O&S cost sensitivity to R&M achievements and report back by February 28, 1976.

In March 1976 the DSARC principals recommended approval of full scale production of the GAU-8 gun system and ammunition. On March 30, 1976, the Commander, Tactical Air Command, formally accepted the A-10 from the Commander, Air Force Systems Command.

IV. PROGRAM STATUS

Initial Operational Capability (IOC) was obtained with the A-10 in October 1977, four months later than originally set at the DSARC II in January 1973.

The planned production program has not proceeded as well as IOC. The following summarizes the changes:

- Budget constraints imposed during the preparation of the FY 78 budget inputs resulted in the reduction of the FY 78 buy year procurement quantity from 173 to 144 aircraft, and slipped final procurement to FY 81.

- Congressional action on the FY 79 President's Budget reduced the FY 79 buy from 162 to 144 aircraft.

- The FY 81 program was reduced by OSD from 106 aircraft to 60 in the preparation of the FY 81 President's Budget, and the addition of 46 aircraft per year for FY 82 through FY 84. Total quantity increase of 92 aircraft.

- FY 82 Amended President's Budget terminated the program in FY 82 with 60 aircraft. Total program quantity decreased by 78 aircraft to a total of 747.

- FY82 Revised Amended President's Budget reduced the FY82 quantity from 60 to 20. Directed 20 aircraft to FY83 and terminated 20 aircraft. Total program quantity now decreased by 98 to a total of 727.

The following shows the comparison between the DSARC IIB decision and the evolving actuals:

	FY 75	FY 76	FY 7T	FY 77	FY 78	FY 79	FY 80	FY 81	FY 82	TO COMP	TOTAL
DSARC IIIB (Dec 75)	22	53	20	100	173	180	185	-	-	-	773
FY 78 BES (Oct 76)	22	53	20	100	144	162	162	70	-	-	733
FY 79 Cong. Act (Oct 78)	22	53	20	100	144	144	162	70	-	-	715
FY 80 FYDP (Jan 79)	22	53	20	100	144	144	144	106	-	-	733
FY 81 OSD Act (Nov 79)	22	53	20	100	144	144	144	60	46	92	825
FY 82 FYDP Amend	22	53	20	100	144	144	144	60	60	-	747
FY 82 FYDP Revised Amend.	22	53	20	100	144	144	144	60	20	20	727

APPENDIX D

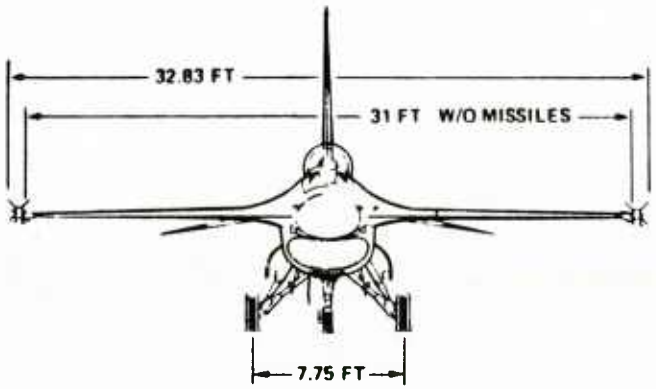
F-16
PROGRAM STUDY REPORT

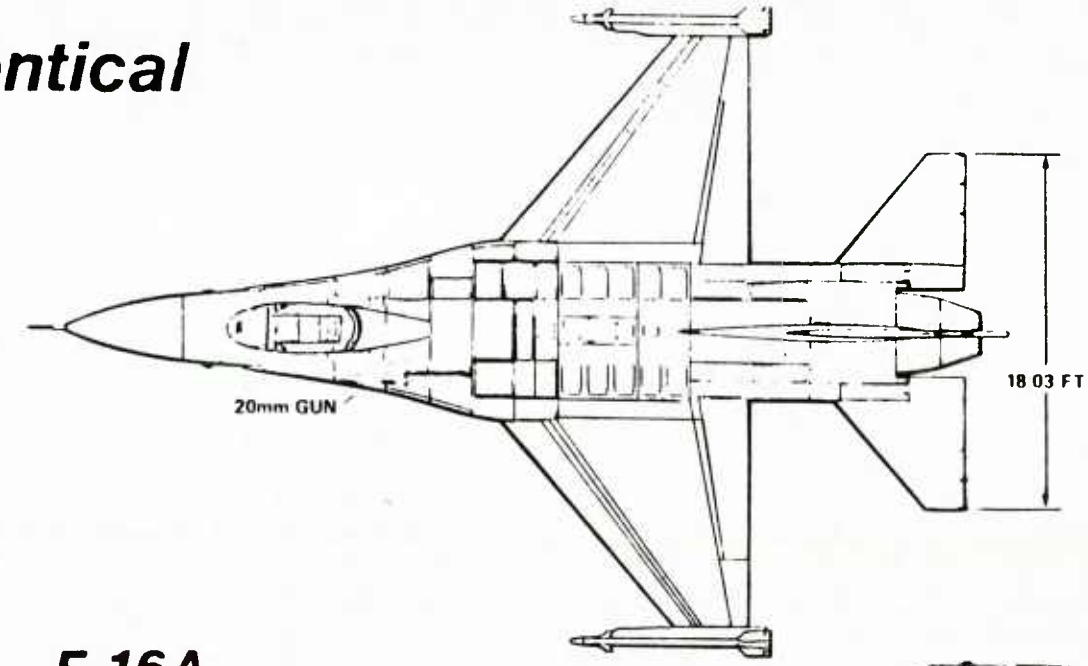
I. SYSTEM DESCRIPTION

The F-16 is a lightweight, high-performance, multi-mission fighter aircraft. In the air superiority mission it will complement the F-15. Extremely maneuverable and armed with 20mm cannon and Sidewinder missiles, it is intended to be highly effective in clear-air-mass, air-to-air combat. With the future incorporation of AMRAAM and improved radar this capability will be extended to beyond visual range and other than clear-air combat. The F-16 also provides substanstial air-to-ground ordnance delivery capability. In this role the F-16 will supplement the A-7, A-10 and F-111. The F-16 replaces the F-4 in the Air Force inventory.

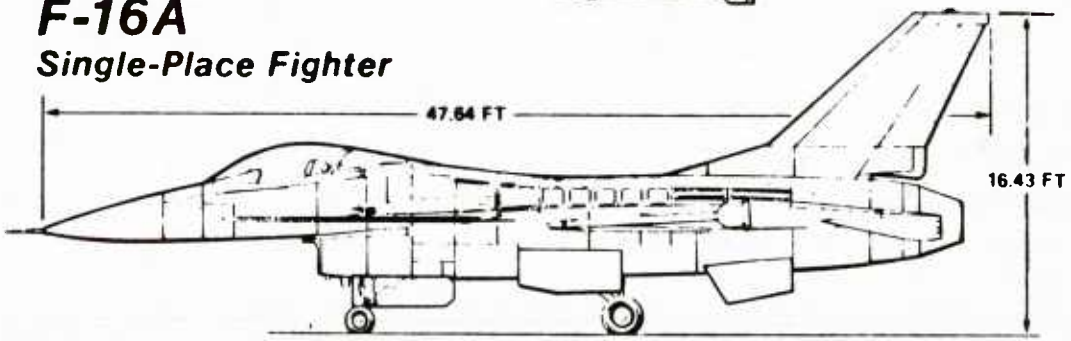
Figure D1 shows the general plan form of the F-16 and selected physical characteristics. The F-16 incorporates many innovations in its design. The aircraft is controlled solely by a "fly-by-wire" control system using a force sensor stick on the right side of the cockpit instead of the normal position-sensor stick between the pilot's knees. To improve the pilot's tolerance to "g" forces, the seat is inclined 30, instead of the conventional 15. To improve aircraft maneuverability for air-to-air combat, the aerodynamic design provides relaxed static stability. This means that the basic design is unstable, but as a result of the use of an electronics unit and sensors to control the unstable aircraft, the pilot is unaware of any unconventional stability characteristics.

F-16A & F-16B Are Identical Dimensionally

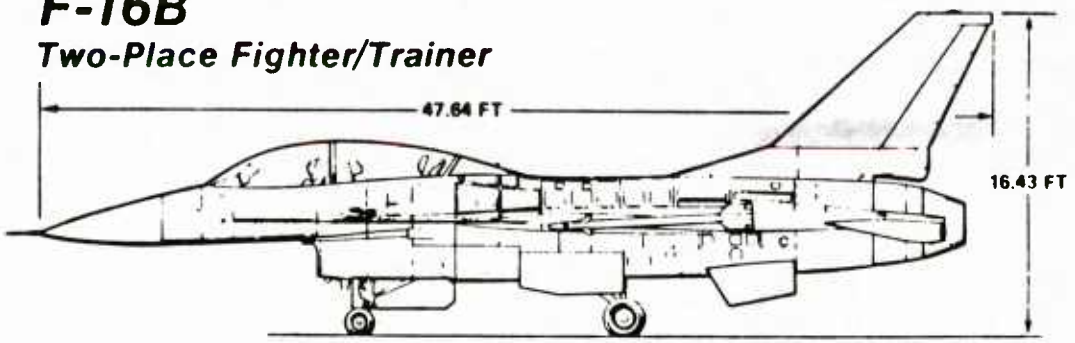




F-16A
Single-Place Fighter



F-16B
Two-Place Fighter/Trainer



Wing Area	300 Sq Ft
Aspect Ratio	3.0
L.E. Sweep	40°
Design Load Factor	9"g"
Design T.O.G.W.	22,500 lb
Max T.O.G.W	35,400 lb
Max Ext Load Capacity	15,200 lb

FIGURE D1

II. INITIAL PROGRAM SUMMARY

The F-16 aircraft evolved from the Air Force's Light Weight Fighter (LWF) Prototype Program. This effort was initiated in FY 72 when General Dynamics and Northrop were selected on April 13, 1972 to produce and test two prototype aircraft each. The Air Force had no plans to integrate an LWF into the force structure, and no Required Operational Capability (ROC) had been written. This program was to be a technology demonstration as indicated by the statement of the Air Force's DCS/RD, Lt. General Otto Glasser before the Senate Armed Services' Committee (92nd Congress, 2nd Session):

> "If it is determined that an operational requirement does exist for such a fighter, and force structure considerations permit, one of the prototypes or a synthesis of the two prototypes, could be selected to proceed into full-scale development in a missionized configuration. This is not presently planned, however. If no requirement exists in the Air Force, the technology could be used in the near term for other in-production programs while providing available hardware alternatives on the shelf for longer term fighter development."

This view prevailed until early 1974 when the Tactical Fighter Modernization Study Group (TFMSG) was formed to seek a replacement for the aging F-4 aircraft. A derivative of the LWF was a directed alternative to be considered by the TFMSG. By the Spring of 1974, several NATO countries were interested in the LWF as a possible replacement for their F-104Gs. Iran also indicated an interest in the LWF, particularly the YF-17 because of its twin engine design. In May 1974, the TFMSG recommended that a derivative of the LWF serve as the Air Force replacement aircraft. In June 1974 the United States indicated a commitment to buy the winner of the LWF competition. (The name was now changed to Air Combat Fighter (ACF) competition.) This was rapidly followed by the formation of the European Consortium, and Iran indicated it would buy 250 of the winning configuration.

The original technology demonstration program with independent twelve month test periods was now redirected to complete so as to allow a January 1975 source selection. The resultant flight test cumulative activity is shown in Figure D2.

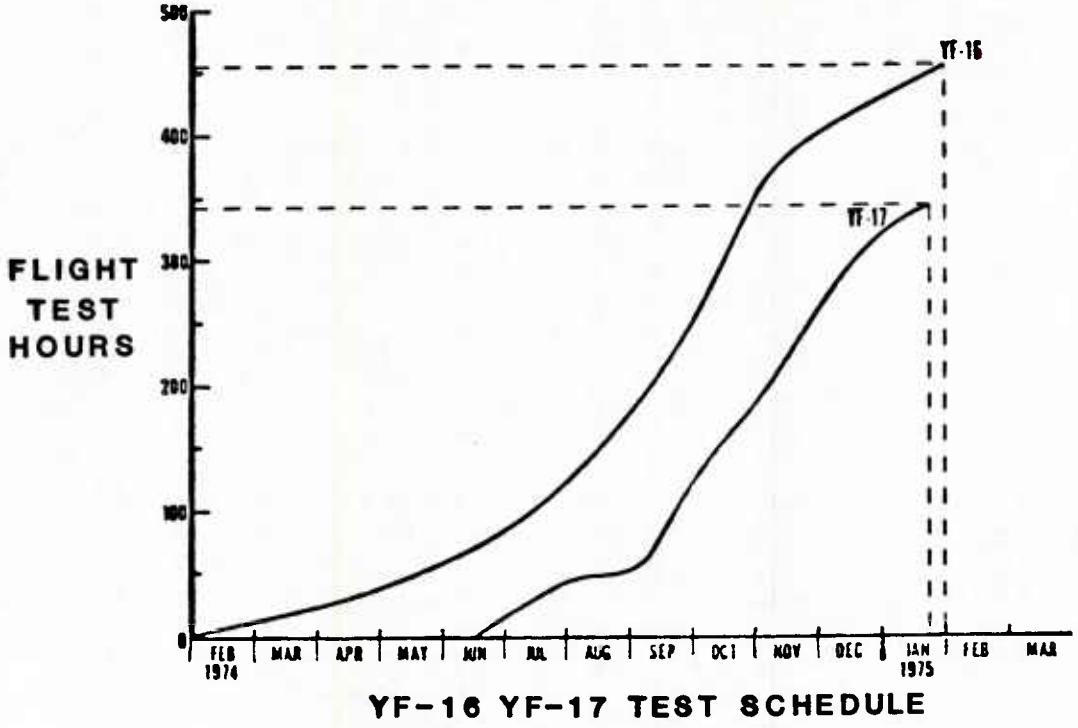
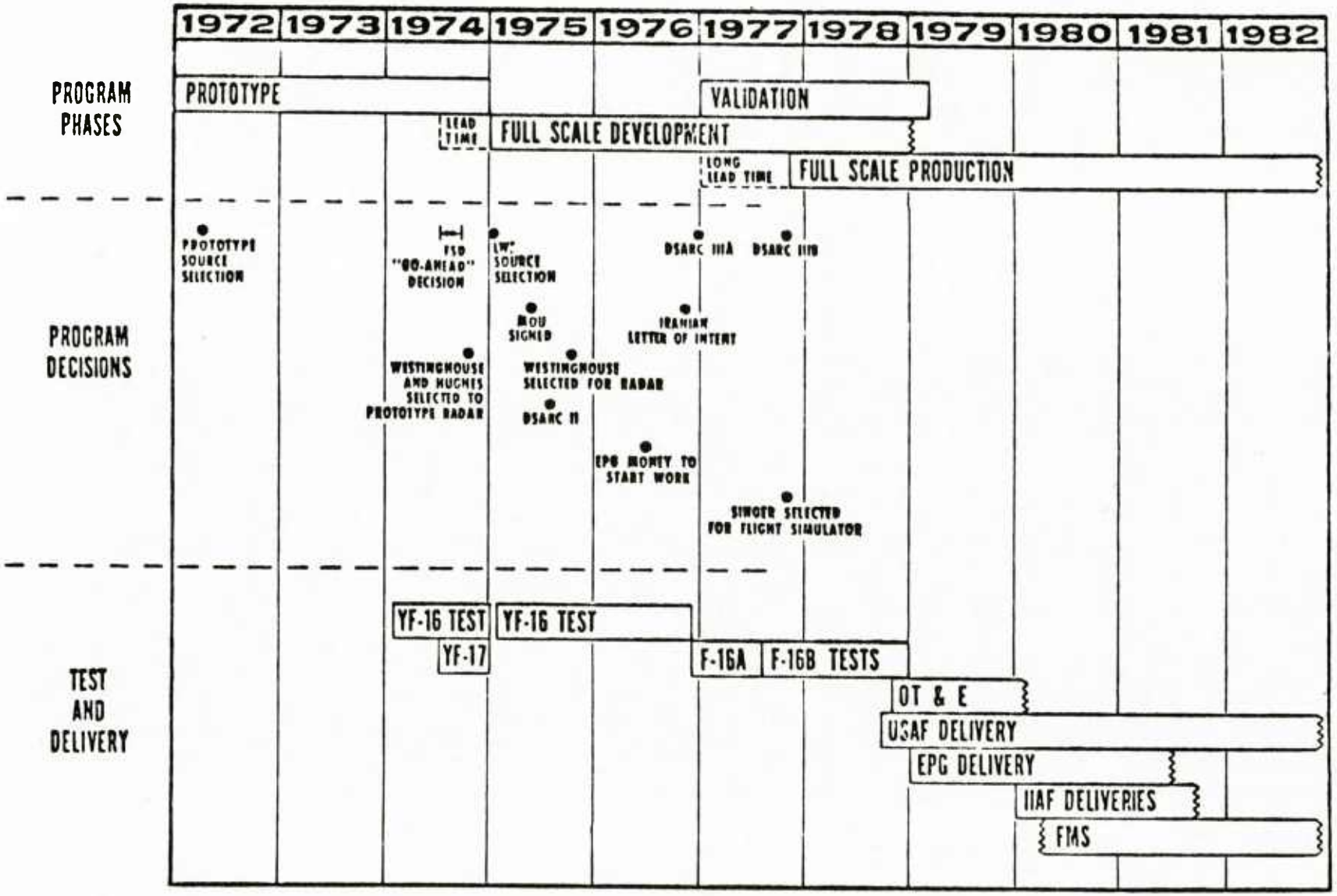


FIGURE D2

The selected contractor would then proceed into a full scale development program followed by production. Figure D3 shows the overall structure of the resulting program.



HISTORY OF THE LWF/F-16 PROGRAM

FIGURE D3

III. PROGRAM EVOLUTION

A. Program Initiation - Prototype

The Secretary of Defense approved the LWF Prototype Program on April 13, 1972. Key elements of this technology effort would henceforth be associated with addressing the problems of cost, schedule, performance and testing. The Secretary of the Air Force had established, and the SecDef endorsed, a design to unit cost goal of $3 million, based on a proposed procurement of 300 aircraft in FY 72 dollars.

DCP #120 for the LWF Program, was approved by the DepSecDef on January 19, 1973. A major issue in the coordination of this document was the realism of the Air Force's projection of cost range from $3.0 to $3.4 million. A parametric analysis, conducted by ASD/SA, indicated that the range should be $3.4 to $4.0 million and that the Air Force would have to emphasize low cost at the expense of advancing technology. The Comptroller felt, on the other hand, that $3 million had to be realized or cost growth would lessen the possibility of future procurements.

In approving the DCP, the DepSecDef raised the question of a possible LWF full scale development and production program. The Air Force responded by reiterating its earlier position that this was only a program to demonstrate and evaluate technology. The Secretary of the Air Force noted increased pressure from OSD to initiate early planning and funding for an LWF production program, and cautioned that low cost estimates would not be realized in any operational aircraft acceptable to the Air Force. Also, selection of any system for development and acquisition was dependent on the flight test program.

The Air Force had two new tactical aircraft, the F-15 and A-10, in development and it appears there was grave concern about starting a third aircraft development. To a large segment of the Air Force, the LWF posed a potential threat to the funding of the F-15 and possibly the A-10, an undesireable situation. As an indication of this concern, the Air Force deleted all funds for the LWF in the FY 75 budget formulation process. DDR&E restored the funding.

The LWF Prototype Program was managed by a small program office at the Aeronautical Systems Division. The Advanced Prototype Program Office used the "Adaptive Management" technique recommended by the Prototype Study Group with very few personnel assigned. In June 1973, Colonel W.E. Thurman was assigned as the new Director and the next month the office was elevated to the position of Deputy for Prototypes. Besides the LWF, the office also managed the AMST and Specialized Systems (See Figure D4).

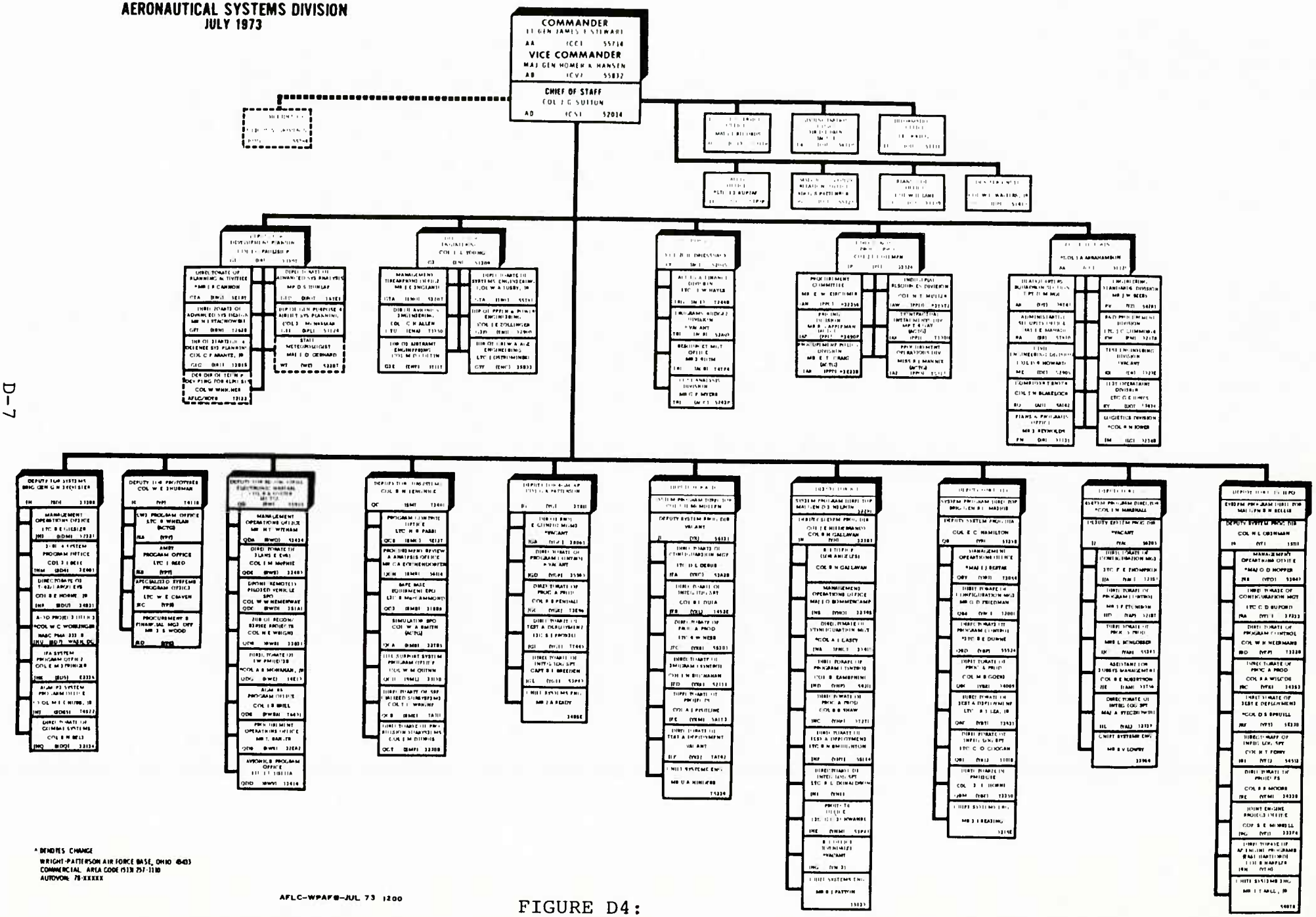

AERONAUTICAL SYSTEMS DIVISION
JULY 1973
COMMANDER
LT GEN JAMES T STEWART
AA (CC) 55714
VICE COMMANDER
MAJ GEN HOMER A HANSEN
AB (CV) 55832
CHIEF OF STAFF
COL J G SUTTON
AD (CS) 52014
* DENOTES CHANGE
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433
COMMERCIAL AREA CODE (513) 257-3110
AUTOVON 78-XXXXX
AFLC-WPAFB-JUL 73 1200

FIGURE D4:

B. Full-Scale Development

Between January 21 and 23, 1974 a series of briefings were presented by Col. Thurman to Hqtrs AFSC, TAC, Air Force and to the Secretary of the Air Force. These briefings were in response to an earlier DDR&E request for information on the feasibility of the YF-16 or YF-17 entering an FSD phase. The briefings addressed configuration, cost, and schedule of an LWF development program and indicated that an FSD decision by April 1975 was reasonable (anticipated end of YF-17 flight test).

The official prototype flight test began on February 2, 1974 for the YF-16. The YF-17 would not start flight testing until June 1974, due to engine delays. The original plan allowed both aircraft a leisurely 12 month test period and the YF-17 delays were not considered significant.

Also during the early part of 1974, the Air Force Chief of Staff, General G.S. Brown, directed that a study be undertaken to determine a suitable replacement for the F-4. The Tactical Fighter Modernization Study Group (TFMSG) was chartered to perform this task and was specifically tasked to consider a derivative of the LWF. Based on the study results, the SecDef announced on April 29, 1974 that DoD was "seriously considering FSD and possibly production of an LWF".

The technology demonstration program thrust was now changing to a competitive fly-off. The Iranians had indicated an interest in the LWF, particularly the YF-17 with a potential buy of 250 aircraft. The Europeans anticipated a buy of 350 aircraft, while the U.S. Air Force was estimating a buy of 650. An additional buy of 800 aircraft by the U.S. Navy was also a possibility.

In the May-June 1974 time period several activities occurred that were central to moving the LWF toward FSD:

- The TFMSG made a final recommendation that a derivative of the LWF be employed as a replacement for the F-4.
- Netherlands, Norway, Denmark and Belgium formed a Consortium to select an F-104 replacement for the four countries.
- Iran announced that it would buy whichever airplane wins the YF-16/YF-17 competition.
- The Air Force FY 76 POM submission included a force plan for the deployment of the Air Combat Fighter (ACF). ACF was the new designation for the LWF. Plan called for 400 aircraft with a unit flyaway cost of $4.5 million (FY 75$ and 300 quantity).
- OSD announced its decision to move the program into FSD.

Intent was to complete flight testing so as to support source selection in January 1975.

By July 1974, there was little doubt that there would be an FSD program. Although formal program documentation had not yet been issued by the Air Staff, the Program Office was accomplishing the changes in the program to support a decision in January 1975. The Request for Quotation (RFQ) was sent to both contractors by August 1974. The RFQ emphasized the DTC goal of $4.5 million and sanctioned the inclusion of an advanced radar system in the ACF.

There are indications that in August 1974, DDR&E warned the Air Force that continued OSD support depended on the ability to restrain the tendency to increase cost and sophistication of the aircraft. The significance of the $3.0 million unit cost objective was emphasized along with the concept that LCC would be one of the most important considerations in source selection. On September 11, 1974, OSD announced that 650 ACF aircraft would definitely be procured. This announcement was immediately followed by the Air Force's offer to the Consortium for a 100% offset plan if they purchased the ACF.

On October 1, 1974, Aeronautical Systems Divisions reorganized and formed the Deputy for ACF. The other functions that had been in the Deputy for Prototype were distributed throughout the organization. As an example, AMST was moved into the Deputy for Systems. (See Figure D5). The Air Staff issued interim program direction by message format later that month. The source selection process began on November 1, 1974 with submittal of bids from both contractors. From available records it was not possible to determine the preparatory activities initially identified for the DSARC II. However, the initial, formal direction on the ACF program was issued on December 24, 1974. The Program Management Directive (PMD #R-Q 5061(1)/64229F) contained the following:

- o General planning guidance for FSD and production.
- o Confirmation of the air-to-ground mission for the aircraft.
- o Indication that the ACF was to complement F-15.
- o Direction that the FSD program would have 11 single seat and 4 two seat aircraft .
- o Confirmation that production quantity would be 650 aircraft.
- o Direction of the following schedule:
  - oo Source selection complete by January 15, 1975.

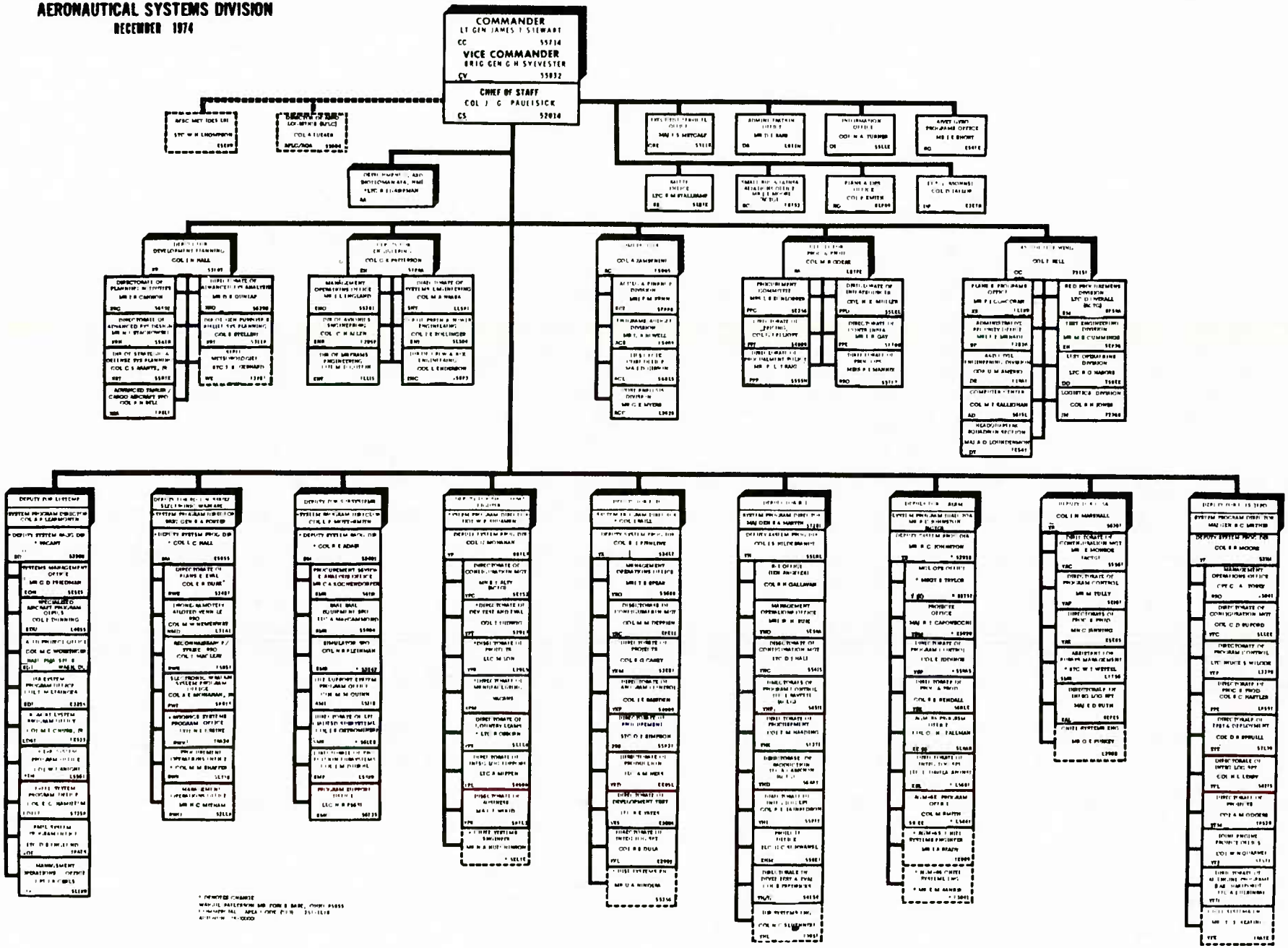

AERONAUTICAL SYSTEMS DIVISION
DECEMBER 1974
COMMANDER
LT GEN JAMES T STEWART
CC 55714
VICE COMMANDER
BRIG GEN G H SYVESTER
CV 55832
CHIEF OF STAFF
COL J G PAUELSICK
CS 52014

FIGURE D5:

- oo DSARC II on January 21, 1975.
- oo DSARC III in October 1977.

- o Financial guidance that RDT&E Development Estimate (FY76-80) was for $663.5 million.

On December 26, 1974 a "For Comment" draft of DCP #143 was submitted to OSD. Issues discussed in this DCP were as follows:

- o Is the requirement for ACF valid and will an operational version of the YF-16/YF-17 meet the requirements?
- o Are the LWFs ready for FSD?
- o Will the cost of the ACF compare favorably to that of current operational fighters?
- o What are procurement implications of ACF?
- o What is the projected impact on the tactical force structure and Air Force resources?
- o Have Navy requirements for an ACF been accomodated?

On January 13, 1975 the Secretary of the Air Force announced that the General Dynamics F-16 had been selected and the FSD contract was awarded. DSARC II pre-briefs were given on January 15, 1975 at Hqtrs AFSC to the Vice Commander and DCS/Systems and then to the Air Staff (DCS/RD). On January 16, 1975 DDR&E (T&E) was given a program briefing with detailed presentation on test plans up to DSARC III. The CAIG briefing was conducted on January 21, 1975 as originally planned in the PMD.

It is not clear exactly when the DSARC II meeting slipped. However, it appears that the slip was associated with the configuration to be pursued in FSD. A DDR&E memo to SAF/RD on January 21, 1975 requested a "missionization review" with the staff prior to the DSARC. The memo indicated that DSARC should be rescheduled to February 6, 1975 to allow the additional time for the additional review: on January 22, 1975 the Air Staff issued the following revised DSARC preparatory schedule:

January 27	-	DSARC Pre-Brief, Air Staff Directors level
January 27	-	DSARC Pre-Brief, Air Staff DCS level
January 30	-	DSARC Pre-Brief, SAF/RD & SAF/IL
February 3	-	DSARC Pre-Brief, SAF and CSAF
February 4	-	DSARC Pre-Brief, OSD Staff
February 6	-	DSARC

On January 24, 1975 a meeting between OSD and Air Staff personnel was held to discuss the ACF configuration rationale. Details from this meeting are not available but the following was obtained from subsequent OSD memos:

- o PA&E (Jan 27, 75): Emphasized optimizing the aircraft for visual range air superiority role while maintaining minimum equipment for ground attack. Pointed out that the austere (Config. A) configuration meets this but Air Force is proposing a more multi-mission configuration (Config. B).

- o ASD/I&L (6 Feb 75): Indicated feeling that original objective of ACF program was a weapon system with superior operational readiness. Therefore, concluded ACF must be unsophisticated and highly reliable and maintainable. "Excessive sophistication and resultant reduced quantities is currently one of our most glaring deficiencies. Just how big a step in the right direction" will the ACF represent?

- o General feeling that cost would be a primary criterion for a number of foreign countries in deciding on the F-16.

The F-16 Configuration Steering Group met on February 19, 1975 to review the issue of fuselage extension, increased wing area and ejection seat selection. Additional Air Staff and OSD staff level briefings occurred between February 24 and 28, 1975 to discuss the proposed changes to the aircraft design and the revised schedules. In an Air Staff message to AFSC/SD on March 3, 1975, it was indicated that OSD supported the fuselage stretch and wing area increase to provide a common airframe for F-16A and F-16B (two seat trainer). It was also indicated that OSD supported the air-to-air radar capability planned for the aircraft. However, the inclusion of significant ground attack capability, including radar ground mapping and the management of the ECO allowance, would be an issue at the DSARC unless resolved before the new date of March 11, 1975. On March 7, 1975, a briefing was given to DDR&E (T&E) to review the changes to the test program due to configuration changes, and the "For Coordination" draft of DCP #143 was submitted to OSD on March 10, 1975. The DSARC II was held on March 11, 1975. (See Table D1 for attendees). The FSD and production schedules are shown in Figures D6 and D7, respectively.

It appears that during the DSARC II preparations, a decision was made to reduce the number of FSD aircraft from 15 to 8. This reduction was primarily the result of a decision to fund operational test and evaluation aircraft with production funds rather than development funds. Figure D6 shows the 15 FSD aircraft contract award, while Figure D7 shows the revised allocation. The following summarizes the proposed RDT&E budget:

($ M)

FY	75	76	7T	77	78	79	80	TOTAL
75$	32.0	201.0	60.6	138.7	61.1	7.9	2.2	503.5
TY$	32.0	221.1	69.7	167.8	76.4	10.3	3.0	580.3

TABLE D1
F-16 DSARC II
ATTENDANCE
March 11, 1975

Secretary of Defense J. Schlesinger*

ODDR&E
Dr. M. Currie (Chairman)
B/Gen C. Spence
Col. T. Davies
G. Sutherland
R. O'Donahue

D/DDR&E(T&E)
L/Gen. A. Starbird
B/Gen. W. Witlatch
Col. W. Twinting

AIR FORCE
F. Shrontz, ASAF(I&L)
Dr. W. LaBerge, ASAF(R&D)
Mr. J. Martin, ASAF(R&D)
Gen. D. Jones
L/Gen. W. Evans, AFRD
M/Gen. A. Slay, AFRDQ
L/Gen. J. Hudson, AFSC
B/Gen. H. Leaf, AFTAC
Col. C. Spangrud, AFLG
Col. T. Swalm, AFTAC
L/Col. M. Jones, AFSC
L/Col. T. Woods, RDPM
L/Col. R. Orr, TAC

Briefers
Col. W. Thurman, F-16 SPO
G. Myers, ASD
L/Col. J. Gentry, RDQRT
L/Col. E. Bracken, RDQRT
L/Col. F. Dent, AFTAC
L/Col. M. Loh
Maj. L. VanPelt

OASD(I&L)
A. Mendolia
J. Gansler
F. Myers
D. Babione
Dr. Bennett
J. Smith

OASD(C)
T. McClary
N. Eaton
S. Trodden

NAVY
VAdm. W. Houser, OP-05
B/Gen. P. Shutler, MARCORPS
Capt. G. Kelly, OP-98
Capt. H. Halleland, PM VFAX

JCS
RAdm. R. Hilton
L/Col. J. Voorhees (AF)

OASD(PA&E)
L. Sullivan
E. Pyatt
T. Christie
R. Croteau
G. Hall

CAIG
M. Margolis
L/Cdr. D. Pilling
H. Manetti

* Mr. B. West, Assistant to SecDef.
L/Col. Graves, OSD

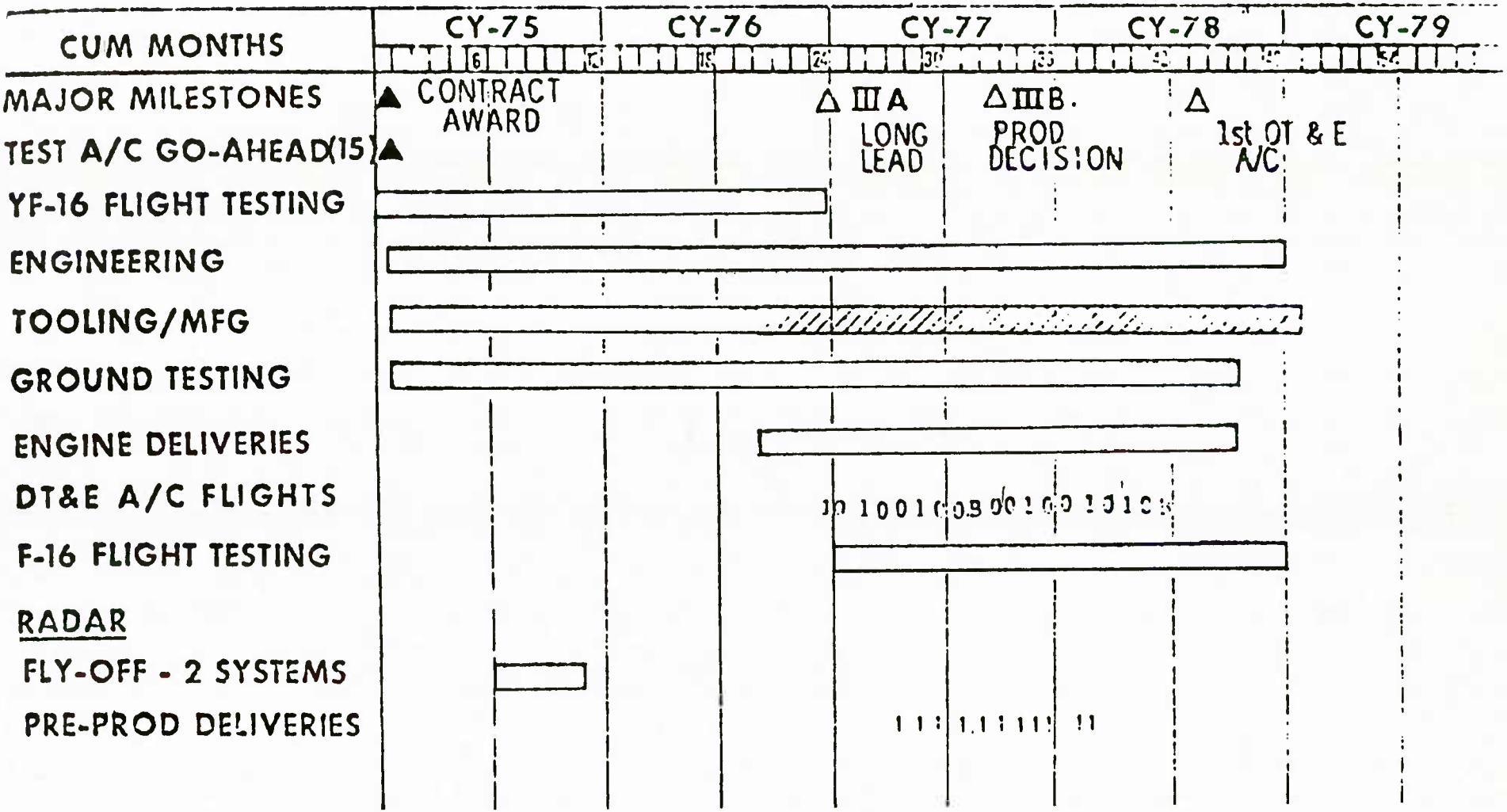

CUM MONTHS
CY-75
CY-76
CY-77
CY-78
CY-79
MAJOR MILESTONES
CONTRACT AWARD
III A LONG LEAD
III B. PROD DECISION
1st OT & E A/C
TEST A/C GO-AHEAD(15)
YF-16 FLIGHT TESTING
ENGINEERING
TOOLING/MFG
GROUND TESTING
ENGINE DELIVERIES
DT&E A/C FLIGHTS
F-16 FLIGHT TESTING
RADAR
FLY-OFF - 2 SYSTEMS
PRE-PROD DELIVERIES

FIGURE D6

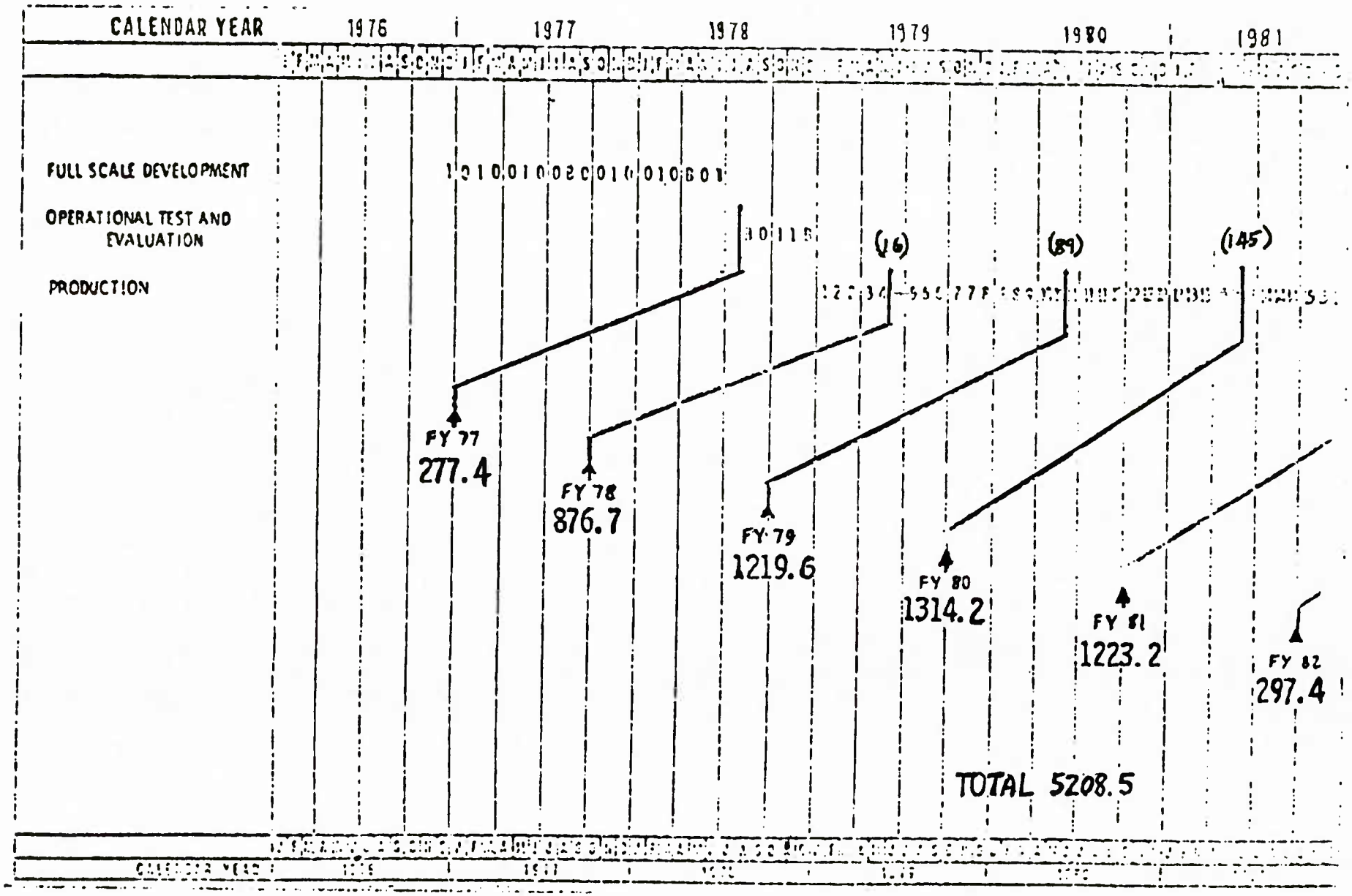

CALENDAR YEAR
1976
1977
1978
1979
1980
1981
FULL SCALE DEVELOPMENT
OPERATIONAL TEST AND EVALUATION
PRODUCTION
(16)
(89)
(145)
FY 77
277.4
FY 78
876.7
FY 79
1219.6
FY 80
1314.2
FY 81
1223.2
FY 82
297.4
TOTAL 5208.5

FIGURE D7

There were doubts within OSD about the financial feasibility of the baseline configuration (Config. B). The CAIG indicated the relative aggreement of its DTC cost estimate of $4.9M (FY 75$) with the Air Force estimate of $4.7M (650 aircraft procurement). The largest difference was attributed by the CAIG to its higher avionics estimate. ASD/PA&E emphasized that airframe weight and avionics cost had increased substantially since 1973. PA&E suggested an austere configuration to yield significant savings. It was felt that DOD had to exercise strong configuration control over program cost.

On March 14, 1975, a briefing that was very similar to the DSARC presentation was given to the Cannon Tac Air Subcommittee of the Senate Armed Services Committee. On March 21, 24 and 25, 1975, follow-up meetings and discussions between AFSC and OSD/I&L were held on the subject of reliability requirements and the reasons for the differences between the F-15 and F-16 programs.

The Air Force was informally provided a draft of the Secretary's decision memorandum on March 25, 1975. During the next seven days discussions were held between the Air Staff and OSD staff and there are indications that the proposed wording of the decision memo was reviewed by Air Force Chief of Staff. The discussions indicated the following positions:

- Aircraft configuration presented and program plan was approved by OSD. Air Force naturally took no exception.
- OSD expressed concern about possible delay in full qualification of radar system. Air Force plan was to accept initial production aircraft without radars, if required.
- OSD concerned that Air Force would misuse ECO funds to increase avionics and/or performance capability of F-16. Air Force position was that ECO funds would be used to improve safety, correct deficiencies, and effect cost savings.

On April 9, 1975 a contract change order was issued to General Dynamics to reduce the number of DT&E aircraft from 15 to 8 (6 A's and 2 B's); to stretch the fuselage by ten inches; and to increase the wing area to 300 square feet (approximate 20 additional square feet).

In memorandum of April 21, 1975 the DepSecDef approved the FSD contingent upon inclusion of the following:

- Provide a program plan to acquire aircraft with reduced avionics suite.
- Fund a reliability improvement program.
- Continue to conduct trades of capabilities vs. costs.

- Take a close look at GFE vs. CFE (issue of total responsibility against cost).

- Cost reduction program for F-100 engine.

- Commitment tied to meeting DTC objectives. (DTC defined as $4.5 M in FY75$'s, flyaway cost on 650 aircraft, tooled to 10/month and learn to 15/month with 15% 2 place aircraft).

The Secretary of the Air Force responded on May 14, 1975 to the DepSecDef Decision Memo. In his memo, the Secretary stated the following:

- Believed that "recent discussions with OSD staff had removed considerable misunderstanding and provided a greater appreciation of the F-16 reliability program".

- The F-16 configuration was based on "Tactical Air Force requirements and provides only the capabilities considered essential for the fighter which must replace the F-4 in the next decade". The F-100 Engine CIP was ongoing and proposals which promise cost reduction are being evaluated.

- Pulse doppler radar was an essential part of the avionics package. It is the only new avionics subsystem being developed and is based on proven technology. Radar development has been structured to provide positive indications of attaining full target reliability on schedule.

- Confident that the F-16 cost, performance, and reliability goals will be achieved.

- Plan to brief the DSARC principals when the ongoing negotiations with the prime contractor are completed.

On December 9, 1975 the DDR&E, in a memo to the Ass't Secretary of the Air Force (R&D), requested a briefing on the F-16 with emphasis on plans for R&M goals as tasked in the DepSecDef memo of April 21, 1975. The suggested briefing date was December 17, 1975. The briefing was actually conducted on December 22, 1975 with the bottom line being "We are doing what you directed we do!"

Program Management Directive (PMO #R-Q 6075(1)/64229F) dated March 3, 1976 superseded the PMD issued in December 1974 and became the formal direction for FSD and production planning. The document provided the following:

- Significant Milestones--

  - DSARC IIIA January 1977

oo DSARC IIIB September 1977

- o F-16 Production Configuration was defined.
- o Program management content was specified, to include "Blueline Reporting" per AFR 800-2.
- o Operational Requirement - TAFROC 303-76, February 26, 1976.
- o Actions/Reports identified with due dates in support of Milestones IIIA & IIIB.
- o Financial Plan:

FY 77 Presidents Budget (TY $M)

	FY 75	76	7T	77	78	79	80	81	TC	TOTAL
RDT&E	32.0	215.7	69.7	259.1	69.3	12.3	1.0	-	-	659.1
Proc ($)				360.1	1058.9	1193.8	1283.1	1173.4	325.6	5395.4
(Qty)				16	89	145	175	180	45	650

The above Financial Plan is consistent with the initial SAR that was submitted on December 31, 1975 which showed a Development Estimate of $6054.5 million for the total program.

C. Initial Production

The issuance of PMD # R-Q 6075(1)/64229F on March 3, 1976 basically marked the end of the initiation and definition of Full Scale Development, and the start of the activities for a production decision. The Program Office had been growing steadily in size since the initiation of FSD in January 1975. (See Figure D8 for estimate of Program Office assigned personnel).

On May 3, 1976 Brigadier General James A. Abrahamson became the Program Director. By this time, specific planning actions were ongoing to obtain decisions on the initiation of the production phase of the F-16 program. The "For Comment" draft of the DCP was submitted to OSD on May 18, 1976. This draft was an update of the March 10, 1975 issue that was submitted to support the DSARC II Review.

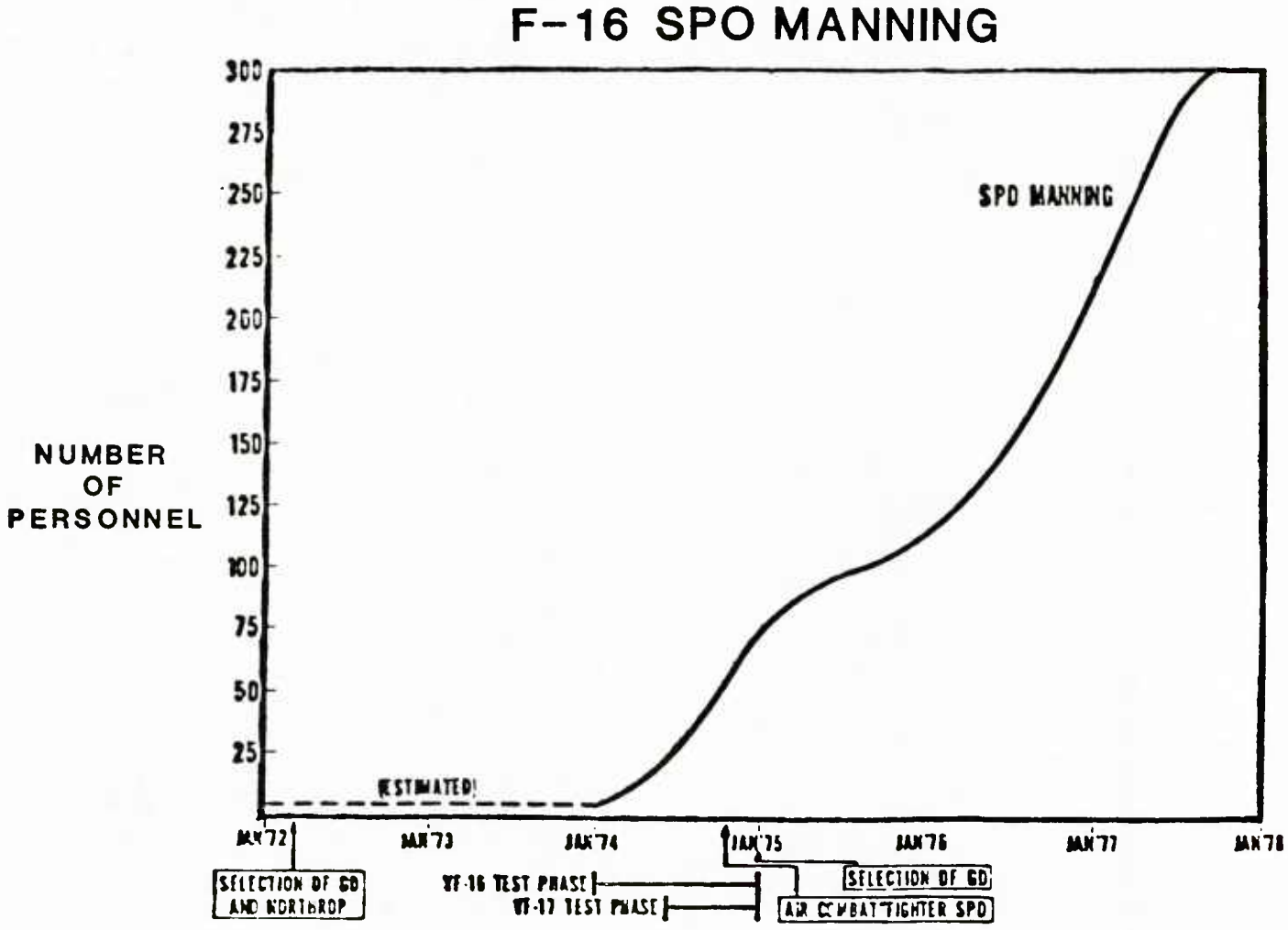

F-16 SPO MANNING
NUMBER OF PERSONNEL
300
275
250
225
200
175
150
125
100
75
50
25
SPO MANNING
ESTIMATED
JAN'72
JAN'73
JAN'74
JAN'75
JAN'76
JAN'77
JAN'78
SELECTION OF GD AND NORTHROP
YF-16 TEST PHASE
YF-17 TEST PHASE
SELECTION OF GD
AIR COMBAT FIGHTER SPO

FIGURE D8

Although the DSARC IIIA Review was not scheduled until January 1977, the European Long Lead Release was required by June 1976. The following briefing schedule was accomplished to obtain concurrence in exercising the European options for tooling and long lead material using European funds:

May 28, 1976	-	ASD Council
June 1, 1976	-	AFSC, DCS Level
June 2, 1976	-	AFSC, Commander
June 2, 1976	-	Air Staff, DCS/R&D
June 3, 1976	-	Air Force Council
June 4, 1976	-	Secretary of the Air Force
June 8, 1976	-	OSD Staff
June 10, 1976	-	DSARC Principals- Dr. Currie's Office

It appears that during the Summer/Early Fall of 1976, cost growth in the program was being encountered. In a memo of October 6, 1976, to the Ass't Sec of the Air Force (R&D), DDR&E requested a briefing to review program costs. This meeting was requested for November 3, 1976 even though the DSARC IIIA was scheduled to occur within sixty days thereafter. The Air Force pre-reviews occurred in late October 1976 and the review with OSD occurred November 3, 1976. The briefing summarized the program status and reviewed the schedule shown in Figure D9. The program's financial plan was discussed, and the briefing concluded with a review of the considerations for release of the long lead funding at the Milestone IIIA. Air Force then recommended that this November review replace the DSARC IIIA in January 1977 since the next two months would not provide enough additional information on which to make a decision. OSD disagreed and held for the formal review in Janaury 1977.

The month of December 1976, was a very busy one for the program. In fact, the last six months of 1976 placed a heavy briefing demand on the Program Office. The Program Control Office documented 58 specific scheduled briefings that the SPO supported during this time period. The following summarizes some of the activies for December 1976: this is not an all inclusive list since dates of many of the prebriefs could not be determined:

PROGRAM OVERVIEW

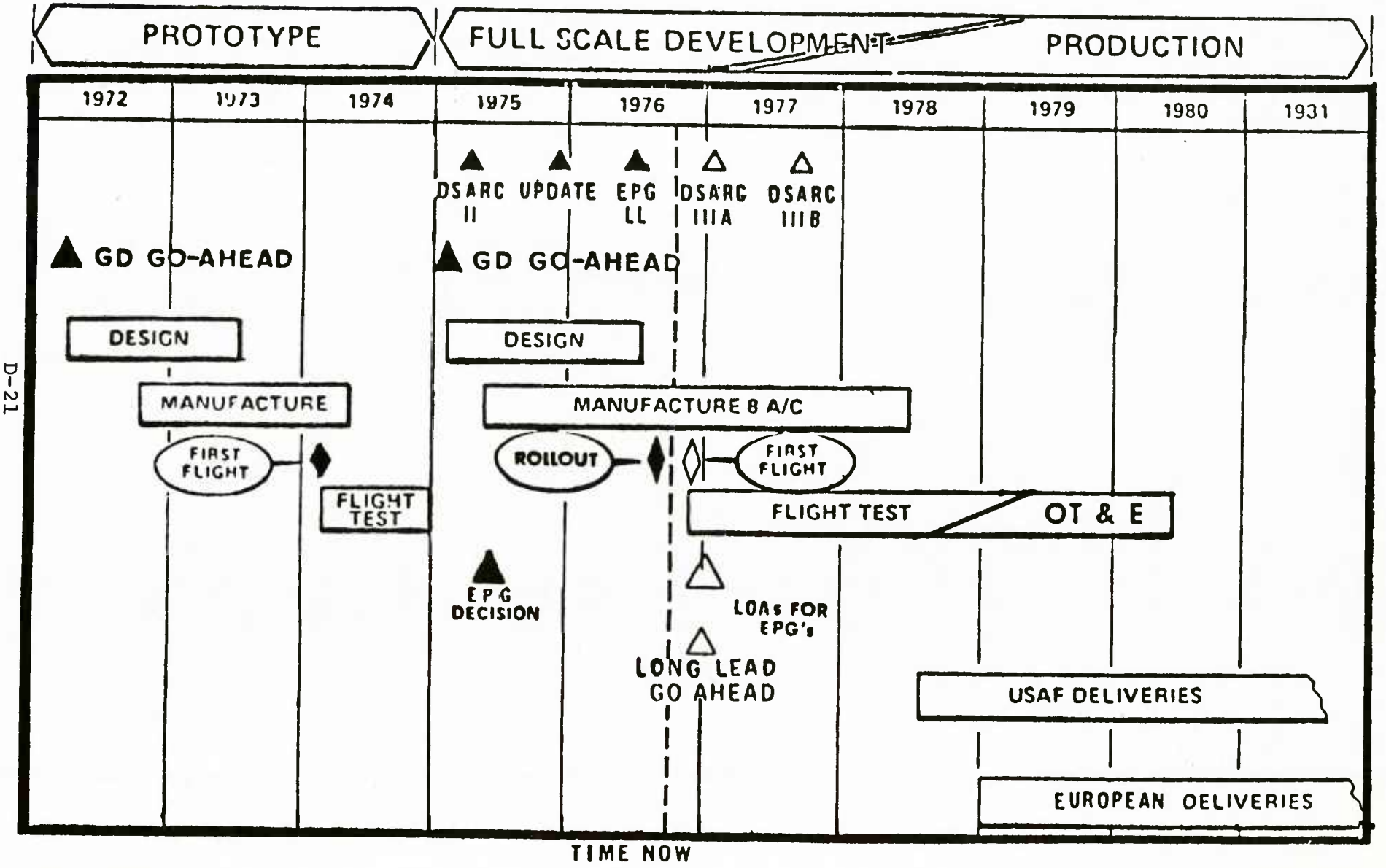


FIGURE D9

December 6, 1976 (week of) - OASD/I&L Staff Production Readiness Reviews Briefings at SPO. Staff also visits G/D and interviews 36 people.

December 7, 1976 - CAIG Review

December 15, 1976 - "For Coord" DCP submitted to OSD

December 15, 1976 - Cost Trade "DSARC II to DSARC III" Briefing to OSD

December 21, 1976 - DCS/RD Pre-Brief on T&E

December 22, 1976 - Briefing to DDR&E (T&E)

December 23, 1976 - OSD/MRA&L distributes DCP to staff for final coordination.

December 27, 1976 - Pre-AFSARC review

December 29, 1976 - AFSARC Review

January 4, 1977 - DSARC IIIA Review (See Figure D10 for Attendees)

The DCP submitted for this review addressed three basic issues: Cost, Concurrency, and Production Readiness. The following briefly discusses each item:

- Cost: Table D2 shows the Resource Annex from DCP #143, dated December 15, 1976. Since DSARC II, RDT&E had an apparent cost growth of over 50%. This growth was attributable primarily to definition of the Avionics Intermediate Shop (AIS), inflation, and new tasks. Figure D11 provides total cost track. The 30% apparent cost growth in production for the original 650 aircraft, was primarily associated with AIS and other AGE increases, new tasks, and inflation. Figure D12 provides cost track to include the additional 738 production aircraft. The DCP assessment was that the F-16 was a much lower cost aircraft in comparison to F-15 and F-18, and that the O&S cost estimate was basically unchanged since DSARC II.

- Concurrency: At the DSARC II it was recognized that there was a significant degree of concurrency. Approval at DSARC II was an implicit agreement with this program structure. The plan called for long lead production release in January 1977 and full release in October 1977. Financial commitment for long lead was envisioned at less than $70 million. It was also realized that little testing would be expected before this release.

ASD(I&L)
Mr. Babione (Chairman)
Mr. Gansler
Col. Martin
Mr. Smith
Lt. Col. Dillon

ASD(ISA)
Mr. Janka
Col. Preston

DD(T&E)
Gen. Lotz
Adm. Kolmorgen
Col. Twinting

JCS
B/Gen. Winger
Lt. Col. Miller

DDR&E
Dr. Currie
Mr. Stoney
Mr. Sutherland
Lt. Col. Davey

D(P&E)
Mr. Buc
Mr. Croteau

CAIG
Mr. Margolis
Mr. Manetti

ASD(C)
Mr. Wacker
Mr. Speck
Mr. Dominquez

AIR FORCE
Mr. Knapp
Dr. Martin
Mr. Payne
Mr. Keegan
Gen. Evans
Lt. Gen. Poe
Lt. Gen. Hails
Lt. Gen. Slay
B/Gen. McMullen
B/Gen. Abrahamson
Lt. Col. Blake
Maj. Guarino
Mr. Fishburn
Gen. Henry

FIGURE D10
F-16 DSARC III
Attendance
January 4, 1977

TABLE D-2

F-16 RESOURCE ANNEX
(Then Year Dollars - Millions)

	FY-7Q & Prior	FY-77	FY-78	FY-79	FY-80	FY-81	FY-82	To Complete	Total
RDT&E									
Quantity									8
Transition	8.0								8.0
Airframe	197.6	147.5	112.2	41.5	7.0	1.1	1.1		508.0
Engine	40.2	13.9	8.3	2.3					64.7
Radar	36.0	32.0	8.9	4.1					81.0
AGE, Tng, Data, Test, Support & Other Govt Costs	35.5	65.7	63.4	42.0	13.3	5.1	4.4		229.4
Total	317.3	259.1	192.8	89.9	20.3	6.2	5.5		891.1
PROCUREMENT									
Quantity		0	105	145	175	180	180	603	1388
Air Vehicle		0	1085.3	1154.4	1211.2	1231.1	1242.3	4445.7	10370.0
Recurring		0	(991.5)	(1131.5)	(1192.0)	(1212.8)	(1230.0)	(4437.0)	(10194.8)
Non-Recurring		0	(93.8)	(22.9)	(19.2)	(18.3)	(12.3)	(8.7)	(175.2)
Peculiar Support		0	345.8	180.9	181.5	181.4	185.3	652.1	1727.0
Advance Buy (Net)		174.9	-137.2	10.4	-.4	.1	3.3	-51.1	- 0 -
Initial Spares		65.3	208.8	106.4	96.0	73.7	75.8	219.2	845.2
TOTAL		240.2	1502.7	1452.1	1488.3	1486.3	1506.7	5265.9	12942.2

DSARC II TO DSARC IIIA FSD COST TRACK

($ IN MILLIONS)

DSARC II (MAR75) (FY-75$)		$504.0
COST GROWTH ON BASIC TASKS	+ $36.0	
AIS & SUPPORT TASK IDENTIFICATION	+ 129.2	
TRAINING/DATA ESTIMATE CHANGE	+ 11.2	
NEW TASKS	+ 46.7	
TOTAL INCREASE		223.1
DSARC IIIA ESTIMATE (FY75 $s)		727.1
ESCALATION (76.3M IN DSARC II) (THEN YEAR $)		164.0
TOTAL DSARC III A TY ESTIMATE		$891.1
DCP THRESHOLD (THEN YEAR $)		$980.2

FIGURE D11

PROCUREMENT COST TRACK

($ IN MILLIONS)		
DSARC II (650 A/C)		$3,305.3
BASIC AIR VEHICLE	$41.5	
AGE INCREASE	202.7	
TRAINING/DATA INCREASE	224.0	
NEW TASKS	154.5	
PBD ACTIONS	(18.0)	
TOTAL INCREASE		$ 604.7
DSARC IIIA		$3,910.0
ESCALATION ($1,435.7M IN DSARC II)		2,103.9
TOTAL DSARC IIIA (650 A/C) (THEN YEAR)		$6,013.9
ADDED QUANTITY & SUPPORT (THEN YEAR)		6,083.1
INITIAL SPARES ($496.0M IN DSARC II) (THEN YEAR)		845.2
TOTAL DSARC III A (1388 A/C) (THEN YEAR)		$12,942.2
DCP THRESHOLD (THEN YEAR)		$14,236.4

FIGURE D12

- o Production Readiness: DCP identified concern in the area of cost/schedule impact of FMS add-ons occurring too early in the program to permit an orderly, cost-effective rate build-up at G/D Ft. Worth and U.S. subcontractors. Stated that this should be avoided in the future by strictly adhering to the approved F-16 FMS Master Plan.

The current plan now called for $174.9 million prior to the Milestone IIIB. The Europeans had already released $166 million and would release another $317 million prior to September 1977. The DCP observed that this European commitment overshadowed the "production decision" on the U.S. program. The DCP concluded that schedule concurrency was high, but technical risk was high only in the radar program.

The F-16 configuration proposed for production had changed very little since the initiation of FSD. Figure D13 summarizes the major subsystems of the F-16 and annotates the changes since the last milestone. The T&E Assessment issued on December 30, 1976 indicated that the program was low in technical risk and that planned testing prior to DSARC IIIB, if successful, is adequate. On January 4, 1977 the CAIG report indicated that the SPO estimate was reasonable. The report did recognize the cost growth in development and basically agreed with the SPO as to the various causes.

At the DSARC Review on January 4, 1977, cost was one of the major issues considered. The principal question centered on whether the cost of the F-16 program was consistent with the intent that it would be the low element in the high/low fighter mix concept. The Air Force presented data that confirmed that the F-16 program still provided an aircraft that compared "very favorably" with other tactical aircraft and still represented the low cost option.

The draft decision memorandum was reviewed and agreed to by the Air Force on January 26, 1977 and was subsequently signed by the DepSecDef on March 22, 1977. The decision memorandum released $166.7 million in production funds and $65.3 million for initial spares. Concern was expressed with regard to program risk caused by early third country sales and indicated a need to keep this under close control. The Secretary questioned the cost effectiveness of the Full Mission Simulator and requested the Air Force report back within 90 days to review the rationale. DCP #143 (dated Dec 15, 76) was updated to reflect current status and the DSARC IIIA decision and was resubmitted to OSD in May 1977.

The delay in issuing the decision memorandum seems to have centered around the issue of the DTC definition. Several elements of the OSD staff wanted the DTC goal to include non-recurring flyaway cost. This issue was not resolved by the issuance of the DSARC III decision memo. Therefore, the Secretary of the Air Force, in a memo to SecDef on April 28, 1977, reiterated the Air Force position. It would take several

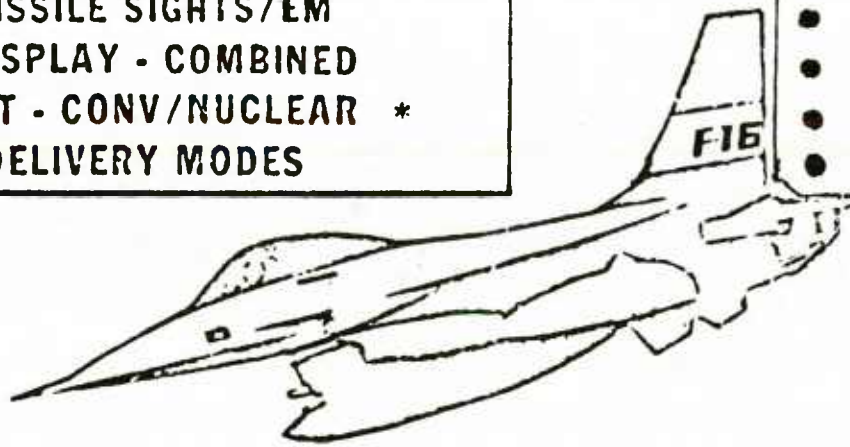
F16 CONFIGURATION

FIRE CONTROL SYSTEM

- RADAR - A/A - LOOKUP/LOOKDOWN
  A/G - MAP/BEACON/RANGING*
- COMPUTER - MUX/OP FLT PGM
- HUD - GUN/MISSILE SIGHTS/EM
- RADAR/EO DISPLAY - COMBINED
- STORES MGMT - CONV/NUCLEAR *
- AUTO WPNS DELIVERY MODES

ARMAMENT

- NINE EXTERNAL STATIONS
- 20MM GUN/515 ROUNDS
- AIM-9J/L - 6 STATIONS
- GEN PURPOSE BOMBS
- MINES/DISPENSERS
- LASER/EO PREC.WPNS
- NUCLEAR WPNS *



COMM/NAV

- UHF/VHF RADIOS
- INS/TACAN/ILS
- A/G IFF

OPERATIONAL FEATURES

- INTERNAL ENGINE START
- AIR REFUELING
- AUTOPILOT
- FUEL TANK INERTING
- TAIL HOOK
- ADV EJECTION SEAT
- BACKUP ENGINE CONTROL*

ELECTRONIC WARFARE

- RWR - COMPASS TIE/SAIL
- POWER MANAGEMENT
- POD CARRIAGE
- CHAFF/FLARE DISPENSER
- INTERFERENCE BLANKER

*** CHANGED SINCE DSARC II**

FIGURE D13

more months before DDR&E would agree with the Air Force position, thereby closing the issue on July 5, 1977.

D. Full Rate Production

Because the time between the DSARC IIIA and DSARC IIIB was so short, it is difficult to determine when actions were completed from one review and preparation started for the next. As indicated above, DCP #143 (dated Dec. 15, 1976) was updated and resubmitted to OSD in May 1977 to reflect the Milestone IIIA decision. By about this same time, the Commander, AFSC was becoming concerned about the workload demands on the Program Office. In letters to the Commander, Tactical Air Command (TAC) and to the Vice Chief of Staff of the Air Force, he indicated that a lot of work needed to be done to prepare for the DSARC IIIB. He felt that other major, internal Air Force Reviews should be postponed until after the DSARC IIIB. However, as an alternative, he recommended what he called a "Command Review" of the DSARC IIIB briefing and other key related briefings. The Vice Chief accepted the recommended alternative on June 3, 1977 and requested that AFSC take the lead.

The following summarizes the schedule associated with this major Air Force internal review (subsequently called Super PAR):

August 9, 1977 - Initial Review by Colonel level from various AF Commands (Deputy Program Managers briefs.

August 29, 1977 - Review by Vice Commanders, AFSC and TAC (believe AFLC and ATC also present)

September 9, 1977 - Pilot Training Pre-Meeting held to support "Super PAR"

September 14, 1977 - Review of IIIB Briefing by AF/RD, NATO principals attend.

September 19, 1977 - Final Preview of Presentations for "Super PAR"

September 22, 1977 - "Super PAR", believe Commanders from AFSC, TAC, AFLC, ATC in attendance.

Other activities were ongoing concurrently with the above, which impacted not only on the DSARC preparation but the content of the Super PAR. On August 17, 1977 PMD Amendment #3 was issued. This document updated guidance and direction on both FSD and production. Specifically in production, the procurement objective was reaffirmed at 1388 aircraft with a build rate of 15 per month. Tooling for production was to be for 10 per month and learn to 15 per month. The DSARC IIIB review was still scheduled for September 1977. The FY 78 President's Budget and FY 79-83 POM were included (as shown below) for planning purposes. The

total procurement of $12431.3 million (without spares) indicated a cost growth of $334 million since the DSARC III.

F-16 FY 78 Presidents Budget & FY 79-83 POM (TY $M)

	FY 77&P	78	79	80	81	TC	TOTAL
RDT&E	576.4	192.8	89.8	20.3	6.2	5.5	891.1
Proc.	174.9	1293.9	1345.7	1498.8	1455.7	6662.3	12431.3
(Qty)	(0)	(105)	(145)	(175)	(180)	(783)	1388

$334M increase over FY 78 FYDP

On August 19, 1977 the Air Staff provided AFSC with a list of OSD developed issues for inclusion in the F-16 DCP. AFSC was requested to prepare a draft response for Air Staff and Secretarial coordination by August 26, 1977. The following is the list of issues:

F-16 DCP ISSUES
F-16 ISSUES ANNEX

ISSUE: PLANT MODERNIZATION

- o Is the modernization of Air Force Plant 4 a cost effective undertaking for the U.S. Air Force?
- o What would be the cost savings to the USAF/EPG?
- o How would this modernization be funded, i.e., Government or corporate ownership? Discuss pros and cons.
- o What contractual provisions would be necessary to incentivize the contractor to participate in a modernization program?

ISSUE: COST IMPACT TO THE U.S. DUE TO MULTINATIONAL FIGHTER PROGRAM

- o Identify the net cost effects of F-16 co-production. This analysis should include not only acquisition costs, but also operating and support costs where possible.

ISSUE: F100-(3) STALL/STAGNATION

- o What progress has been made in resolving the F-100-(3) stall/stagnation problems?
- o What are the F-16 program implications of the stall/stagnation problem from a cost, schedule, and safety viewpoint?
- o What are the operational implications of the stall/stagnation problem?

ISSUE: RADAR

- o What progress has been made in resolving the F-16 radar false alarm problems and doppler beam sharpening problems?
- o What are the program implications of these problems?
- o In the event solutions to radar technical problems are not satisfactory, what alternative plans are available? (Ref DSARC II Decision Memorandum, 21 Apr 75)

ISSUE: AIS TECHNICAL DEVELOPMENT AND SCHEDULE RISK

- o What are the cost and schedule risks associated with the AIS development program, considering the advanced technology and concurrency in the program?
- o What are the back-up support alternatives in case of delivery slippage?

ISSUE: SLIP OF DSARC IIIB MILESTONES

- o What are the technical, schedule and cost implications of the slippage of any scheduled DSARC IIIB milestones beyond the DSARC such as:
  - oo Aircraft Structural Durability Test (one lifetime)
  - oo Aircraft Structural Damage Tolerance Testing (two lifetimes)

  (No issue if all milestones are met)

ISSUE: F-16 PERFORMANCE THRESHOLDS

- o What are the technical, schedule and cost implications of any performance thresholds not met? (No issue if all thresholds are met).

ISSUE: RIW/MTBF/O&S COSTS/SPARES ACQUISITION

- Since USAF had not determined which LRUS would be part of the MTBF/RIW-MTBF contract until just before the option was executed, it is apparent that any previous assessment of cost of initial/replenishment spares and O&S costs was incomplete. Air Force, armed with the executed MTBF/RIW-MTBF contract, should now be able to spell out the initial/replenishment spares offsets and reassess system MTBF and O&S costs at maturity.

The response to this tasking could not be located from available files. It is interesting to note that this list of issues was contained in the DSARC "Blue Books" - reference books provided to the DSARC principals at the time of the Review.

During the month of September a specific series of briefs were provided on the subject of Production Readiness Review. Between September 7 and 15, 1977, six presentations were given to various staff levels ending at OSD/I&L (Gantzler). The month concluded with another "For Coordination" draft of the DCP being submitted to OSD on September 28, 1977 and the EPG being invited to attend the DSARC IIIB Review.

The following extract, from the Program Manager's Monthly Report to the Secretary of the Air Force as of October 1, 1977, provides an insight into the degree of activity ongoing at that time:

> "...to fully communicate this very complex program's status and to insure that it is well understood at all levels within the Air Force and OSD, we have initiated a series of DSARC 'pre-cursor' briefings. The following have already been presented through each level of command to key OSD staffs: Logistics, Production Readiness, detailed engineering, T&E summary (includes an in depth engine briefing), and the ICA. The F-16 Business status will be presented this week."

The AFSARC was held on October 6, 1977. Specific details on this meeting were not available. The OSD (T&E) assessment issued on October 6, 1977 indicated that "based on results to date and satisfactory completion of tests planned, no apparent technical or design problems which preclude release to rate production". On October 7, 1977, a "fast-faxed" handwritten note from the Air Force PEM to the SPO indicates that OSD/I&L had identified the following issues which may arise at the DSARC IIIB on October 11, 1977:

- Sortie Generation.
- Manpower Estimates.
- BIT/AIS Relationship.

- o Abilities of EPG support to maintain their flight hours.

- o DTC goal -- did it or did it not contain non-recurring costs?

Another "fast-faxed" note from the PEM to the SPO prior to DSARC IIIB stated that "Informal discussion with OSD indicates following will be issues at IIIB: Engine stall/stagnation; Radar false alarms; AIS Technical Development and schedule risk". The DSARC IIIB was held on October 11, 1977. A memo by the Program Director, on this same date, stated that the review "went well" but there were a few surprise questions and there would be some follow-on action items.

On October 26, 1977 the Program Office was requested to review and comment on the draft decision memorandum (SDDM). The Assistant Secretary of the Air Force provided concurrence to USDR&E on November 5, 1977. Concurrent with the staffing of the SDDM, OUSDR&E was circulating the Air Force's written responses to the OSD developed DSARC IIIB issues for comment/recommendations on inclusion of these responses in a revised DCP. Irrespective of the above actions, USDR&E forwarded on November 18, 1977 DCP #143 (dated Sept. 28, 1977) to the Secretary of Defense with recommendation for approval. This document was the updated version that included the DSARC IIIA decision and current status as of September 1977. The DCP was signed on November 29, 1977; however, this was not the DSARC IIIB decision. The rate production decision was issued in a DepSecDef memorandum of December 7, 1977.

The SDDM approved release of the FY 78 procurement funds and authorized the program to enter into full rate production. The memorandum reported the early DSARC IIIA concern about the complexity of this co-production program and cautioned that future sales should adhere to the FMS Master Plan. The following specific tasks were requested in order that the OSD staff could "keep abreast of future developments":

- o Take necessary management steps to stay within development and production cost thresholds in the DCP. Report potential breaches to USDR&E.

- o Present a cost reduction status briefing to USDR&E within six months.

- o Schedule OSD reviews to assess production readiness of those program elements whose design is not currently stabilized. (radar, stores management set, AIS)

- o Report to DUSDT&E test results from proposed F-100 engine modifications.

- o Report to DUSDT&E results of tests to verify adequacy of early fixes and permanent design fixes required to correct airframe cracks.

- o Current aircraft performance should be preserved through application of rigourous weight control program. This should be achieved without adding program cost.

- o Defer procurement of weapon system trainer until further tests validate concept. Coordinate this effort with PA&E.

- o O&S manpower projections increased significantly since DSARC IIIA. Within 6 months review with MRA&L total manpower projections in order to identify manpower reduction opportunities.

- o Present an analysis within 2 months to MRA&L on cost tradeoffs and risks associated with Engine Health Monitor and Diagnostic System.

- o Within 6 months, present an analysis to MRA&L on a series of issues that affect sortie rates.

- o Revise DCP and resubmit by January 31, 1978.

The Air Force submitted the updated DCP to USDR&E on May 8, 1978. The Resource Annex in this issue indicates that the total Procurement Program for 1388 aircraft was now $14,078.5 million - approximately $1,100 million more that at DSARC IIIA. (See Table D3). This document was subsequently released to the OSD staff for coordination on June 8, 1978. There is no indication that the DCP was approved. Other actions from the DSARC IIIB could not be tracked specifically but there are indications that by September 1978 general agreement was reached that all action items were complete. On September 13, 1978 PMD Amendment #4 was issued. This document updated guidance on both FSD and full rate production.

TABLE D-3

F-16 RESOURCE ANNEX

(Then Year Dollars in Millions)

	FY 77 & Prior	FY-78	FY-79	FY-80	FY-81	FY-82	FY-83	TO COMPLETE	TOTAL
RDT&E									
Quantity	4							4	8
Transition	8.0								8.0
Airframe	424.6	94.4	37.2	20.2	4.2	3.3	3.9		589.2
Engine	49.9	12.0	27.1	15.8	0.5	0.5			105.4
AGE, Tng, Data, Test, Support, & Other Govt Costs	93.9	87.7	43.6	20.6	7.9	3.0			256.7
TOTAL	576.4	194.1	107.9	56.6	12.6	6.8	3.9		958.3
PROCUREMENT									
Quantity		105	145	175	180	180	180	423	1388
Air Vehicle		1051.8	1107.5	1350.8	1429.5	1394.2	1420.1	3629.3	11383.2
Recurring		(956.7)	(1091.5)	(1326.5)	(1391.3)	(1390.5)	(1417.2)	(3619.8)	(11193.5)
Nonrecurring		(95.1)	(16.0)	(24.3)	(38.2)	(3.7)	(2.9)	(9.5)	(189.7)
Peculiar Support		379.3	241.4	213.0	190.3	237.0	212.8	368.3	1842.1
Advanced Buy (Net)	174.9	-137.2	26.2	-8.2	2.0	1.0	2.9	-61.6	0.0
Initial Spares	76.7	197.3	111.5	87.6	91.4	76.6	81.6	130.5	853.2
TOTAL	251.6	1491.2	1486.6	1643.2	1713.2	1708.8	1717.4	4066.5	14078.5
PROGRAM TOTAL	828.0	1685.3	1594.5	1699.8	1725.8	1715.6	1721.3	4066.5	15036.8

IV. PROGRAM STATUS

The F-16 attained Initial Operational Capability (IOC) in October 1980. Production of the aircraft is on-going with the U.S. Air Force buying 120 per year at this time under a four year contract.

The F-16 Program Management Directive has undergone numerous revisions since DSARC IIIB, in October 1977, including the following major changes:

- o Procurement increased from 1388 to 2165.
- o Increased Capability (P^3I): The F-16 Multinational Staged Improvement Program (MSIP) is providing block change increases in aircraft capability. The MSIP program will result in basically three configurations of the F-16:
  - oo Current capability - the baseline F-16
  - oo Improved Air-to-Air capability - current capabilities plus improvements in air-to-air such as AMRAAM and radar updates.
  - oo Improved Air-to-Surface - the improved air-to-air configuration with additional air-to-surface capability such as LANTIRN.
- o Prototype demonstration of F-16E. Major airframe/wing change to improve weapons and fuel carriage. Configuration will provide increased range, payload, and penetration speed. Effort keyed to an FSD decision in 1st Qtr FY84 and production decision in 1st Qtr FY86.
- o The financial plan (as of the FY84 President's Budget) is as follows:

(Then Year Dollars in Millions)

	FY82&P	FY83	FY84	FY85	FY86	FY87	FY88	TO COMP	TOTAL
RDT&E	956.0	73.5	107.4	72.8	48.6	11.6	11.6	-0-	1,281.5
*Prod($)	8900.5	2246.6	2123.6	3164.5	3847.3	3926.7	4094.5	13909.0	42,212.7
(Qty)	(725)	(120)	(120)	(120)	(180)	(180)	(180)	(540)	(2,165)

*Includes Initial Spares.

APPENDIX E

ALCM
PROGRAM STUDY REPORT

I. SYSTEMS DESCRIPTION

The Air-Launched Cruise Missile (ALCM), designated AGM-86B, is a guided, subsonic air-to-ground missile. A small jet engine provides thrust for the cruise missile and wings provide aerodynamic lift, like an airplane. ALCM flies at low altitudes and is capable of carrying a nuclear warhead.

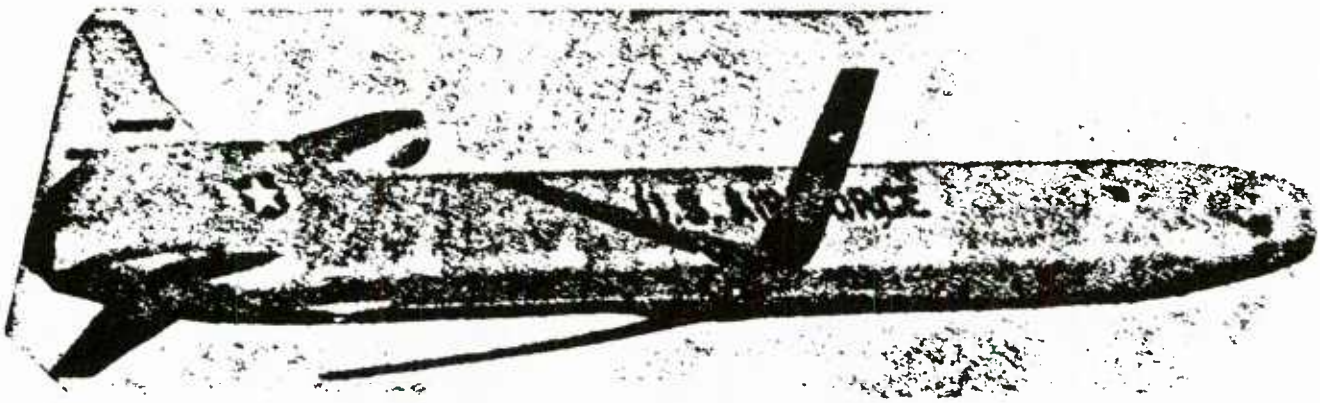
Before launch, the missile's engine inlet, wings and other control surfaces are retracted for compact storage and carriage. After separation from the launch aircraft, ALCM rapidly deploys its retracted elements, and the cruise engine ignites to sustain thrust. An internal guidance unit then directs ALCM to its target.

The sophisticated inertial navigation and terrain contour matching (TERCOM) guidance system keeps the missile on a programmed course. During flight, TERCOM periodically compares surface characteristics with terrain profiles stored in the system's computer to determine if the missile is on its proper course. The guidance system then makes appropriate course corrections, resulting in pinpoint accuracy.

A radar altimeter, barometric altimeter, inertial measurement unit and digital computer compose TERCOM's principal elements. The Air Force's Ground-Launched Cruise Missile (GLCM) and the Navy's Sea-Launched Cruise Missile (SLCM) also use TERCOM.

Specifications

Length	20 ft. 9 in. (6.3 cm)
Wing Span when deployed	12 ft. (3.6 cm)
Weight	3167 pounds
Range	Approx. 1,500 mi. (2,500 km)
Speed	Approx. 500 mph (805 kph)
Contractors	
Missile	Boeing Aerospace Co., Seattle
Engine	Williams International, Walled Lake, MI
Navigation Guidance	McDonnell-Douglas Astronautics, St. Louis Litton Guidance and Control, Salt Lake City



II. INITIAL PROGRAM SUMMARY

The SCAD program was terminated at the Milestone II DSARC review. Therefore, in July 1973, the Air Force redirected the activities with the objective of establishing a technology base for a long range, air launched cruise missile and demonstrating its capability. A new Program Director, Colonel O. H. Tallman, was assigned to the Program Office in August 1973. The Program Office, which had approximately 180 persons at the time of the SCAD termination, was reduced to less than 60 by the end of the year.

In mid-October 1973, DDR&E requested preliminary plans for the development of a cruise missile based on the SCAD concept. It appears that a briefing was subsequently given to the DepSecDef in late November 1973 which subsequently led to Mr. Clements issuing a memo on December 19, 1973, on cruise Missile Progams.

In his memo to the Navy and Air Force, Mr. Clements issued the following decisions:

- Two separate cruise missile efforts will be pursued with a common technology base.
- The Air Force will develop the Air Launched Cruise Missile (ALCM) and the Navy will develop the Surface Launched Cruise Missile (SLCM).
- ALCM will make maximum use of the terminated SCAD engineering development program.
- Development activities should permit deployment in late 1978 for ALCM and 1980 for SLCM.
- Flight tests of cruise missile systems were to begin by mid-1976.

The Air Force structured a program that did take maximum advantage of previous SCAD work. The management structure was to emphasize strong liaison with the Navy Program Office and would use a multiple contractor structure. Specific areas of technical commonality were identified as guidance, warhead, and jet engine. The Air Force strongly advocated the SCAD engine for joint use while the Navy appeared to have the stronger position in the guidance technology.

The initial program was conceived as a highly concurrent program that would go from DSARC I to delivery of the first production missile in less than five years. Estimated total cost of the missile RDT&E phase (FY74-FY78) was $292 million. The program plan was in compliance with Mr. Clements direction.

III. PROGRAM EVOLUTION

A. Initiation

The specific activities following the December 19, 1973, memo were not available within existing records. A DSARC I was held on February 12, 1974. The program presented was responsive to the tasking of the DepSecDef memo. Figure E1 and Table E1 show the general schedule and funding requirements, respectively.

The following summarizes the Decision Memorandum issued on May 1, 1974:

- Navy proceed with SLCM with prototype development starting in early FY75.
- Air Force proceed with ALCM program modified to include an 18-month prototype phase prior to finalizing the design of the engineering flight test articles. Prototype phase should start at the beginning of FY75.
- Testing should be sufficient to resolve issues relating to launch aircraft compatibility range, RCS reduction and terrain following.
- Air Force should minimize delays by continuous engineering design efforts in parallel with prototype flight test. IOC should not slip more than 6 months from that presented at DSARC. Initiate an additional engine development. Maximize use of data from Navy guidance system.
- Memo specified goals for range, speed, altitude, RCS, warhead yield and accuracy.
- Requested a DCP for each program by July 1974.

The Air Force responded on May 16, 1974, to the DDR&E decision. The Assistant Secretary of the Air Force (R&D) indicated that the Air Force was proceeding with the program presented at DSARC I, but without the 18-month parallel prototype phase. The memo further indicated that all other directions were being followed, including planned flight tests in FY76, and that the Air Force would be ready for a DSARC II in November 1974. The Air Force position was accepted by DDR&E in a memo of June 10, 1974.

Files were extremely limited for this time period, so specific activities in preparation for the DSARC II could not be determined. There is record of a DCP 136, dated October 1, 1974. The DDR&E (T&E) indicated in a November 29, 1974, memo that he considered the ALCM program ready for FSD, and in a memo of the same date the CAIG indicated that the SPO&ICA estimates on RDT&E

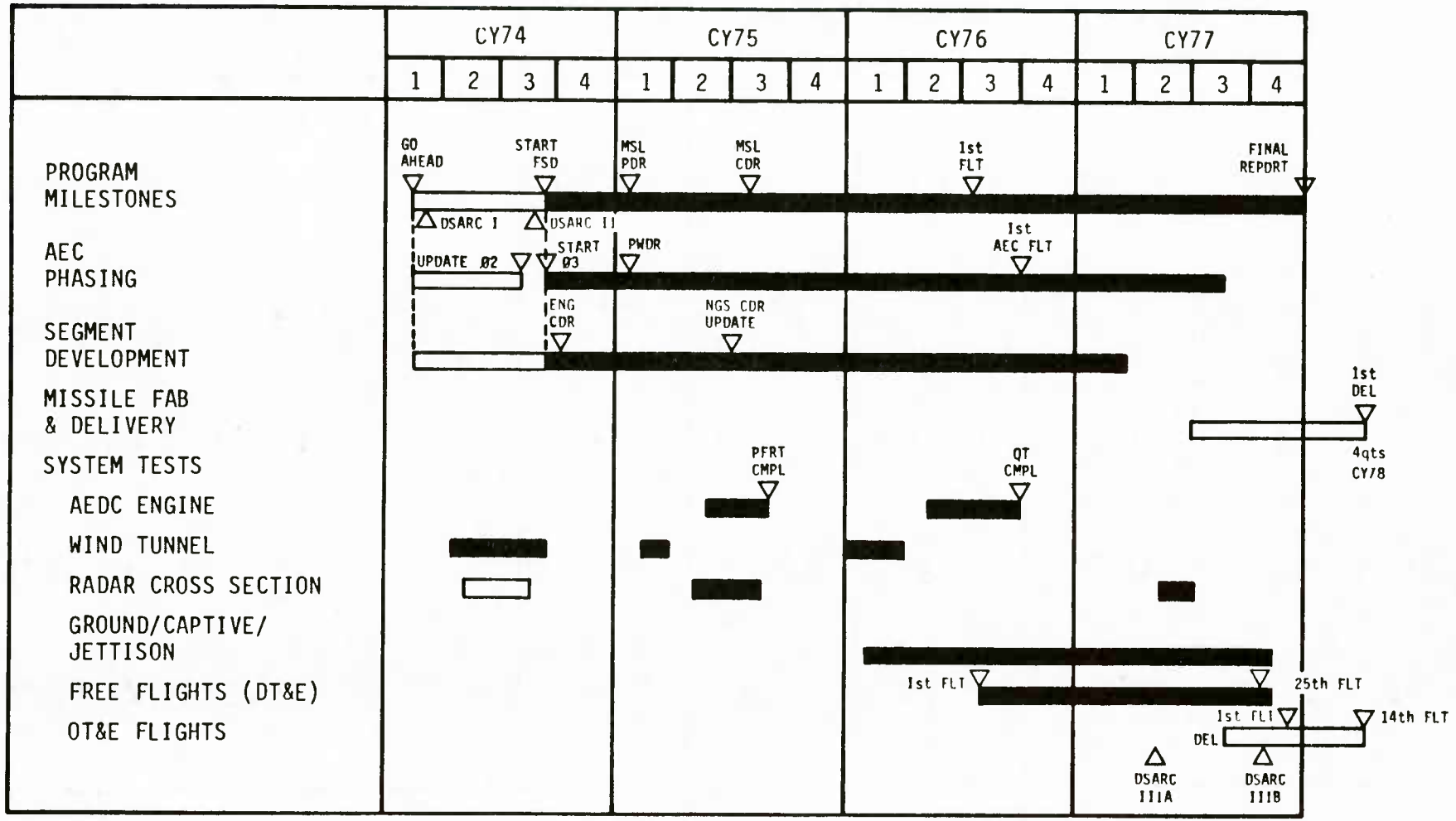

CY74
CY75
CY76
CY77
1
2
3
4
PROGRAM MILESTONES
AEC PHASING
SEGMENT DEVELOPMENT
MISSILE FAB & DELIVERY
SYSTEM TESTS
AEDC ENGINE
WIND TUNNEL
RADAR CROSS SECTION
GROUND/CAPTIVE/ JETTISON
FREE FLIGHTS (DT&E)
OT&E FLIGHTS
GO AHEAD
START FSD
MSL PDR
MSL CDR
1st FLT
FINAL REPORT
DSARC I
DSARC II
UPDATE 02
START 03
PWDR
1st AEC FLT
ENG CDR
NGS CDR UPDATE
1st DEL
4qts CY78
PFRT CMPL
QT CMPL
1st FLT
25th FLT
1st FLT
14th FLT
DEL
DSARC IIIA
DSARC IIIB

FIGURE E1

TABLE E1

ALCM DEVELOPMENT PROGRAM

(THEN YEAR $ - MILLIONS)

	FY74	FY75	FY76	FY77	FY78	TOTAL
AIRFRAME/CAE	4.0	53.0	86.0	60.0	11.0	214.0
ENGINE	4.9	9.0	5.0	1.0	•	19.9
NAVIGATION GUID	-	7.0	14.0	2.0	•	23.0
TERRAIN CORRELATION	.6	.7	-	-	-	1.3
OTHER GOV'T COSTS	1.5	10.3	10.0	10.0	2.0	33.8
TOTAL	11.0	80.0	115.0	73.0	13.0	292.0

AEC & DMAAC COSTS ARE NOT INCLUDED
•LESS THAN 500K - INCLUDED IN OTHER GOV'T COSTS
B-1 INTEGRATION AND TEST COSTS TO BE DETERMINED

seemed low, the estimate of procurement cost appeared reasonable, and the O&S cost estimate needed more work. The DSARC II was held on December 3, 1974. The program presented would lead to the first wing IOC in 3rd Qtr/79 with a total procurement of 1018 missiles. Total program acquisition cost was estimated at $1,451 million, of which, $315 million was RDT&E. The central issues identified for discussion at the DSARC II were as follows:

- Should the program proceed into FSD?
- How does concept of operations contribute to Air Force strategic mission?
- What is the force structure and ALCM relationship to B-52 and B-1 missions?
- What is force effectiveness and does it warrant FSD?
- What are mission critical technical design parameters?

In a memo to the Assistant Secretaries of Navy and Air Force (R&D) in January 1975, DDR&E provided the following observations and direction:

- Concerned with lack of concept demonstration.
- Agreed that separate pieces of technology are in hand but the problem was one of integrating them into a useful and cost effective system.
- Need to preserve full range of programmatic and technical options until improved cost and performance data are obtained.
- ALCM should not proceed into FSD.
- Both ALCM and SLCM should stay in AD until DSARC II in early CY77.
- Request restructured program at DSARC IA February 13, 1975.

B. Re-Initiation

The January 14, 1974, DDR&E memo required that the then currently structured program be modified. The objectives to this extension of the validation phase were:

- Demonstrate that all component technology can be integrated into an effective system.
- Confirm performance specifications by full up flights.

- o Confirm cost estimates for producton by prototype hardware demonstration.

The restructured program was briefed to the DSARC on March 18, 1975. This was a joint briefing with Colonel Tallman presenting the Air Force program and Captain W. M. Locke presenting the Navy program. Figures E2 & E3 show the propsed ALCM program from the DSARC IA until first wing IOC in CY81. Table E2 shows the estimated RDT&E budget for this program.

On May 13, 1975, the decision memorandum was issued approving Advanced Development for the ALCM and SLCM programs as presented. In addition to requiring an "initial" draft DCP within 60 days and a TEMP within 90 days, the memo "set-up a series of events from October 1975 to January 1977." The specific nature of these events was classified and cannot be included in this report.

Col. C. A. MacIvor was assigned as the Program Director on July 29, 1975. The revised Program Management Directive (PMD) which incorporated the DSARC IA decision was issued on August 4, 1975. The PMD confirmed that the currently approved FY76/77 program and the FY77 Air Force POM supported the financial requirements presented at the DSARC IA (Table E2).

C. Full Scale Development

The DSARC IA SDDM established January 1977 as the time for the DSARC II Review. Specific details on the preparatory activities for this review were not available from the files studied. It appears, however, that actions to support this review must have started in the March 1976 time period. A "For Coordination" draft of the DCP was forwarded to OSD in April 1976. In a memo of May 28, 1976 the Secretary of the Air Force forwarded to DDR&E an updated version of this "For Coordination" draft. The memo indicated that updates would be provided on the Advanced Development testing and the evaluation of the Navy's study on the Tomahawk/B-52 interface issue.

The DCP discussed two configurations for the ALCM missile. The basic configuration, referred to as Class I, was being designed for internal carriage and launch from the SRAM rotary launcher. This Class I vehicle would be 168 inches long, and weigh approximate 1900 pounds. A second configuration, Class II, consisted of the Class I vehicle with a jettisonable fuel tank added. This vehicle was limited to external carriage only. The performance of both configurations would be similar except that the Class II vehicle would have greater range because of the additional fuel provided.

On January 4, 1977, the Air Staff released to OSD what it called a "preliminary draft of the DCP" dated December 1976. This document had not been fully coordinated within the staff. The document was being released to support the DSARC II review

ALCM ADVANCED DEVELOPMENT PROGRAM

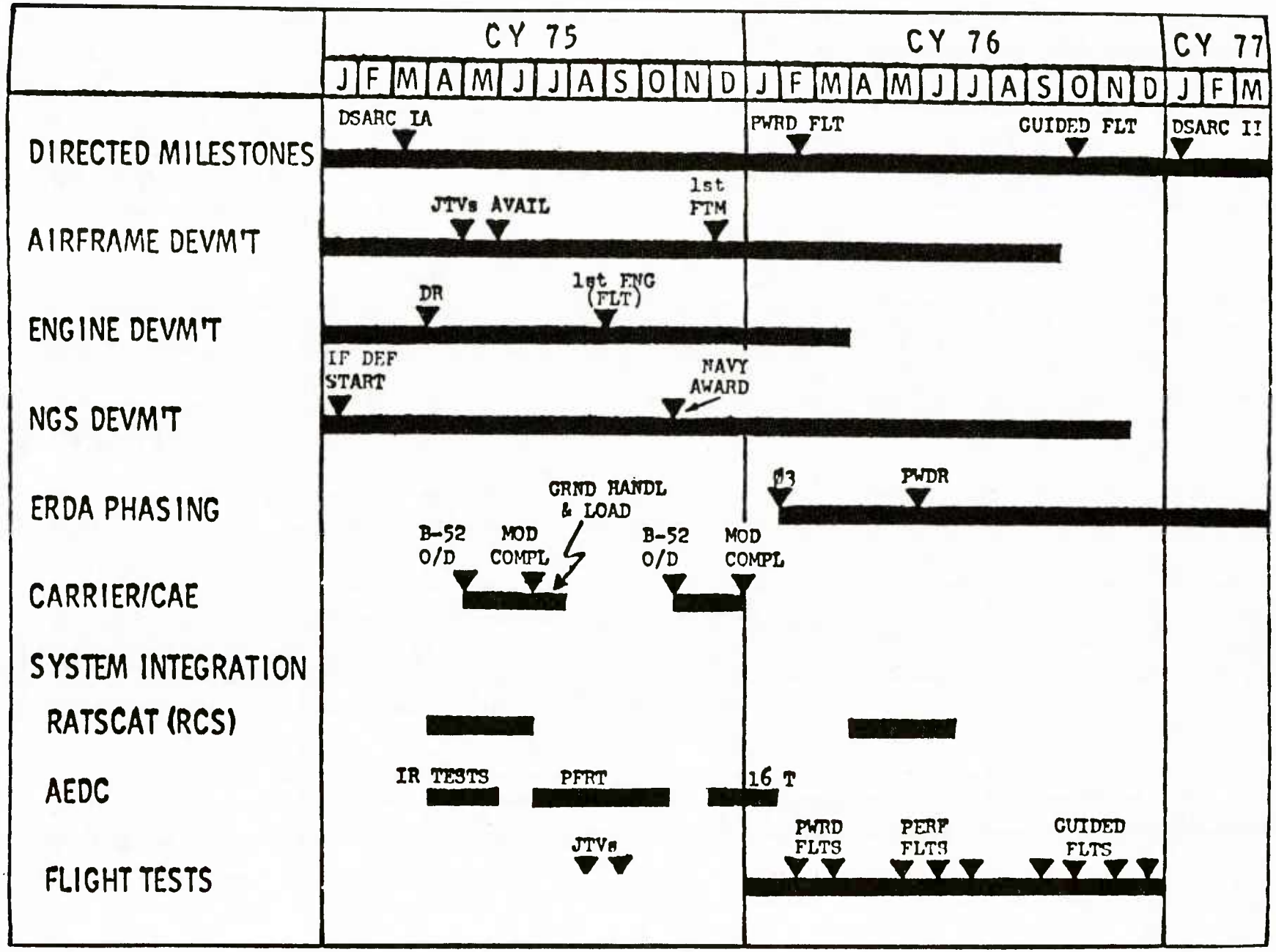


FIGURE E2

ALCM FSD/ PRODUCTION SCHEDULE

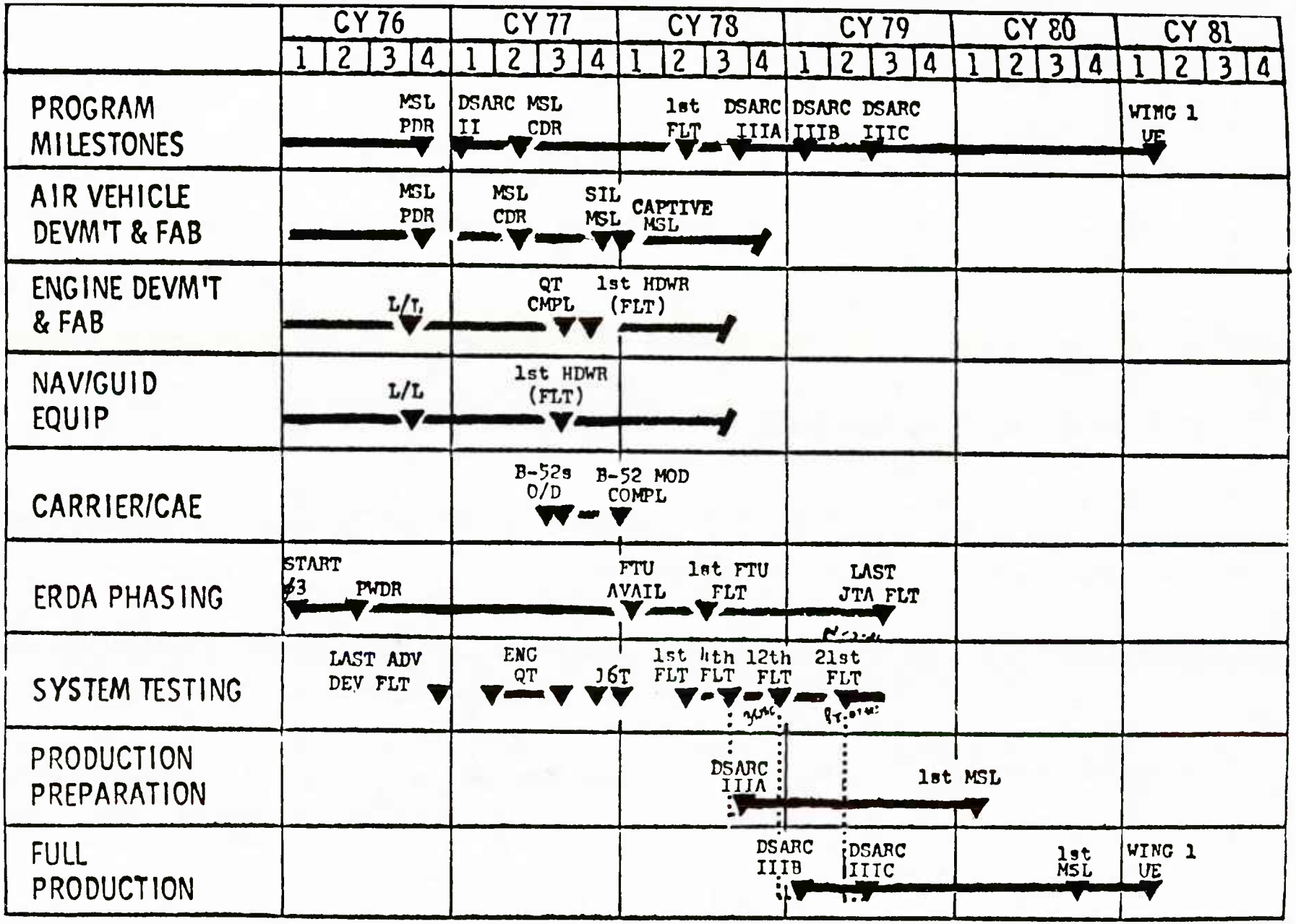


FIGURE E3

TABLE E2
ALCM DEELOPMENT COSTS
(Then Year $ - Millions)

	75	76	7T	77	78	79	80	TOTAL
ADVANCED DEVELOPMENT	54.6	51.0	13.0	6.5				125.1
AIRFRAME/CAE	35.0	34.0	8.0	4.0				81.0
NAV/GUID	2.5	6.5	1.2	0.9				11.1
ENGINE	7.5	4.8	1.8	0.2				14.3
STAS & CONTROL	4.5	1.0	1.0	0.5				7.0
OTHER	5.1	4.7	1.0	0.9				11.7
FULL SCALE DEVELOPMENT				96.0	128.0	59.0	6.0	289.0
AIRFRAME/CAE				74.5	102.0	46.0	4.5	227.0
NAV/GUID				9.5	11.0	3.5		24.0
ENGINE				7.0	7.5	3.0		17.5
OTHER				5.0	7.5	6.5	1.5	20.5
TOTAL	54.6	51.0	13.0	102.5	128.0	59.0	6.0	414.1

and was subject to subsequent revision and correction. It would appear that the earlier draft must have encountered difficulties in the initial coordination cycle and was late in being reaccomplished. The following summarizes the issues contained in this draft:

- Is ALCM ready to enter FSD?
  - Technical performance/system effectiveness
  - Cost
  - Program schedule
- Which missile configuration (AGM-86 or Tomahawk) should be deployed on B-52 and B-1?
  - Competition
  - Level of commonality
  - Realizeable LCC savings
  - Relative maturity of designs for air launch
  - Effects of configuration on weapons carriage (i.e., number of weapons/aircraft)
- Missile range requirement and employment concept?
  - Long range vs short range (stand-off vs penetration)

The DSARC II Review was held on January 6, 1977. Col. MacIvor, Program Manager since July 1975, presented the Air Force briefing. The program schedule and funding requirements, as briefed, are shown in Figure E4 and Tables E3 and E4. The briefing also reviewed the requirements for an air launched cruise missile by summarizing SAC ROC 12-76. It then discussed cruise missiles in the theater role by the use of a "stylized" TAC ROC. This then led to a general discussion of a Ground Launched Cruise Missile (GLCM). The briefing closed with the following assessment:

- AD objectives have been accomplished.
- FSD planning has been accomplished.
- Ready for FSD.

The CAIG review of the program indicated that the Air Force ICA estimated the ALCM RDT&E to be approximately $392M in FY75 $ - this was approximately $100M greater than the SPO's estimate. The CAIG also raised issue with the degree of savings from commonality. The Navy was forecasting approximately $460M, whereas the CAIG felt $270M was more realistic. The assessment by PA&E indicated that their "mission analysis leads to the conclusion that both cruise missile programs are currently structured incorrectly to support what they believed to be the priority mission." It was recommended that both programs be continued but structured to reflect the priority mission. Specifically, the Air Force should proceed to develop a long range ALCM for internal carriage on B-52G/H, maintain B-1 option, and develop a plan for a mobile land platform for Tomahawk.

ALCM FSD SCHEDULE (JUN 80 IOC)

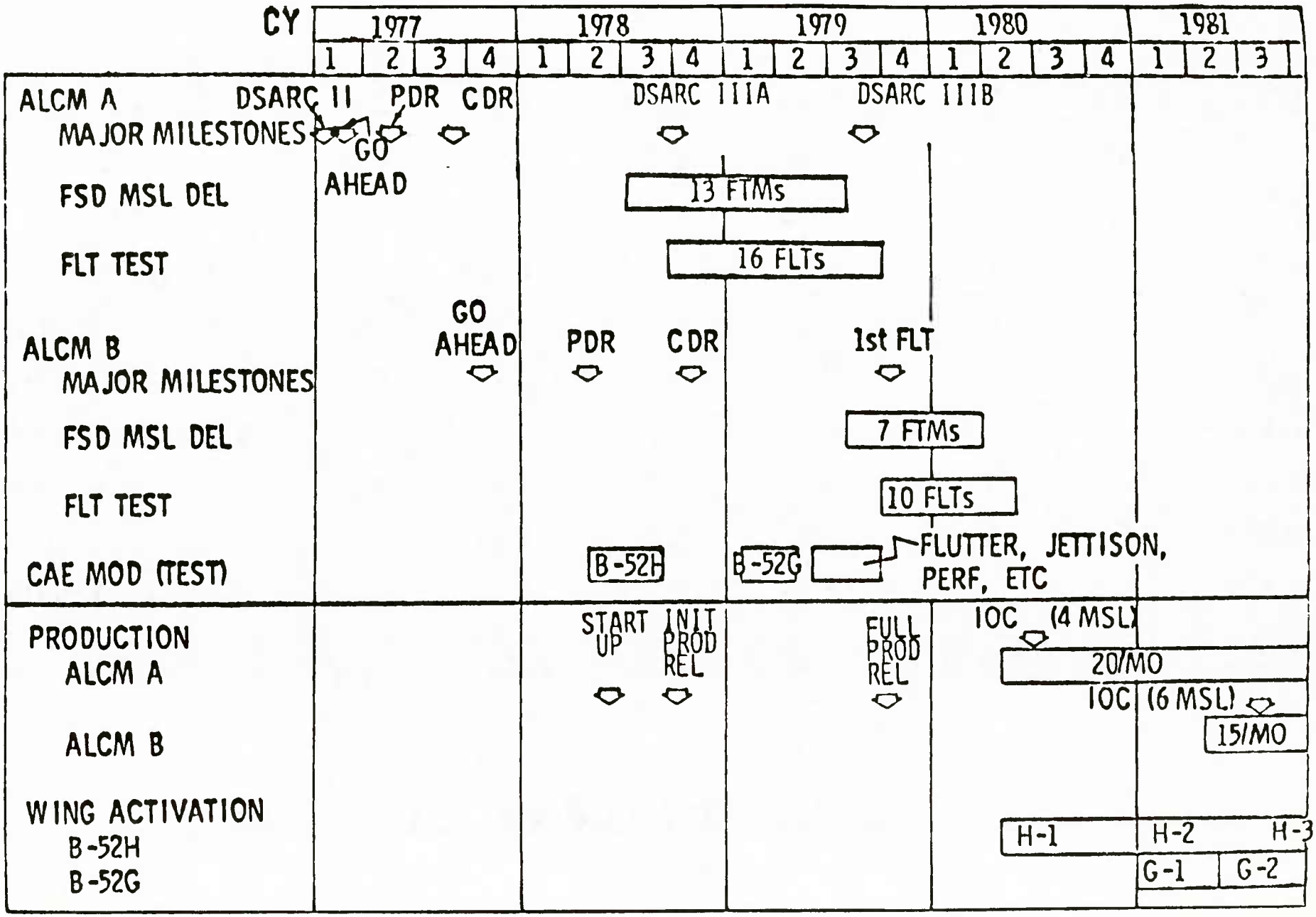


FIGURE E4

TABLE E3

FULL-SCALE DEVELOPMENT COST ESTIMATE

(DOLLARS IN MILLIONS)

	FY77	FY78	FY79	FY80	FY81	FY82	TOTAL
AIRFRAME/CAE	47.1	97.6	107.5	53.8	9.2	4.0	319.2
ENGINE	4.7	8.4	6.7	2.0	.5	.3	22.6
NAV/GUID	4.4	7.1	3.5	2.6	.6	.2	18.4
TERRAIN CORRELATION	.8	1.8	.9	.3			3.8
MISSION PLANNING	1.0	1.5	1.5	1.0			5.0
OTHER	3.2	7.5	4.6	2.6	.8	.7	19.4
THEN YEAR $	61.2	123.9	124.7	62.3	11.1	5.2	388.4
FY 74 $	47.5	89.3	83.4	39.9	6.8	3.1	270.0
FY 75 $	52.0	97.8	91.3	43.7	7.5	3.4	295.7
FY 77 $	61.2	115.1	107.5	51.4	8.8	4.0	348.0

TABLE E4

PRODUCTION COST ESTIMATE

(DOLLARS IN MILLIONS)
(2328 MISSILES)

APPROPRIATION	FY78	FY79	FY80	FY81	FY82	TO COMPLETE	TOTAL
3010 (CAE)	2.0	12.6	33.9	44.1	44.7	98.6	235.9
3020 (MISSILE)	40.7	269.0	381.3	385.3	366.5	825.7	2268.5
3300 (FACILITIES)		1.7	6.6	5.7	5.9	10.5	30.4
3400 (MOD)			.4	1.3	1.3	3.9	6.9
THEN YEAR $	42.7	283.3	422.2	436.4	418.4	938.7	2541.7
FY 74 $	28.3	175.6	258.9	257.2	237.1	498.2	1455.3
FY 75 $	31.0	192.3	283.5	281.6	259.7	545.6	1593.7
FY 77 $	36.7	227.6	335.6	333.3	307.3	645.6	1886.1

On January 14, 1977, the DepSecDef (Mr. Clements) signed the decision memorandum. The following is directly quoted from the opening two paragraphs of this memo:

"As a result of the DSARC II review, the Air Force and the Navy are to be commended for the accomplishments to date of their respective cruise missile development programs of ALCM and TOMAHAWK."

"A major issue before the DSARC was whether or not an air-launched cruise missile with a unique airframe should be allowed to proceed. In spite of the acquisition cost savings which would accrue from such a course of action, I have decided that a common airframe for all applications may impose unnecessary and unwarranted performance compromises on both weapon systems. However, considerable benefit still can be realized in joint test and evaluation, in quantity buy of common components, and in management efficiency, by consolidating the two separate Air Force and Navy programs, now independently managed by different program offices."

Based on the above, Mr. Clements, in his memo directed the following:

- Establish Joint Service Cruise Missile Program Office (JSCMPO), Navy lead service with Caption Walter Locke as Program Manager.
- Set JSCMPO under general direction of DDR&E to develop ALCM and Tomahawk.
- Consolidate funding.
- Maximize subsystem/component commonality.
- Submit plan within 45 days to establish JSCMPO.
- Set IOC dates, specified range performance, ALCM B to have priority over ALCM A; and created the GLCM program.
- Submit within 90 days a Joint TEMP.
- Submit within 90 days position on any roles/mission issues.
- Start R&D programs in advance cruise missile technology.

The Air Staff issued direction on February 4, 1977 to proceed with the ALCM program. In addition, AFSC was directed to accomplish the actions necessary to support the creation of the Joint Service Cruise Missile Program Office (JSCMPO). Additional clarification on how the JSCMPO was to operate was issued by Mr. Parker (Acting DDR&E) on March 25, 1977.

It appears that the initial contracts with the primes were awarded soon after the DSARC II decision was published. According to the initial Selected Acquisition Report (SAR) (Dec. 31, 1977) these were letter contracts, not definitive contracts. In July 1977, OSD directed the Air Force to terminate the efforts on the short range ALCM A and just pursue the ALCM B configuration. Data on specific activities during this time period were not available, but it appears that actions were underway to modify the structure of the program as directed by the DSARC. An Air Staff message (AF/RD 101800Z-August 1977) to AFSC indicated the following: "Firm direction cannot be established until current Air Staff/OSD/Congressional Review and decision process is complete. In the interm ..."

- Plan for parallel FSD on AGM-86B and AGM-109.
- Assume following funding:

	FY78	FY79	FY80	FY81
AGM86B	173.9	139.6	24.9	5.0
AGM109	103.0	98.2	23.2	5.0

- Complete FSD flight test NLT February 1980.

In a September 30, 1977 memo, Mr. Perry, the new DDR&E, directed that the ALCM program be restructured to "provide a competitive fly-off between the Boeing and General Dynamics missiles" to determine which airframe would be used for the air launched mission. The memo also directed that the ALCM SPO move to the JSCMPO in Washington, D.C., and established the Cruise Missile Executive Committee (EXCOM) to provide program oversight and direction on a regular basis. The EXCOM composition is shown in Figure E5.

The EXCOM was not a voting group. The chairman, DDR&E, attempted to establish a concensus, but would act without this if required. Meetings dealt with significant details in the program. The group reviewed status, identified issues, assigned action items, conducted follow-ups and made decision. The first meeting occurred on October 21, 1977. By November 26, 1980, twenty-four meetings had been held.

This change in acquisition strategy and its associated budgetary impacts were incorporated in the FY78 Supplementary Budget Request to Congress. In addition, the original letter contracts were extended to cover the period of October 1, 1977, to January 31, 1978, in order to continue the original DSARC II directed program until Congressional action on the FY78 Supplemental Budget. The schedule and cost estimates were based on initiating the competitive program on October 1, 1977. Although OSD directed the effort by that time, Congress did not act on the supplement budget request as rapidly. As evidenced in a USDR&E

JOINT CRUISE MISSILES PROJECT EXECUTIVE COMMITTEE

CHAIRMAN
DR. WILLIAM J. PERRY, USDR&E

USN	OSD	USAF	USA
DR. DAVID E. MANN ASN(RE&S)	MR. FRED P. WACKER ASD(C)	DR. ROBERT J. HERMAN ASAF(RD&L)	HON. PERCY A. PIERRE ASA(RE&A)
ADM J.D. WATKINS VCNO	MR. RUSSELL MURRAY ASD(PA&E)	GEN ROBERT C. MATHIS VCS(AF)	
ADM A.J. WHITTLE, JR. CNM		GEN ALTON D. SLAY COMMANDER, AFSC	

FIGURE E5

memo of February 10, 1978 to the JSCMPO, the Congress had still not acted on the FY78 Budget Supplement. The memo, therefore, confirmed earlier direction to the Program Office "to initiate the air launched cruise missile competition using funds appropriated for the FY78 Defense Budget." A day later, another USDR&E memo confirmed that the program was of highest national priority and that the President had approved assignment of BRICK-BAT DX industrial priority rating.

Formal program direction for the competitive program was issued by the Air Staff on April 7, 1978, with the following financial plan:

	FY78	FY79	FY80	FY81
RDT&E	276.9	237.8	25.0	10.0
3020	104.6/(24)	178.3(36)	431.2 (263)	609.6/(690)

The program schedule was to reach a DSARC III in February 1980. This was a major change from the DSARC plan of a DSARC IIIA in 4th Quarter CY78 and DSARC IIIB in 3rd Quarter CY79. In addition, the new financial plan required $227.7M more in the FY78-81 time period than originally briefed at the DSARC II. The program philosophy was again changed by a June 16, 1978, memo from Mr. Perry. At this time, the IOC milestone for the first fully modified B-52G squadron equipped with ALCM was revised to December 1982. The requirement for a limited operational capability in June 1980 of one B-52G was cancelled; however, the first fully Offensive Avionics System (OAS) modified B-52G was to be available for SAC alert in September 1981. The SAR data for June 30, 1980, provides the following status:

	D.E. (FY77$) (FY74-85)	Change	C.E. (FY74-87)
Development	696.1	+213.7	909.8
Procurement	2311.6	- 81.0	2230.6
Construction	121.4	+ 0.2	121.6
	3129.1	132.9	3262.0
Escalation	1054.9	1014.0	2068.9
Total	4184.0	1146.9	5330.9

The SAR indicates that the major contributors to cost increases in development were the delay in the FY78 Supplement Budget which caused a slip in starting the competitive phase ($83M); and engineering task for B-52 integration ($126M). What is not explained in the SAR is the establishment of the $696.1M figure for the Development Estimate (D.E). Normally this is the figure briefed at the DSARC II. This was not the case for ALCM, because of the major redirection in the development program. However, the SAR provides no insight into the effects of this

redirection on the development program. Therefore, after accounting for advanced development expenditures, adjusting to FY77 base year dollars and increasing the FSD estimate by the CAIG recommendation, there is still more than $90 million left unexplained. It might, therefore, be concluded that this was the cost associated with the decision to add the competitive fly-off. Within 18 months of the DSARC II decision, the program had been redirected twice and experienced approximately a $300 million cost growth in development (about 50% growth).

D. Production

In support of an anticipated DSARC III in February 1980, a USDR&E memo of June 6, 1979, indicated that the approved DCP dated November 1978 should be used as the baseline for updating. The memo requested that Annexes be added for Technology Assessment and for Reliability/Maintainability resolution. The Program Management Directive (PMD) Ammendment 7, issued July 16, 1979, directed that DSARC III planning should include the requirement to brief the AFSARC. The PMD contained the following financial plan, which was the current Air Force FY81 Basic POM position:

	PY	FY79	FY80	FY81	FY82	FY83	FY84	FY85
RDT&E	480	303.9	90.0	99.7	32.4	0	0	0
3020 Wpn Syst	104.6	90.8	364.4	482.4	462.2	432.6	424.4	398.7
In. Sprs		3.4	6.8	28.1	4.9	2.9	2.7	2.6
3300			14.2	62.6	32.4	14.7	32.2	7.4
Qty()	(24)	(24)	(225)	(480)	(480)	(480)	(480)	(480)

An initial working level planning meeting was held on August 24, 1979. Representatives from the Program Office, Air Staff, and OSD staff attended. The output from this meeting was the identification of engine producibility as a potential issue at the DSARC review. The first formal DCP/DSARC III planning meeting was held on October 22, 1979. Twenty-two persons attended this meeting. A planning schedule, shown in Table E5, was established which set the DSARC date as March 18, 1980. The delay in the DSARC date was attributed to extending the fly-off competition date. The attendees agreed upon the following issues:

- Engine producibility
- Reliability/maintainability (personnel and testing)

On October 29, 1979, the planning schedule was modified by the Assistant Secretary of the Air Force (R&D) in his capacity as the Air Force Acquisition Executive; he directed that an ALCM

TABLE E5

ALCM DSARC III PLANNING SCHEDULE

WHAT	WHO	WHEN
1. PLANNING CONFERENCES	ALL	24 AUG 79/22 OCT 79
2. MRA&L ISSUE MEETING	AF/JCMPO	5 NOV 79
3. "FOR COMMENT" DCP TO OSD	AF/JCMPO	30 NOV 79
4. DCP COMMENTS TO AF	OSD	4 JAN 80
5. DCP REVISION AND AF COORD CYCLE	AF/JCMPO	7 JAN - 19 FEB 80
6. FOR COORDINATION DCP TO SAF/USDRE	AF	20 FEB 80 1/
7. DIA REPORT TO DSARC CHAIR	DIA	28 FEB 80
8. SOURCE SELECTION	SAF	4 MAR 80 2/
9. AF/OSD CAIG BRIEFING	AF/OSD	4 MAR 80
10. OSD T&E BRIEFING	JCMPO/AFTEC	5 MAR 80
11. MRA&L BRIEFING	AF/JCMPO	5 MAR 80
12. PRINCIPALS PRE-BRIEF	OSD	11 MAR 80
13. AIR-STAFF BOARD	AF/JCMPO/AFTEC	10 MAR 80
14. AIR FORCE COUNCIL	AF/JCMPO/AFTEC	11 MAR 80
15. CAIG REPORT	OSD/CAIG	14 MAR 80
16. T&E REPORT	DDT&E	14 MAR 80
17. AFSARC/DSARC	ALL	18 MAR 80

1/ ASSUMES COMBINED AFSARC/DSARC

2/ LONG LEAD CONTRACT AWARD

AFSARC was not required as part of the DSARC process. In lieu of the AFSARC, a one-time expanded Secretarial Program Review (SPR) would be held to review the overall B-52G/OAS/ALCM Program. The review was established as an information meeting and not a decision point. Also on October 29, 1979, the "For Comment" draft of the DCP was submitted to Air Force Systems Command Headquarters for staffing and forwarding to Air Staff and subsequently to OSD.

By late October 1979 the work load was increasing considerably. The competitive flight test program was approximately at its mid-point, the contractors had submitted their best and final offers, and DSARC planning was becoming a daily requirement. The ALCM Program Director, therefore, found it essential to designate one individual within the organization to pull all the pieces together for the DSARC. Figure's E6, E7 and E8 show the organizational position of the JSCMPO and its internal structure and provide some indication of the complex task associated with orchestrating the DSARC preparation activities. It should be remembered that during the entire preparation period for the DSARC, other program activities also continued: this included the regular, and rather frequent, EXCOM meetings. The external demands on the Program Director's time for DSARC pre-activities and other meetings and briefings eventually would result in the Deputy Program Director becoming the day-to-day manager of the current program activities.

On November 5, 1979, an "Issues Meeting" was held to "address and if possible close the following ALCM Production Issues: a) Reliability/Maintainability Program; b) Alternate Support Concepts; and c) Engine Producibility." The minutes of the meeting indicate that there was agreement that engine producibility was not a program issue but was a program risk and should be covered in the appropriate section of the DCP. The other two issues were discussed with specific action items being identified to close out the issues. A subsequent memo on November 26, 1979 from an MRA&L Staff Engineer disagreed with the contents of the minutes. The memo went on to indicate that the following items remained open and that submission of the data, for the last two items, would not close the manpower issue.

- Specification of reliability and maintainability test thresholds (at IOC and FAC) for ALCM and ESTES. JCMPO has the action to identify these and include them in the DCP.

- Identification of responsibility for integration of OAS and ALCM built-in-test. MRA&L has the action to follow-up.

- Reliability of maintenance manpower to force generation requirements. JCMPO and SAC will provide information to OSD (MRA&L).

B-52/CRUISE MISSILE ORGANIZATIONAL RELATIONSHIPS

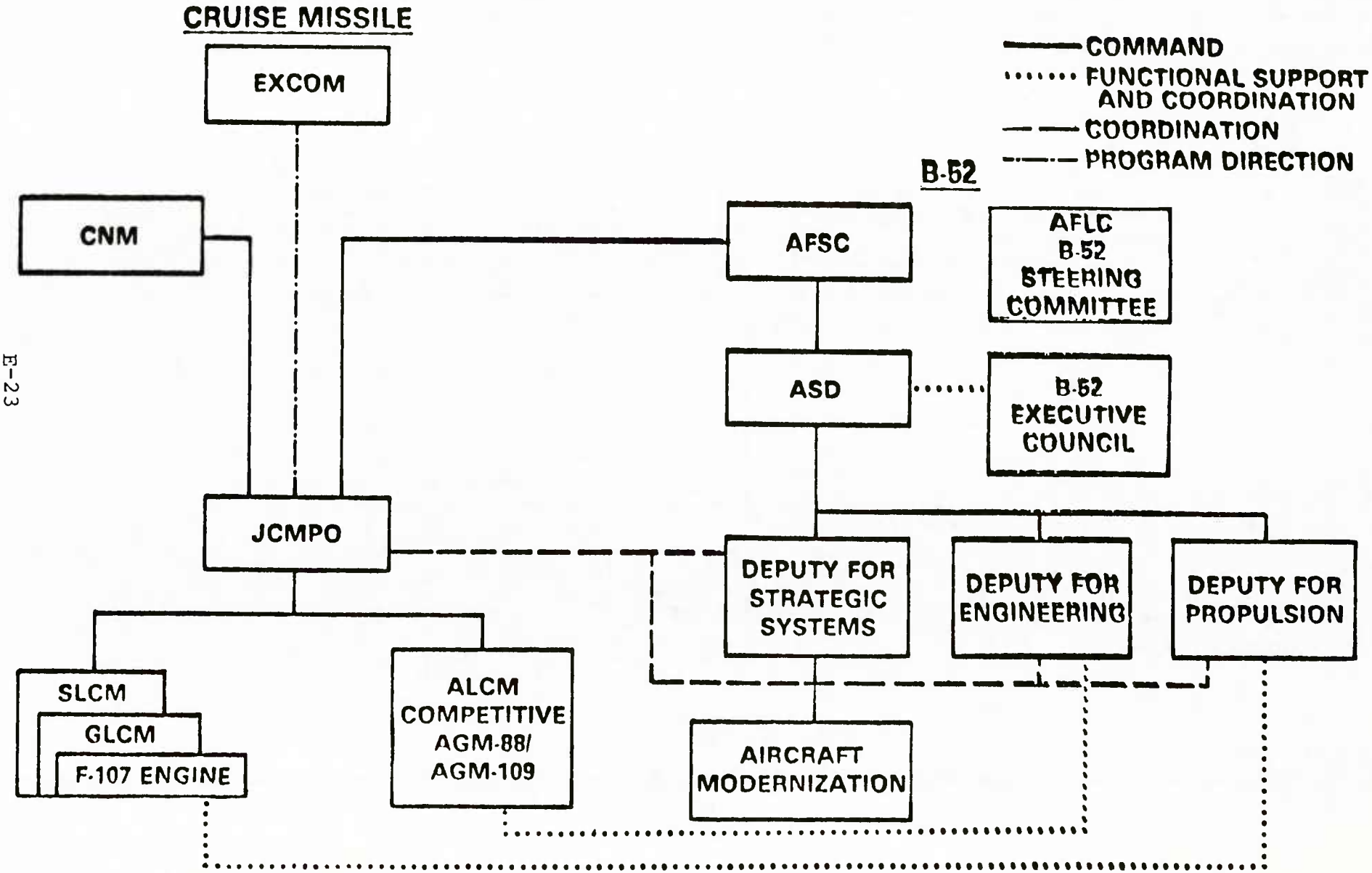


FIGURE E6

JOINT CRUISE MISSILES PROJECT OFFICE

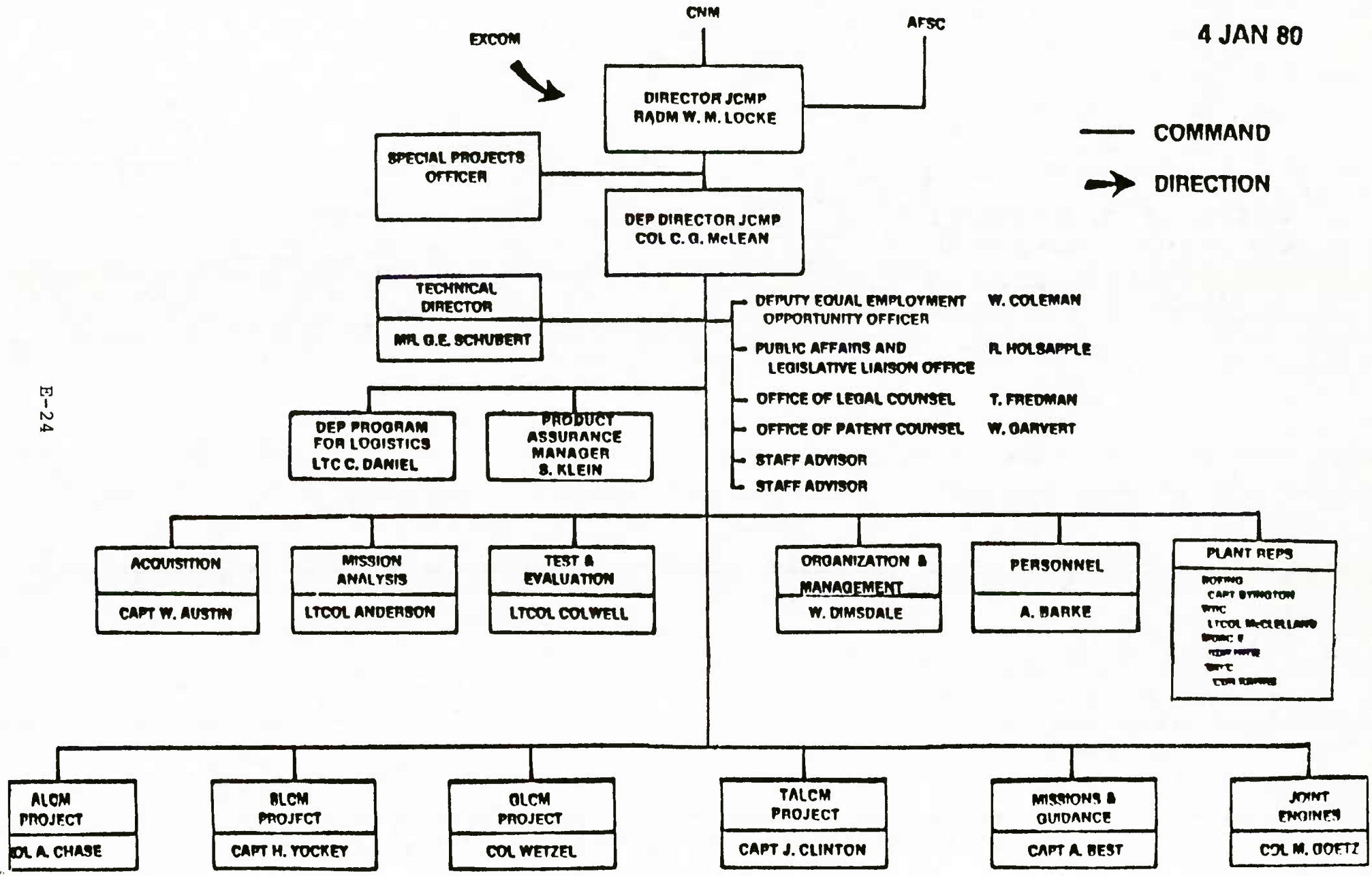


FIGURE E7

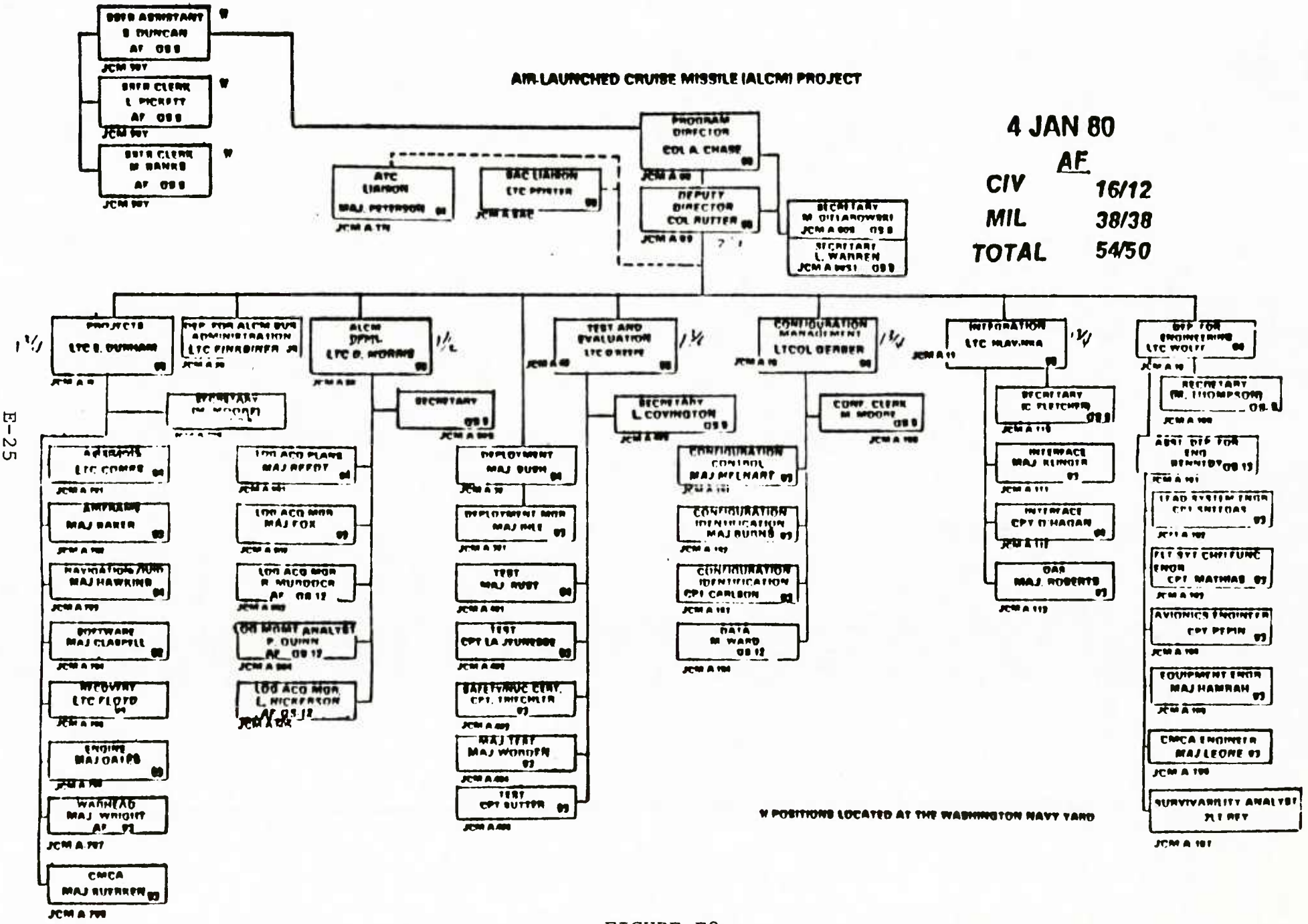

AIR-LAUNCHED CRUISE MISSILE (ALCM) PROJECT
4 JAN 80
AF
CIV 16/12
MIL 38/38
TOTAL 54/50
PROGRAM DIRECTOR
COL A. CHASE
DEPUTY DIRECTOR
COL RUTTER
ATC LIAISON
MAJ. PETERSON
SAC LIAISON
LTC PRYOR
SECRETARY
M DIFIAROWSKI
SECRETARY
L. WARREN
PROJECTS
LTC B. DUNCAN
ALCM OPNL
LTC D. MORRIS
TEST AND EVALUATION
LTC O'KEEFE
CONFIGURATION MANAGEMENT
LTCOL GERBER
INTEGRATION
LTC MAVRAS
DEP FOR ENGINEERING
LTC WOLFF
SECRETARY
L COVINGTON
SECRETARY
M. THOMPSON
SECRETARY
M MOORE
SECRETARY
IC FLETCHER
CONF CLERK
M MOORE
DEPLOYMENT
MAJ BUSH
CONFIGURATION CONTROL
MAJ MELHART
CONFIGURATION IDENTIFICATION
MAJ BURNS
CONFIGURATION IDENTIFICATION
CPT CARLSON
DATA
M WARD
INTERFACE
MAJ REINGTA
INTERFACE
CPT O'HAGAN
CAR
MAJ. ROBERTS
W POSITIONS LOCATED AT THE WASHINGTON NAVY YARD

FIGURE E8

- o Identification of design characteristics which drive recertification requirements. JCMPO will provide to OSD (MRA&L).

The ALCM Program Office had developed a philosophy that they would try and close all issues prior to the DSARC III Review. This meant "working the issues" enroute as the briefings moved "up the chain." As an example, the issue of leader-follower was resolved by this process. The decision on this item, contained in the SDDM, was consistent with the program office position. It was impossible to identify all the issues raised or how they would be resolved, but the continual interaction of all staff elements made the final review relatively smooth.

The Program Office indicated that the geographic proximity to OSD resulted in its involvement in activities that would normally have been handled totally by AFSC and the Air Staff. This had its good and bad points. Ready availability of knowledgeable people on every aspect of the program allowed for quick reaction which could "defuse" a problem before it became a major issue. However, the Program Office was tasked on short notice to support a lot of working level meetings. From this close contact, by Program Office personnel, it was perceived that each functional area was jockeying to get coverage in the DCP. In addition, there was a sense that there would be "a lot of grief" if they did not cooperate.

As indicated earlier, EXCOM meetings continued during this entire period of preparation for the DSARC. It is interesting to note that this type of almost direct OSD management did not preclude a lot of staffing to get to the DSARC III Review. It was observed by Program Office personnel that the USDR&E staff was well informed by involvement in EXCOM and liaison with the Air Staff PEM, but other OSD staff elements were not as current on the program before the preparation activities started.

An issue that required considerable effort, but which was not vital to the production decision for ALCM, was management responsibility of ALCM after the production decision. This was finally resolved by USDR&E in a March 7, 1980 memo which endorsed the formal transfer of management responsibility for the ALCM program back to the Air Force at the DSARC III. The JSCMPO would retain management of the common equipments and be responsive to ALCM program needs. The memo further indicated that after DSARC III the ALCM program would receive management direction exclusively from the Air Force, but that the ALCM Program Manager should continue to provide information briefings to the EXCOM.

On March 25, 1980, the Secretary of the Air Force in his position as Source Selection Authority decided on Boeing to produce the ALCM. Table E6 shows the planning schedule as of that time. It appears that the activities in April went as scheduled. A point to be made is that this Table does not show

TABLE E6

MEETINGS/BRIEFINGS	DOCUMENTS/REPORTS	DATE
PLANNING CONFERENCES		24 AUG 79/22 OCT 79
MRA&L ISSUE MEETING		5 NOV 79
-	"FOR COMMENT" DCP TO OSD	6 DEC 79
-	DCP COMMENT TO AIR FORCE	25 JAN 80
-	DCP REVISION AND AF COORD CYCLE	28 JAN - 17 MAR 80
SSEB BRIEFS SSAC	-	10-13 MAR 80
-	FOR COORDINATION DCP TO SAF/USDRE	17 MAR 80
SSAC BRIEFS CC/AFSC	-	20 MAR 80
SSAC BRIEFS SSA	-	21 MAR 80
SOURCE SELECTION DECISION	-	25 MAR 80
-	DIA REPORT TO DSARC CHAIR	25 MAR 80
SURVIVABILITY BRIEFING TO AFSC	-	25 MAR 80
AF CAIG BRIEFING	-	31 MAR 80
OSD CAIG BRIEFING	-	1 APR 80
MRA&L PRE-BRIEF TO AF	-	3 APR 80
TE BRIEF TO AFSC	-	3 APR 80
TE BRIEF TO XOO/ RDO/LEY	-	3 APR 80
MRA&L BRIEFING	-	3 APR 80
TE BRIEF TO RADM LINDER	-	4 APR 80
AFSC-PAR (ALCM/B-52/SV)	-	7 APR 80
AF COUNCIL/SPR	-	8 APR 80
SAF/SPR	-	8 APR 80
DSARC PRINCIPALS (PREBRIEF)	-	10 APR 80
-	CAIG REPORT	14 APR 80
-	DDT&E REPORT	14 APR 80
DSARC III	-	17 APR 80
	SDDM	30 APR 80

all the briefings and meetings that were accomplished. The pre-briefs at the Systems Command level and lower, which by policy are always required, were not documented in the files reviewed for this study. It is interesting to note that even though planning activities had been ongoing for 7 months, the DASD (C3) found it necessary to issue a memo on April 7, 1980 requesting a review before the DSARC III of all C3I systems supporting ALCM.

The DSARC III Review was held on April 17, 1980. The CAIG analysis indicated that the production estimate was reasonable but there were some specific fiscal years with shortages when comparing the estimate to the January 1980 FYDP. The OUSDR&E (T&E) indicated some concerns because of the limited testing that had been accomplished and, therefore, recommended the following:

- The Air Force be directed to conduct testing to fully evaluate operational effectiveness and suitability of ALCM with emphasis on determination of key subsystem performance parameters (not fully tested or previously found deficient) and evaluation of systems still under development (radar altimeter, B-52 OAS, support equipment).

- The Air Force be directed to initiate a high priority effort to establish reliability/maintainability goals to be demonstrated through testing at key program phase points, especially during missile/carrier/support equipment integration to assure that FAC/IOC goals are achieved.

MRA&L identified two major areas of concern--lack of ALCM/B-52 systems maintenance thresholds/goals, and the FY80 funding deficiency. It was felt that if the $30 million FY80 funding deficit was not restored, the shortfall will be allocated to the support area. This was an area already identified as having high schedule risk to meet First Alert Capability (FAC).

On April 30, 1980, the Deputy Secretary of Defense signed the decision memorandum. The following summarizes the direction:

- Proceed into production as planned.

- Identify needs to accelerate production rate beyond 40 per month. Report findings to OSD within 90 days.

- Conduct follow-on testing to fully evaluate operational effectiveness and suitability of ALCM. Submit progress reports in October 1980 and March 1981.

- Continue high priority R&M efforts, with additional emphasis on storage reliability. The program to meet R&M

thresholds and goals should be briefed to EXCOM within 60 days.

- Place management attention on improving QA discipline of the Boeing Company. Report progress to EXCOM within 6 months.
- Implement cost-effective warranties on major subsystems.
- Do not implement the leader-follower option.
- Evaluate application of multi-year procurement and present recommendations to EXCOM in 3 months.

A message from the Air Staff to AFSC on May 5, 1980 provided official notification of the DepSecDef decision and indicated that this direction would be included in a Program Management Directive (PMD) then in staffing. PMD ammendment #9 was issued on June 21, 1980 and contained the following financial plans:

- FY80 and Prior Year Program ($ in Then Year Millions): The funds shown below reflect the amounts appropriated by Congress and any approved budget amendments/supplements or reprogramming actions.

APPROP	PRIOR YEARS	FY80
3600	818.9	90.3
3020		
Weapon System	195.4	367.1
Initial Spares	3.4	6.8
3300		14.2
TOTAL	1017.7	478.4
(Quantity)	48	225

- OSD Approved Program ($ in Then Year Millions): The OSD approved program based on the FY81 FYDP and including Air Force below threshold reprogramming changes is:

APPROP	FY81	FY82	FY83	FY84	FY85	TO COMPLETE	TOTAL
3600	109.4	32.8	0	0	0	0	1051.4
3020							
Weapon System	551.7	511.0	491.4	486.5	451.6	852.6	3907.3
Initial SP	27.9	6.0	3.2	3.2	3.0	5.0	58.5
3300	66.3	32.4	14.7	32.2	7.4	60.8	228.0
TOTAL	755.3	582.2	509.3	521.9	462.0	918.4	5245.2
Quantity	480	480	480	480	480	745	3418

- o Air Force Current Position ($ in Then Year Millions): The current Air Force funding position based on the FY82 POM is shown below. It is subject to OSD approval, is not program direction, and should only be considered the program's tentative financial plan.

APPROP	FY82	FY83	FY84	FY85	FY86	TO COMPLETE	TOTAL
3600	69.0	11.0	0	0	0	0	1089.6
3020							
Weapon System	570.9	584.0	524.9	520.7	523.1	596.2	4434.0
Initial SP	9.8	13.4	3.6	11.0	9.0	16.2	101.1
3300	78.8	20.5	18.3	6.1	9.4	37.0	250.6
TOTAL	728.5	628.9	546.8	537.8	541.5	649.4	5884.3
Quantity	440	440	440	440	440	465	3418

There were only two remaining directed program milestones:

First Alert Capability*	Sep 81
IOC**	Dec 82

* First Alert Capability: First OAS production B-52G equipped with ALCMs.

** IOC: First squadron of OAS production B-52Gs equipped with 12 externalALCMs each.

IV. PROGRAM STATUS

Program Management Directive (PMD) amendment #12 dated May 11, 1982 provides the updated financial plans for the increased total quantities of ALCM, the reduced monthly production rates, and the expansion of RDT&E tasks:

- o Current and Prior Year Program (Then Year $ in Millions): The funds shown below reflect the amounts appropriated by Congress and any approved budget amendments/supplements or reprogramming actions.

APPROP	PRIOR YEARS	FY82
3600	1017.6	68.7
3020		
Weapon System	1102.1	587.6
3300	80.5	102.3
(Quantity)	(733)1/	(440)

- o The OSD Approved Program (FYDP) based on the FY83 President's Budget is shown below (Then Year $ in Millions):

APPROP	FY83	FY84	FY85	FY86	FY87	FY88	FY89	TOTAL
3600	26.3	19.7	24.1	25.5	24.4	0.0	0.0	1206.3
3020								
Wpn Sys	633.8	617.8	644.6	678.7	728.6	709.6	627.6	6330.4
3300	0.0	32.0	44.9	52.6	44.4	0.0	0.0	356.7
Quantity	(440)	(440)	(480)	(480)	(480)	(480)	(355)	(4348)1/

- o Current Air Force Position (Then Year $ in Millions): The current Air Force program based on the FY84 POM submitted to OSD is shown below.

APPROP	FY84	FY85	FY86	FY87	FY88	FY89	TOTAL
3600	32.8	27.2	28.9	27.7	29.3	0.0	1258.5
3020							
Wpn Sys	643.0	641.4	636.5	783.5	780.1	1026.5	6834.5
3300	30.2	37.7	82.1	105.2	14.6	0.0	453.6
Quantity	(400)	(400)	(400)	(480)	(480)	(555)	(4348)

1/ Includes 24 AGM-109 missiles which were not delivered as ALCMs (USDRE Memo,7 Mar 80).

The SAR dated September 30, 1982 provides an overall summary of the program growth since December 1977 as follows:

	D.E. (FY77$) (FY74-85)	Change	C.E. (FY77$) (FY74-89)
Development	696.1	+285.9	982.0
Procurement	2311.6	+1033.9	3345.5
Construction	121.4	+ 72.7	194.1
Total	3129.1	+1392.5	4521.6
Escalation	1054.9	+2921.4	3976.3
Total	4184.0	4313.9	8497.9
Quantities:			
Development	35	-11	24
Procurement	3424	+924	4348
Total	3459	+913	4372

The SAR identified the major contributors to program growth as follows:

Development ($M)

Category	Amount	Cause
Engineering	+156.2	ALCM/B-52 Integration
Other Support	+44.4	Added Support Equipment

Production ($M)

Category	Amount	Cause
Schedule	-57.1	Reduce production rate from 60/mo. to 40/mo.
Estimating	+288.2	
Other Support	+249.8	Addition Support Equipment

The program has remained basically on schedule since the DSARC III Review in April 1980. However, the outyear production schedule has changed considerably. Table E7 shows the evolution of the production plan since the DSARC III.

The period of deliveries has naturally been extended to account for the additional 930 missiles to be produced. However, a constant yearly production rate of 480 is no longer planned. The program was tooled to that rate and procured that quantity in FY81. The plan now reduces the yearly rate to 400 by FY84, then restores it to 480 per year in FY87, with a peak production of 555 missiles in FY89, the last planned production year.

TABLE E7

ALCM PRODUCTION PLAN EVOLUTION

Weapon System Cost ($M TY) & Quantity

[FY80 + Prior = $562.5M/(273)]

	FY81	FY82	FY83	FY84	FY85	FY86	FY87	FY88	FY89	Total
FY81 FYDP (Jan 1980)	551.7 (480)	511.0 (480)	491.4 (480)	486.5 (480)	451.6 (480)	[--852.6---] (745)		0	0	3907.3 (3418)
FY82 POM (May 1980)	551.7 (440)	570.9 (440)	584.0 (440)	524.9 (440)	520.7 (440)	523.1 (440)	[----596.2--] (465)		0	4434.0 (3418)
FY83 FYDP (Jan 1982)	539.7 (480)	587.6 (440)	633.8 (440)	617.8 (440)	644.6 (480)	678.6 (480)	728.6 (480)	709.6 (480)	627.6 (355)	6330.4 (4348)
FY84 POM (May 1982)	539.6 (480)	587.6 (440)	633.8 (400)	643.0 (400)	641.4 (400)	636.5 (400)	783.5 (480)	780.1 (480)	1026.5 (555)	6834.5 (4348)

Since the production decision the program has experienced a 27% growth in quantity but total weapon system acquisition cost has grown by approximatley 75%. Although yearly TOA has been continually increased, it did not fully fund the actual inflation experienced and the new requirements added to the program; i.e., warranties, second sources, etc. This has resulted in reduced yearly procurements and a longer production run with vulnerability to the outyear effects of inflation.

APPENDIX F

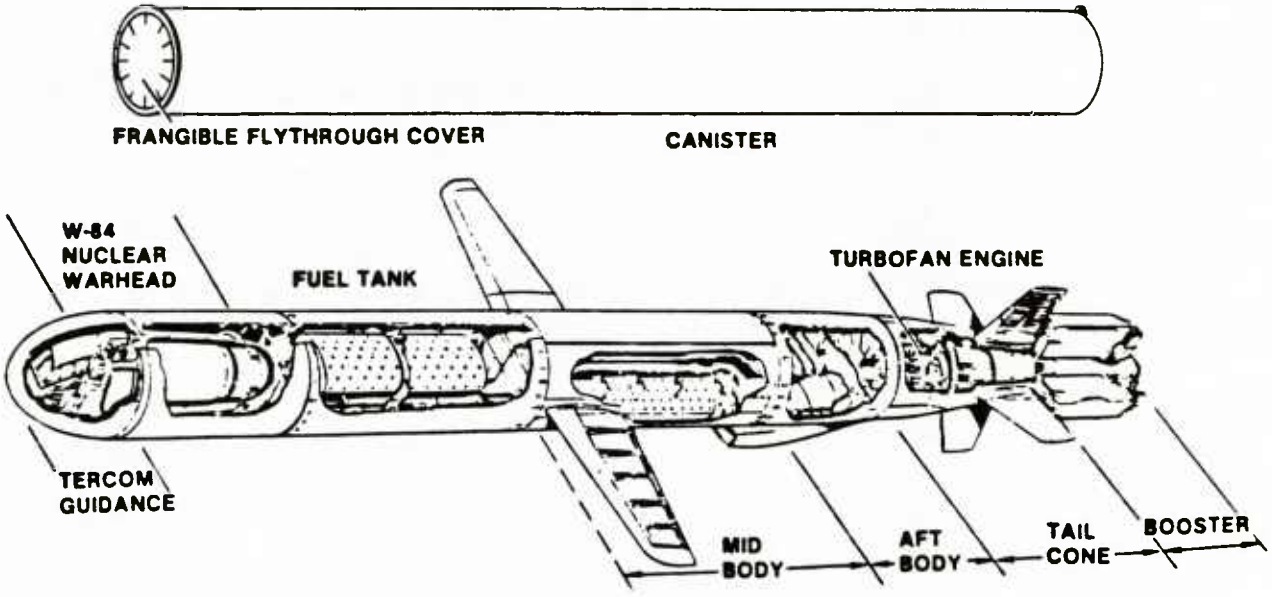
GLCM
PROGRAM STUDY REPORT

I. SYSTEM DESCRIPTION

The Ground Launched Cruise Missile (GLCM), designated BGM-109, is a guided, subsonic surface-to-surface missile. GLCM is basically the same missile as the Navy's Sea Launched Cruise Missile (SLCM). A small jet engine provides thrust for the cruise missile and wings provide aerodynamic lift like an airplane. GLCM flies at low altitudes and is capable of carrying a nuclear warhead.

An inertial navigation guidance system updated by Terrain Contour Matching (TERCOM) information directs the missile in flight. The missile receives guidance updates from an on-board navigational computer. The computer matches surface characteristics measured by the missile's radar altimeter with maps of the flight route stored in the guidance computer. The TERCOM system allows for a high degree of accuracy.

GLCMs are fueled in advance and can be stored for months in protective aluminum canisters without need for scheduled maintenance or handling.



Specifications

Missile weight with booster	3,251 lbs. (1,478 kg)
Length with booster	20.3 ft. (6.18 m)
Maximum diameter	20.36 in. (51.5 cm)
Wing span	8.62 ft. (2.63 m)
Cruise speed	High subsonic
Operational range	1,500 mi. (2,500 km)
Contractors	
Missile	General Dynamics Corp., San Diego
Engine	Williams International, Walled Lake, MI
Navigation Guidance	McDonnell-Douglas Astronautics, St. Louis Litton Guidance and Control, Salt Lake City

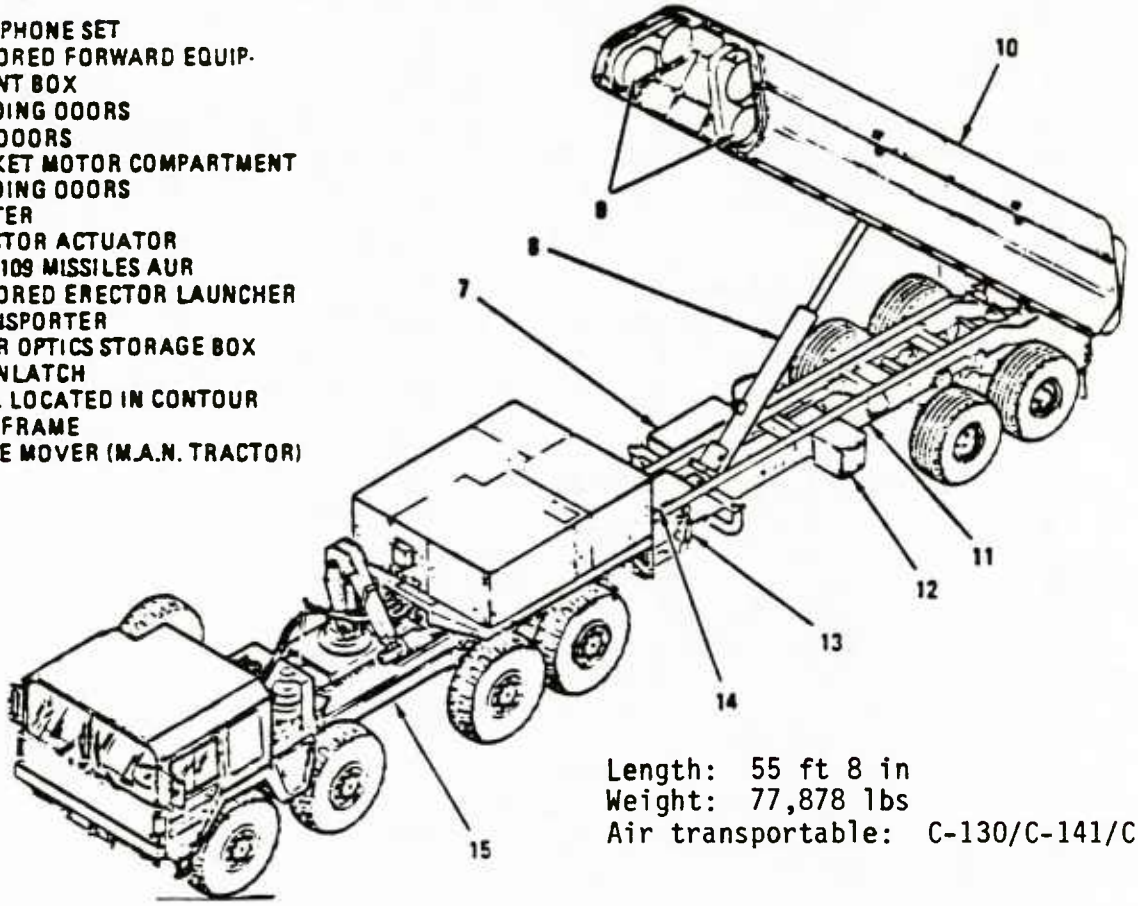
The basic GLCM combat unit consists of 16 air vehicles (missiles) loaded on four Transporter Erector Launchers (TELs) with two mobile Launch Control Centers (LCCs). Each TEL provides transport, protection, evaluation and launch support of four cruise missiles armed with nuclear warheads. The transporter enables rapid movement from main operating bases to remote launch locations. The mobile launch control centers protect launch personnel, communications systems and missile control equipment. Primary and emergency backup power is self-contained in the unit. LCCs achieve the same mobility requirements as the TEL. In combat-alert situations, GLCMs may be moved from protective hardened shelters to areas where natural terrain conceals movement and missile firing.

Until launch, the missile rests in an aluminum canister which is loaded on the TEL. The air vehicle's wings, control fins and engine inlet are retracted during storage.

To launch the air vehicle, a solid-fuel rocket engine boosts the missile to cruising speed. The booster is then jettisoned, fins and wings unfold, the inlet deploys and a turbofan engine ignites to sustain flight.

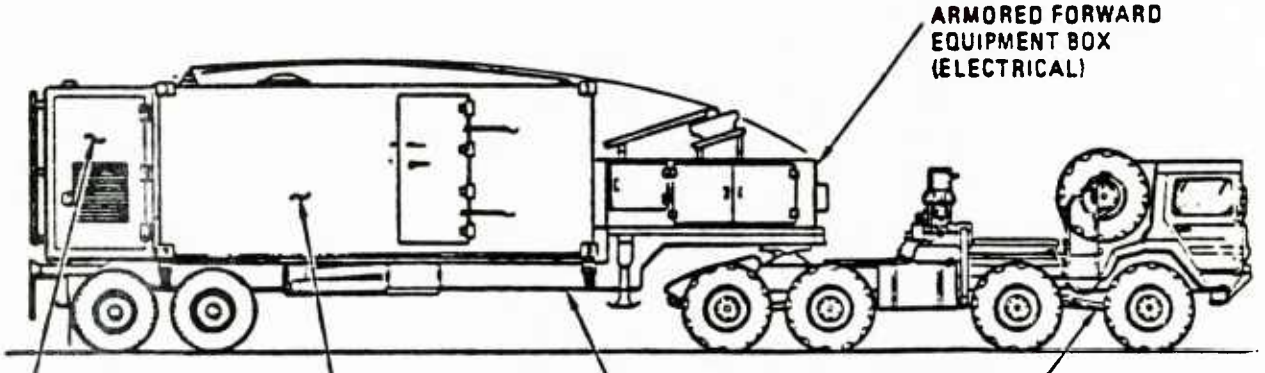
TRANSPORTER ERECTOR LAUNCHER (TEL)

1. TELEPHONE SET
2. ARMORED FORWARD EQUIP-MENT BOX
3. LOADING DOORS
4. AFT DOORS
5. ROCKET MOTOR COMPARTMENT
6. LOADING DOORS
7. HEATER
8. ERECTOR ACTUATOR
9. BGM-109 MISSILES AUR
10. ARMORED ERECTOR LAUNCHER
11. TRANSPORTER
12. FIBER OPTICS STORAGE BOX
13. DOWNLATCH
14. FUEL LOCATED IN CONTOUR OR FRAME
15. PRIME MOVER (M.A.N. TRACTOR)



Length: 55 ft 8 in
Weight: 77,878 lbs
Air transportable: C-130/C-141/C-5

LAUNCH CONTROL CENTER (LCC)



Length: 56 ft 1 in
Weight: 79,241
Air transportable: C-130/C-141/C-5

II. INITIAL PROGRAM SUMMARY

The GLCM program did not start like most other programs. The program was initiated by the Deputy Secretary of Defense Decision Memorandum on the DSARC II for the ALCM and Tomahawk programs.1/ Specifically the memo provided the following directions:

- "The first tasks of the JCMPO are to complete the RDT&E, leading to production decisions at DSARC III, of the ALCM for strategic bombers and the Tomahawk variants including the important Air Force ground-launched cruise missile application..."

- "The Navy and Air Force are to submit jointly within 45 days from this date for DDR&E approval, the plan for establishing the JCMPO and a set of program plans, schedules and milestones for the respective ALCM, Tomahawk and the Ground Launched Cruise Missile (GLCM), reflecting the following specific guidelines..."

- "The Air Force GLCM is to be adapted from the land-attack Tomahawk..."

- "Funds should be reprogrammed as required in FY78 so as to permit the GLCM to enter full scale engineering development in FY79."

At the time of the issuance of this memo, January 14, 1977, the Air Force had no validated requirement or concept of operations for a ground launched cruise missile. A full scale development program had been initiated by OSD and now the Air Force had to define its content.

1/ Deputy Secretary of Defense Memorandum; subject: Cruise Missile Programs; dated January 14, 1977.

III. PROGRAM EVOLUTION

A. Full Scale Development-Initial Phase.

With a decision to proceed with FSD on the GLCM, it was essential that program content and systems configuration be defined as quickly as possible. Details of the specific activities that occurred in the next 18 months were not available from files reviewed. However, there were some indications as to what was occurring in this time period to get the program started.

On February 23, 1977, the TAF ROC for GLCM was published. Within 2 months after this, an initial operations concept was released. On July 8, 1977, the Air Staff issued the following guidance:

- o Investigate alternatives to get design established.
- o Once design is established, FSD can begin.
- o Anticipate $14M in FY78 after passage of appropriations bill.
- o Develop program alternatives that would deliver first production missiles in December 1980 and December 1981.

The initial Program Management Directive (PMD#R-Q8010(1)) was issued on November 14, 1977. This document provided the following direction and planning guidance:

- o Start FSD for GLCM.
- o Precedence rating of 2-7.
- o Set thresholds for altitude, speed, range, accuracy, dispersal time, set-up time, response time, RCS, nuclear hardness, maintainability and design-to-cost.
- o Funding plan--

FY78	FY79	FY80	FY81	TOTAL
18.7	33.0	27.0	10.0	88.7

- o Schedule--
  - oo Contract go-ahead — Oct 1977
  - oo Preliminary Design Review (PDR) — Mar 1978
  - oo Critical Design Review (CDR) — Aug 1978
  - oo Start Government Testing — Jul 1979
  - oo DSARC III — Nov 1980
  - oo IOC — May 1981 or Mar 1982*

  (* based on funding)

The Air Force Systems Command (AFSC) implementing directive was issued on February 27, 1978. This document resolved the long standing problem of personnel assignment for the GLCM Program Office. The Aeronautical System Division (ASD) of AFSC was directed to provide the personnel authorizations for the project office. In addition, ASD would provide engineering support. Up to this point it appears that only about six persons were assigned to the JCMPO to work GLCM. These were subsequently augmented by personnel from ASD on temporary duty to the project office. It was not until the summer of 1978 that a colonel was assigned as the GLCM Program Manager and personnel strength reached approximately 30. A memorandum from the Secretary of Defense on June 2, 1978, revised the program milestones to set DSARC III as May 1981 and IOC as March 1982. The IOC was defined as 2 LCCs, 4 TELs, and 16 missiles combat ready and on alert at a main operating base.

B. Full Scale Development

In a memorandum to the Air Force Vice Chief of Staff on May 12, 1978, the Assistant Secretary of the Air Force (R&D) requested a program review by the AFSARC. The review was requested to address issues that had been raised at EXCOM V and VI meetings, particularly the systems concept, systems vulnerability, and mission planning. The review was desired for October 1978 with the understanding that a DSARC review could be anticipated.

An internal Air Staff memo between the Director of Requirements and Development Plans and the DCS, Research and Development on June 7, 1978, outlined the following points for the AFSARC Review:

- This is a program review and not a milestone decision point.
- DCP/MENS will not be required.
- Representatives from OUSDR&E and ASD (C3I) would probably attend.
- TAC will attend and present operation concept.
- The purpose of the review is to assure the AFSARC that C3 and mission planning is sufficiently well defined to proceed on to the CDR phase of development.

On July 18, 1978, an AFSARC Planning meeting was held with 23 persons in attendance. The meeting was chaired by the Air Force Deputy Assistant Secretary for Systems. The meeting provided guidance on briefing content, directed that an ICA be accomplished, and tentatively set the AFSARC date for November 7, 1978.

A week after the AFSARC Planning meeting a memo from the USDR&E, dated July 25, 1978, requested the Air Force submit a "For Comment" draft of the GLCM DCP in September 1978. The DCP was to update the DSARC II decision with subsequent program decisions-- it appears that this document was to be viewed, in this application, as a program status paper. In August 1978, EXCOM IX reset the submission schedule to have the "For Comment" Draft submitted by November 1, 1978, and the "For Coordination" draft by December 1, 1978.

The following reflects the Cost Track Summary and Funding Profile contained in the November 1978 DCP:

Cost Track ($M)

	FY77 $		Escalated
	Development Estimate 1)	Current Estimate 2)	Current Estimate 2)
Total Development:	74.8	89.1	107.7
Contractor Subtotal	(64.6)	(78.5)	(94.9)
In-House Subtotal	(10.2)	(10.6)	(12.8)
Total Production:	927.6	933.8	1415.1
Weapon System	(653.9)	(548.0)	(836.0)
Initial Spares	(19.9)	(24.6)	(34.1)
Other Production Costs	(253.8)	(361.2)	(545.0)
Total Construction:	51.2	51.2	73.1

1) September 30, 1978 SAR
2) FY80 AF BES, September 22 1978

Funding Profile ($M)

	FY78	FY79	FY80	FY81	FY82	FY83	FY84	To Comp	Total
Devel.	18.7	33.0	32.1	14.6	9.3	--	--	--	107.7
Prod.:	--	20.2	106.1	228.4	254.9	220.6	208.1	376.8	1415.1
Mil. Constr.		--	17.0	--	35.1	--	20.0	--	72.1
(Quantities):			(22)	(84)	(120)	(120)	(120)	(230)	696

The OSD staff comments, on the DCP, were provided to the Air Force on November 20, 1978, with a request that the "For Coordination" draft be submitted by December 11, 1978.

The tentative date for the AFSARC in early November 1978 did not hold. Specific details on the preparation for this review could not be determined from available files, however, it would appear that the analysis efforts necessary to support this review did not progress at the rate earlier anticipated. On December 7, 1978, a briefing was presented to the Air Force Deputy Assistant Secretary for Systems, the Air Force Chief Scientist, and members of OUSDR&E/C^3I staff. The purpose of this presentation was to review the results of the C3 analysis and to obtain concurrence in the approach being pursued.

The following summarizes the major levels of briefings prior to the AFSARC Review; it does not show the lower level pre-briefs that are a normal requirement for presentations at each of these levels:

Briefing To:	Date
Commanders, ASD, AFTEC, AFALD	January 16, 1979
Commander, TAC	January 17, 1979
Commander, AFSC	January 19, 1979
Air Force DCS/R&D	January 22, 1979
Air Force Council	January 23, 1979
AFSARC	January 31, 1979

During the preparation and presentation of the briefings the content and thrust appear to have changed. The initial tasking was to review C^3 and mission planning aspects of GLCM, while the final review looked at the entire scope of the program. Areas added that are of special significance are as follows:

- Survivability and mobility--the briefing included the results of USDR&E requested studies on nuclear and conventional prelaunch survivability and system mobility.
- Force structure was of concern at the Air Force Council Review. DCS Operations was tasked to adequately staff the issue and present the Concept of Operations at the AFSARC.
- Disclosure of GLCM information to NATO allies. Several issues on data releasability.
- Basing Concepts.
- Change from standard M-818 tractor to a new tractor.
- Issues about RDT&E costs, IOC dates, and warhead tests.

- oo Early IOC was being pushed by OSD. The Air Force appears to have been "lukewarm" to the idea, supported OSD position but felt it added significant program risk and required more funds.

- oo The ICA indicated that the JCMPO estimate for FSD was unreasonably low.

The AFSARC was held on January 31, 1979. There was no requirement for the briefing to go to the DSARC. On February 6, 1979, the Assistant Secretary of the Air Force (R&D) "approved proceeding with the following actions for the GLCM development program:"

- o Pursue tractor trailer concept with Army's Heavy Enhanced Mobility Tactical Truck (HEMTT) tractor as the prime mover. The M-818 will be an interim vehicle should HEMTT not support GLCM IOC.

- o NATO disclosure issues require rapid resolution. By February 16, 1979, provide memo for SECAF to send to ASD/ISA.

- o Include conventionally hardened shelters as recommended in AF/SA studies. Start an R&D effort to define shelter design to support FY81 MILCON program.

- o Force structure issue should be resolved in the FY81 POM exercise.

- o Air Staff should obtain revised RDT&E and production estimates from JCMPO. Revised data needed to support FY81 POM. ICA team should review their estimate based on restructured program.

The above direction was issued to AFSC on February 28, 1979, in PMD Amendment #2. In addition, the PMD provided the following:

- o Precedence rating changed to 1-1 (FAD 1).

- o AFSC/AFESC will conduct the design and test of MOB shelters.

- o Set GLCM vehicle dimensions to approximately 55 x 8 x 13 ft.

o Revised Milestone dates:

	New Date	Change
Complete CDR	December 1979	+16mos.
IOT&E Start	August 1981	--
IOT&E Complete	February 1982	--
DSARC III	April 1982	+17 mos.
IOC	May 1983	+14 mos.

There was no indication that the DCP was either signed or approved. An additional attempt was made to write the DCP in late 1979. At the EXCOM XVII meeting, October 24, 1979, it was requested that a "For Comment" draft of the DCP be submitted to OSD by November 21, 1979. This was accomplished and on December 5, 1979, the document was distributed within the OSD staff with comments requested by January 11, 1980. There was no evidence from the files available that this version of the DCP progressed any further in the process. On May 2, 1980, the EXCOM agreed that a DCP was not required since the DSARC III would not occur until November 1982. Therefore, to document the status of the GLCM programs, an Executive Program Summary (EPS) was requested. This document was finally approved by USDR&E on January 19, 1981. This document would then be the program baseline until the DCP was required for the Milestone III.

C. Limited Production

In July 1981, the GLCM program was identified as a potential candidate, under the Acquisition Improvement Program, for delegation of the Milestone III decision to the Air Force. However, since there had not been an OSD review on the program in over four years and production funds had already been released for long lead, it was deemed essential to schedule a Program Review, by the DSARC principals, to assess the readiness for limited production and the desirability of delegating the Milestone III decision.

A working level planning meeting was held in late July 1981. Formal instructions were issued to AFSC on July 31, 1981, to include an update of the EPS approved in January 1981. It is interesting to note at this point that the new Program Manager for GLCM had just arrived at the beginning of the summer. In addition, the Chief of the Projects Division had also just been assigned to the Program Office. It was this latter individual who was given the extra duty of "pulling together" all the actions of the JCMPO to support the Program Review. Although neither of these individuals had direct "DSARC experience" from other program assignments, their previous assignment on the OSD staff appears to have been beneficial in structuring the briefings to satisfy that staff's requirements.

In early September 1981, the OSD staff provided a briefing outline to address the key issues. On September 11, 1981, a

planning meeting was chaired by AFSC/SD with about fifteen persons in attendance. Based on this meeting and other follow-on actions, the following positions/issues were identified:

- o Briefing is informational only, no recommendation will be made.
- o No decisions are required.
- o Milestone III delegation is to be assumed.
- o Schedule is tight and concurrent.
- o There is potential for cost growth.
- o Basing is still an issue due to beddown difficulties.
- o Logistics concern centers on deferred development of support elements.
- o An R&M improvement effort needs to be included in the program.

The OSD CAIG indicated that a formal review would not be required but it would like to review Air Force ICA done in February 1981. The CAIG desired to review this documentation and to have working sessions with analysts familiar with Program Office estimates and current actual costs. The program schedule and funding plan are shown in Figure F1 and Table F1, respectively.

The briefing schedule and document preparation activities are summarized below. This is not an exhaustive list. The Program Office indicated that it supported many "spur-of-the-moment" meetings, with functional elements, to answer questions before they developed into major issues.

ACTION(Number of People Attending)	DATE
EPS submitted to Air Staff	Aug 27 '81
Planning meeting at AFSC (15)	Sep 11 '81
T&E pre-brief to AFSC	Sep 23 '81
T&E pre-brief to Air Staff	Sep 24 '81
T&E pre-brief to OUSDR&E (T&E)	Sep 25 '81
MRA&L pre-brief to Air Staff	Sep 29 '81
MRA&L brief to OSD/MRA&L	Oct 5 '81
Program pre-brief to AFSC/CC (22)	Oct 8 '81
Program pre-brief update to AFSC/SD	Oct 21 '81
Program pre-brief to Air Staff (29)	Oct 28 '81
Program pre-brief to Air Staff Board	Oct 29 '81
Program pre-brief to Air Force Council	Nov 3 '81
EPS "For Coord" draft to USDR&E	Nov 3 '81
Program pre-brief to AFSARC (30)	Nov 6 '81
CAIG Summary*	Nov 16 '81

GLCM PROGRAM

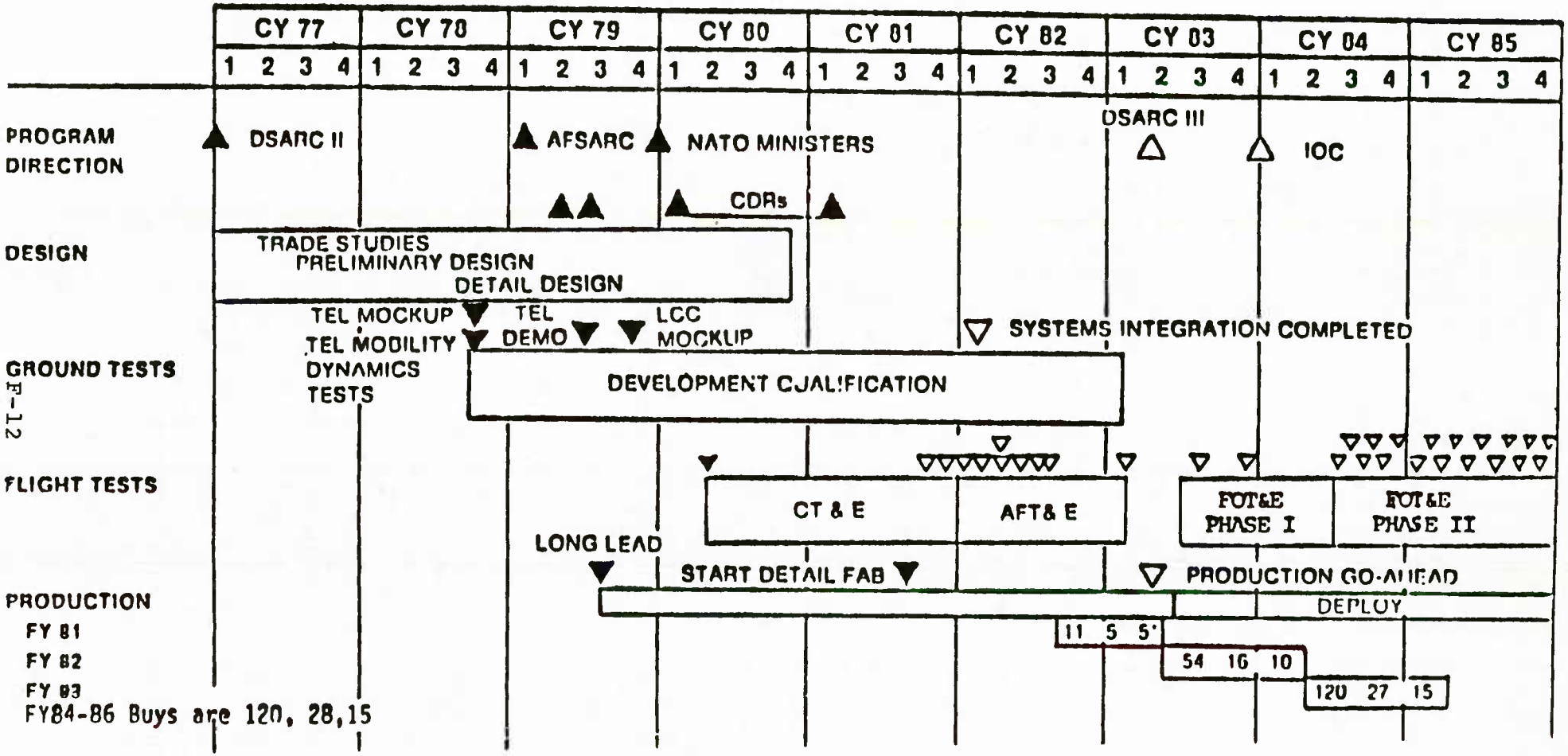


FIGURE - F1:

TABLE - F1:

GROUND LAUNCHED CRUISE MISSILE

FY83 BUDGET ESTIMATE SUBMISSION
($M)

	PRIOR	81	82	83	84	85	86	TO COMP	TOTAL
R&D 64362F									
APPROVED PROGRAM	113.2	107.6	80.4	28.6	24.2				354.0
PRODUCTION 27314F									
APPROVED PROGRAM	28.4	164.1	351.8	510.1	448.5	439.6	406.8	90.7	2440.0
CONST									
APPROVED PROGRAM		22.2	74.5	87.5	94.4	111.4	6.9	0.4	397.3
APPROVED PROGRAM	141.6	293.9	506.7	626.2	567.1	551.0	413.7	91.1	3191.3
MISSILE QTY		11	54	120	120	120	120	15	560
TEL QTY		5	16	27	28	28	28	5	137
LCC QTY		5	10	15	15	15	15	4	79

MRA&L Summary*	Nov 16 '81
T&E Summary*	Nov 16 '81
DSARC Program Review	Nov 17 '81
SDDM	Dec 8 '81
EPS approved	Dec 16 '81

* Following synopsizes these summaries:

- o CAIG
  - oo R&D will cost approximately $15M more than present estimate ($369M vs $354M).
  - oo Production program is estimated to be about 15% greater than Air Force estimate ($3263M vs $2837M).
  - oo Air vehicle cost is reasonable.
- o MRA&L
  - oo Construction schedule and funding tight.
  - oo Manpower accessions, training, retention may be difficult for early years.
  - oo Readiness objectives not clearly defined, nor is there a funded effort to fix R&M deficiencies.
- o T&E
  - oo Relative scarcity of resources and schedule time to accomplish the extensive testing planned for GLCM is a significant risk factor.
  - oo Appears that sufficient test and evaluation has been planned. However, this is highly success-oriented test schedule.

The above schedule of events are only the "tip of the iceberg" when it comes to identifying the amount of effort expended to support the DSARC review. Based on discussions with program office personnel the following is an estimate of the effort expended, in the Program Office, to prepare for and support this process (does not include graphics support):

	Aug	Sep	Oct	Nov
Person-Months	1/2	4-1/2	9	7 to 8

To the above must be added all the time spent by the other agencies and staffs that either supported or reviewed the various briefings. In total this becomes a significant commitment of

personnel resources to the specific decision process. This is normally accomplished by redirecting personnel from their primary tasks, which further exacerbates the daily management problems. As can be seen from the above, large numbers of personnel were involved in each of the meetings.

The DSARC Program Review was held on November 17, 1981. The following summarizes the key points of the presentation:

- o The firm IOC is a major program driver.
- o Development status:
  - oo Missile proceeding satisfactorily.
  - oo TEL/LCC software is impacting the schedule.
- o Deployment efforts were basically on schedule.
- o Logistics Support efforts had been delayed due to early funding shortfalls. Initial spares for IOC were limited.
- o Budget tight, little flexibility to cover any possible test problems.

The main issues at the Program Review ultimately centered on logistics, readiness, and program software. Based on several observations, it appears that the ongoing problems with the software dominated the discussion. On December 8, 1981, USDR&E forwarded a memo to the Secretary of the Air Force indicating that "The GLCM program is of vital importance ... and the European deployment ... represents a national commitment to the NATO alliance." The memo continued by stating that "the following minimum actions are required to enhance our efforts to successfully meet the objectives:"

- o Strongly endorse use of competent software subcontractor and establishment of schedule for tracking software development on weekly basis. Request copy of schedule and biweekly status report.
- o Proceed with FY81 and FY82 production buys and purchase of FY83 long lead material.
- o Conduct analysis of GLCM readiness objectives. Focus on resource and R&M requirements to support dispersed flights for 30 to 45 days. The developed readiness objective will be program baseline. Provide results to OSD not later than May 1, 1982.
- o Budget resources for ECO to allow for correcting any R&M deficiencies found during IOT&E and early fielding.

- o Establish long-range training plan and provide to OSD not later than March 1, 1982.

- o Review OSD CAIG report and "provide comments as to the disparity in production estimates between the CAIG and program offices."

- o Expedite processing of the TEMP and T&E required to support the Milestone III decision. Test and evaluation "must provide credible estimates of operational effectiveness and suitability of GLCM in time to support IOC of the system".

- o Aggressively pursue initiatives to control costs and introduce competition into production phases.

- o "Milestone III decision delegated to the Air Force provided":

  - oo EPS thresholds not breached.

  - oo Major program milestones to support 1983 IOC do not change significantly.

  - oo Program cost threshold is not breached (defined as March 31, 1981, SAR plus 15 percent of base year dollar estimate).

It appears that the USDR&E memo was not formally transmitted to the Air Force Systems Command until January 22, 1982. An AF/RDQ letter, of this date, forwarded the memo, set suspense dates, and assigned responsibilities for specific tasks to either AFSC or TAC. AFSC subsequently forwarded the tasking by letter to the JCMPO on February 1, 1982. Based on the suspenses within this letter (some less than three weeks), it is obvious that work had been initiated on verbal instructions and this correspondence was just a formality.

IV. PROGRAM STATUS

Flight testing using pre-production configuration TEL and LCC equipment started in second quarter of 1982 and is continuing. On May 6, 1982, the Secretary of the Air Force notified Congress that there was a reasonable cause to believe that GLCM would breach cost thresholds. The Unit Cost Exception Report, forwarded by Secretary Orr on June 4, 1982, indicated a program cost of $3911.7M vice $3186.1M reported on March 31, 1981.

The SAR of June 30, 1982 shows the following:

	D.E. (FY78 - 86)	Change	C.E. (FY78 - 88)
Development	$74.8	+$181.9	$256.7
Procurement	$927.6	+$522.2	$1449.8
Construction	$51.2	+$193.8	$245.0
Total (FY77$)	$1053.6	+$897.9	$1951.5
Escalation	$473.6	+$1368.4	$1842.0
Total Cost	$1527.2	+$2266.3	$3793.5

This total program cost is $118.2M less than reported by Secretary Orr on June 4, 1982. As indicated in the SAR, this was the result of the "first round of cost cutting initiatives" which were undertaken in response to Secretary Orr's direction. The SAR identified the following major contributors to program growth:

Development:

Category	Amount($BY)	Description
Schedule	+18.0	Delay in IOC
Estimating	+159.4	TEL/LCC design more complex than originally conceived. Increased software development cost. Increased R&M design, test and evaluation tasks.
Support	+10.4	Increase Support Equipment Requirements

Procurement:

Category	Amount($BY)	Description
Quantity	-124.7	Reduce Quantity to 560
Estimating	+379.8	TEL/LCC design more complex than ongoing estimated. Pre-production cost growth experience.
Support	+145.3	Increased Support Equipment Requirements

Construction:

Category	Amount($BY)	Description
Estimating	92.5	Revised beddown, TEL/LCC design requirements
Support	118.2	Increased equipment requirements

The Air Force estimate by October 1982 had been reduced further as indicated by the FY84 BES as follows:

	FY82&P	FY83*	FY84	FY85	FY86	FY87	FY88	Total
R&D	300.7	28.6	36.5	13.2	0	0	0	379.0
Procurement	543.0	525.4	616.7	543.6	519.9	44.1	0	2792.7
Construction	78.3	75.0	147.9	90.9	30.3	0.4	0.7	423.4
Total	922.0	629.7	801.1	647.7	550.2	44.5	0.7	3595.1

*NOTE: FY83 Congressional committee action as of November 1982 had agreed to reduce construction to $75M and procurement to $458.5M. A proposed supplemental appropriation would add $66.9M to the procurement budget. (The supplemental was subsequently abandoned.)

APPENDIX G

NAVSTAR
PROGRAM STUDY REPORT

I. SYSTEM DESCRIPTION

The Navstar Global Positioning System is a space-based radio navigation system designed to provide users with worldwide three-dimensional position and velocity information along with coordinated universal time (UTC). GPS consists of three segments: (1) a space segment, satellites that transmit radio signals, (2) a control segment, ground-based equipment to monitor the satellites and update their signals, and (3) a user equipment segment, devices to passively receive and convert satellite signals into user information. Figure G1 shows the interrelationship of these three segments.

The space segment consists of 18 satellites in circular 10,900 nautical mile orbits with 12 hour periods. The satellites continuously broadcast on two radio frequencies, 1575.42 and 1227.6 MHz. The GPS satellite has a mean mission duration of six years, and a design life of 7.5 years. Electrical power is supplied by two solar energy converting panels that continually track the sun and by three batteries for use when the earth eclipses the sun. Each GPS satellite has an on board propulsion system for maintaining orbit position and for stability control.

The operational control segment (OSC) consists of five monitor stations, a master control station, and two ground antennas. The monitor stations monitor satellite orbits and signal data and transmit this information to the master control station. The master control station (MCS) processes the information received from the monitor stations to determine satellite position and signal data accuracy. The master control station produces messages to correct for discrepancies in satellite position and signal data errors and relays the message to a ground antenna.

The user equipment (UE) segment includes several different types of user equipment planned to satisfy the different requirements of various users; some users require precise navigation data and/or operate in more stringent dynamic environments than do others. Examples of user applications are strategic and attack aircraft, ships, submarines, armored vehicles, and ground troops.

In general, user sets will have an antenna, receiver, data processor with software, a crystal oscillator (clock), and a control display unit (CDU). Some sets are to be integrated with auxiliary sensors, such as inertial navigation units, to enhance system performance. Depending on user needs, the equipment is designed to receive and process data from four satellites on either a simultaneous or sequential basis. The equipment measures the user's velocity and range with respect to each satellite. The user set then processes the data in World Geodetic System coordinates, an earth centered earth-based coordinate system to derive the user's three-dimensional position and velocity. Positioning data is presented on a display unit in

geographic coordinates, military grid coordinates, or any other coordinate system desired by the user.

Although the GPS is being developed as a military system, it has the potential to provide navigation, position, and time information to civilian users as well. DOD's position is to support the broadest possible civil use of the GPS while prevention exploitation detrimental to the security of the United States and its allies.

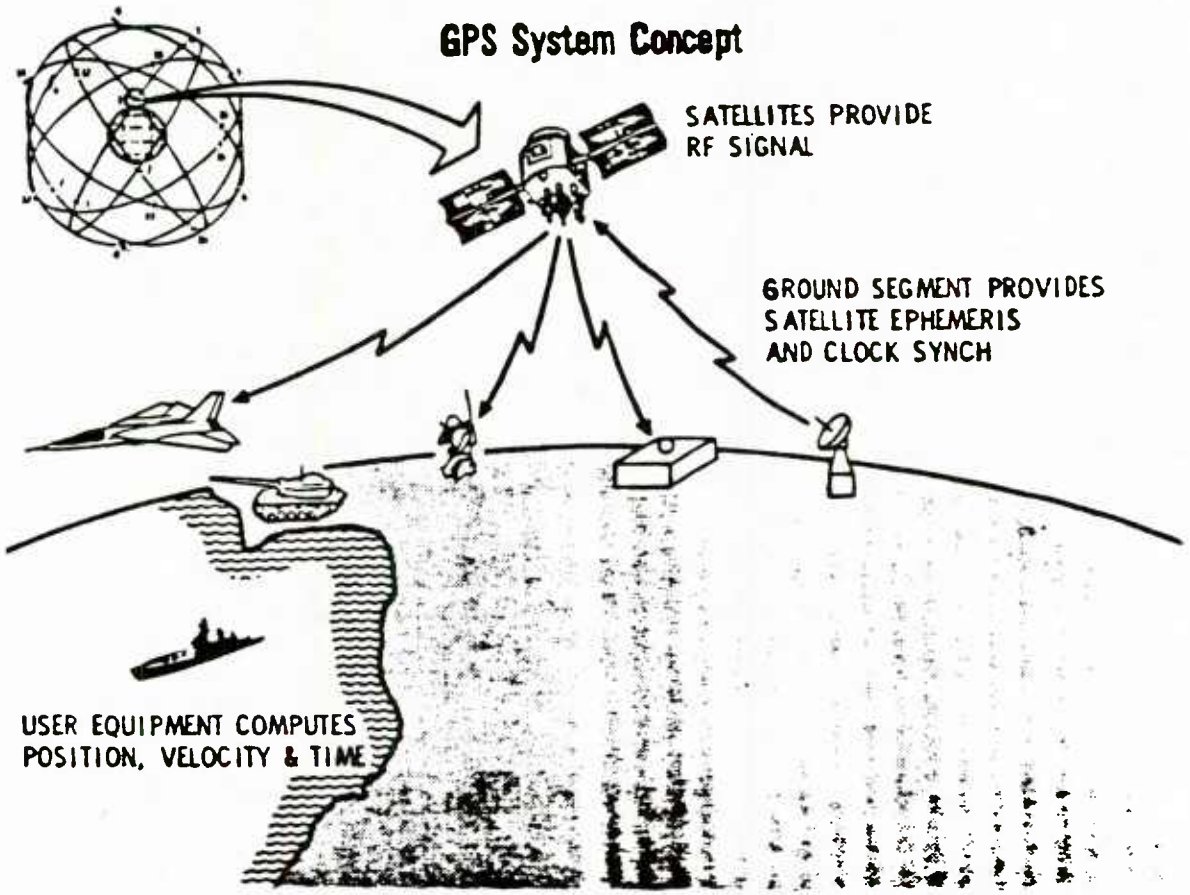


FIGURE G1

II. INITIAL PROGRAM SUMMARY

The Navy and the Air Force had actively pursued the concept that universal navigation and positioning could be performed using radio signals transmitted from space vehicles to meet the need of a broad spectrum of users. By reducing the proliferation of specialized equipment responsive only to particular mission requirements, it was believed that definite cost benefits would accrue. The Navy TRANSIT navigation satellite program was initiated in 1958 for the specific purpose of providing navigation for Fleet Ballistic Missile submarines. TRANSIT became operational in 1964 and was made available to non-military users in 1967.

Each service embarked upon an extensive technology program of studies, experiments, and tests to demonstrate the feasibility of a Defense Navigation Satellite System (DNSS). The Navy sponsored TIMATION, a technology program to advance the development of high stability oscillators, time transfer, and two dimensional navigation. The Air Force concurrently conducted preliminary concept formulations and system design studies for a highly accurate three dimensional navigation system called System 621B. The System 621B concept and techniques were verified in a series of tests and experiments at Holloman Air Force Base and the White Sands Missile Range. The integration of the Air Force and Navy activities resulted from a memorandum by the Deputy Secretary of Defense on April 17, 1973. [1]

The NAVSTAR GPS program evolved from this tasking and was structured into three phases. Each phase's capability evolved from the capablity of the preceeding phase. Phase I required the deployment of four subsynchronous satellites. Two of the three orbits planned for the operational system would receive two satellites each. Besides the normal aspects of a concept validation effort, the program placed special emphasis on attempting to validate the acquisition and recurring costs of the overall system and the various types of user equipment. In addition, prototype user equipment performance was to be evaluated through extensive DT&E, and military value was to be assessed through selected operational demonstrations.

Phase II would be initiated after a successful DSARC II review in early CY78 and continue until DSARC III in early CY82. This full scale development period would include system test and limited operational capability. Additional satellites would be built and deployed to attain precise periodic three-dimensional capability, and a continuous, two-dimensional capability, with fully operational ground stations. This phase was also to contain the IOT&E and initial production of the low-cost class of user equipment and the completion of IOT&E on the other classes

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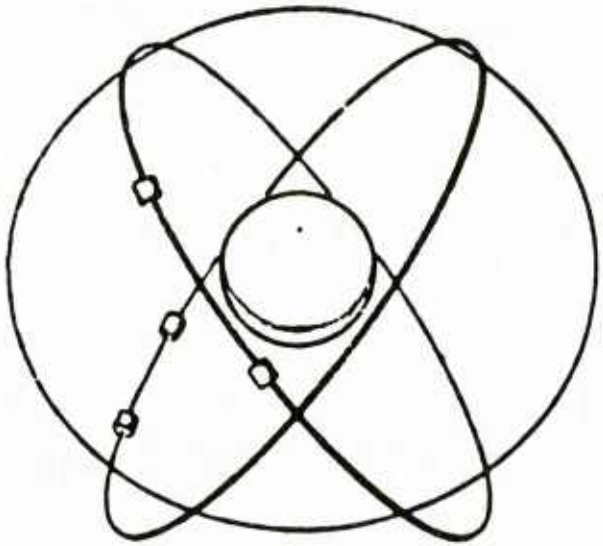
[1]Department of the Air Force PMD No. R/S 4075(18)/PE64778F/35165F dated September 20, 1982. pg. 4.

of user equipment. Figure G2 shows the orbital configuration through the program phases. Phase II is shown in two parts. The Phase IIa configuration shows satellite position during the system test period and Phase IIb shows the repositions for initial operational capability. Phase III would then launch and insert additional satellites into these orbits until there are eight operational in each orbit plus in-orbit spares. Phase III, full operational capability, was to extend from 1982 through 1987. This phase provided for building and launching the remaining satellites to provide the precise, three-dimensional capability, along with the procurement of user equipment. The overall schedule is shown in Figure G3 and the funds required for Phase I are shown in Table G1.

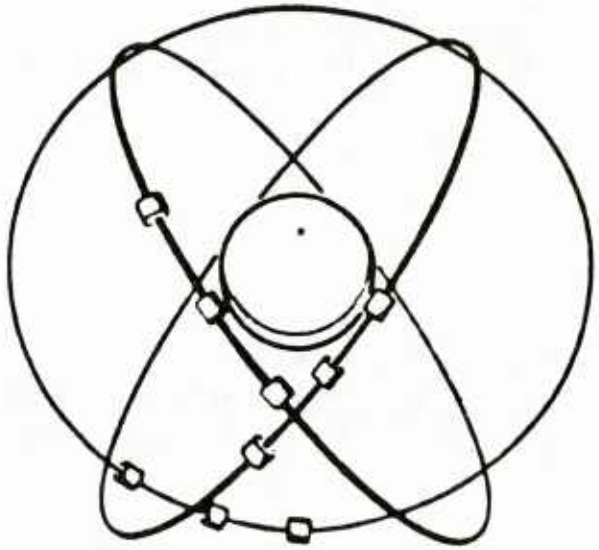
TABLE G1
GPS PROGRAM FUNDS BY SERVICE
(FY74$ in Millions)

Service	FY74	FY75	FY76	FY77	FY78	Phase I Total	Est to Phase	Total Program
Army	1.6	3.8	4.0	3.6	1.6	14.6		
Navy	3.9	6.0	7.2	5.0	2.8	24.9		
Air Force	7.4	25.0	47.1	18.5	10.6	108.6		
TOTAL	12.8	34.9	58.3	27.1	15.0	148.1	353.0	501.1

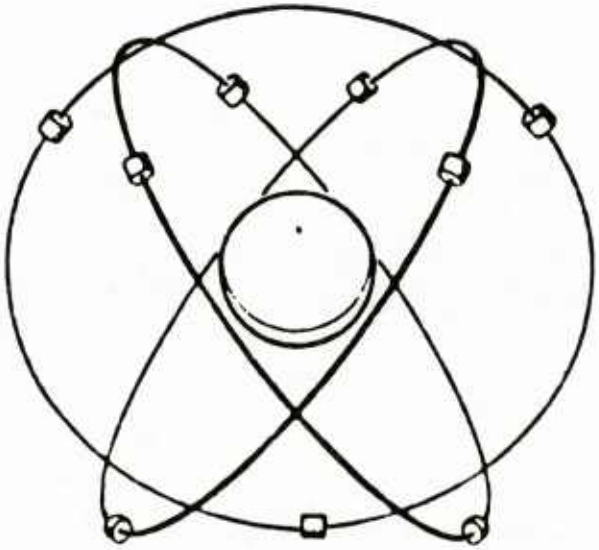
Orbital Configurations by Phase



Phase I



Phase II (a)



Phase II (b)

FIGURE G2

PROGRAM SCHEDULE ALTERNATIVE III

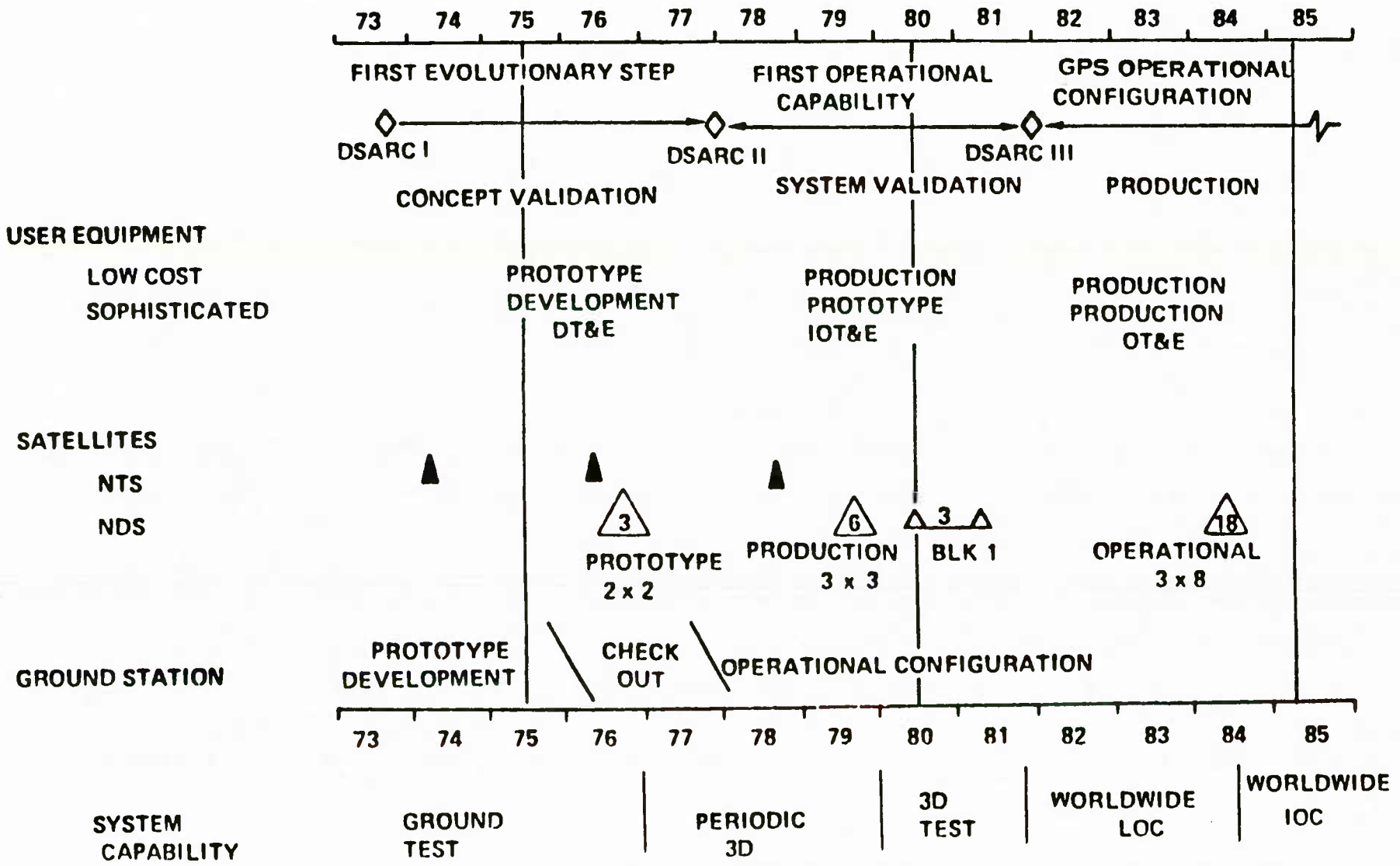


FIGURE G3

III. PROGRAM EVOLUTION

A. Initiation

In a memorandum to the Service Secretaries on April 17, 1973, the Deputy Secretary of Defense, William P. Clements, Jr. stated:

"I have concluded that we should proceed to DSARC with the formulation of a Defense Navigation Satellite Development Program (DNSDP) to test and evaluate the concepts and costs of an advanced navigation system, including a variety of sea, air, and ground-based user equipments. The main purpose of the program will be to clarify cost and value relationships of navigation satellite systems and to produce the technical information and user experience needed to form a basis for a decision on whether to deploy an operational Defense Navigation Satellite System (DNSS) for use during the 1980s."

The memo went on to designate the Air Force as the Executive Service in this joint service program and requested that the DSARC review the proposed program in August 1973. The Air Force was requested to assign a Program Manager; form a joint Program Office, to include Army, Navy and Marine Corps; and submit a DCP for the DNSDP by July 1973. Specific guidelines were provided for inclusion in the implementation plan, and a not-to-exceed cost ceiling for this baseline program was established at $204 million for all services. The following allocation of cost by fiscal year was identified:

	FY74	FY75	FY76	FY77	FY78	Total
Army	3	5	6	2	2	18
Navy	3	7	5	2	2	19
Air Force	11	40	60	40	16	167
Total	17	52	71	44	20	204

On May 7, 1973, in a letter to General George Brown, Commander, Air Force Systems Command (AFSC), General John B. Ryan, Chief of Staff, Air Force indicated his strong support for a program leading to the acquisition of a DNSS and that a DSARC review was fundamentally important to the program. He therefore requested that "AFSC establish a joint program office to work closely with the other commands and agencies..." Later that same month the Secretary of the Air Force requested the Army, Navy, DOT and NASA to participate in the program.

Specific details on the planning activities during May and June 1973 were not available in the program files reviewed, except that the DCP "For Comment" draft was written by a Joint Service Working Group during the period of June 19 to 21, 1973. By July 10, 1973, the following briefing and documentation schedule had been formulated which indicated that the originally requested date of August could not be satisfied:

Briefings	Documents	Date
--	DCP to Services for Comment	Jul 2 '73
CNO Executive Board Review	--	Jul 24
--	DCP Comments from Services to USAF	Aug 1
DNSDP Briefing to DDR&E	--	Aug 9
Progress Briefing to Defense Navigation Planning Group (DNPG)	--	Aug 10
--	Final Draft of DCP Complete	Aug 13
--	DCP to OSD for Comment (NLT)	Sep 4
--	OSD Comments on DCP to USAF	Sep 18
ICA Briefing to AF/CAIG	--	Sep 24
Initial USAF Reviews of DSARC Briefing (DCS Level)	--	Sep 27
Army SARC	--	Oct 4
--	DCP to OSD for Coord	Oct 4
ICA to OSD/CAIG	--	Oct 4
--	DSARC Briefing doc. to OSD	Oct 5
AFSec/CSAF Review	--	Oct 9
JCS Review	--	Oct 10
DDR&E Review of DSARC Briefing	--	Oct 10
OSD Staff Review of DSARC Briefing	--	Oct 11
Final ODDR&E Pre-DSARC Review	--	Oct 16
DSARC Review	--	Oct 18

The inability to meet the original August 1973 date is somewhat expected. At the time of the DepSecDef request, each service was pursuing its own technology program. Although each service may have been aware of the others' activities, there was no formal management structure that tied them together. Furthermore, there was no real agreement on basic requirements for such a system as GPS. Therefore, the tasks to be accomplished before a DSARC Milestone I Review could be held were significant. An entire program plan had to be constructed in sufficient detail to support a decision to commit $200M for a validation effort that would yield appropriate data for the subsequent development and global deployment of a precision navigation system. This requirement was in addition to developing the management structure and reaching agreement on basic technical requirements. The initial period of three months seems to be characterized by a high level of activity with the paperwork catching up when it could. As an example, the initial formal direction from the Air Staff was issued in a Program Management Directive on July 18, 1973--three months after the DepSecDef memo. However, the PMD contained considerable indication of completed actions and basic agreements and identified several key milestones from the above list.

The following summarizes the key issues and sub-elements to be considered at the DSARC I Review:

- o Should the development of a universal,precise positioning and navigation system be initiated?
  - oo Will it permit a significant reduction in the total DOD cost for positioning and navigation?
  - oo Will military effectiveness be significantly increased because of the improved capability provided by this system?
- o What is the best program orientation and pace for achieving the desired capability?

By early August 1973, it appears things were on track for an October DSARC Review. A joint ad hoc DSARC Planning Committee, chaired by the Air Staff Director of Space, was providing taskings and doing status reporting on all associated activities. However, the presentation to Dr. Currie (DDR&E) and other OSD staff members on August 9, 1973, was, in the words of the Air Force Chief Scientist, Dr. Yarymovych, "received poorly." It appears there was a complete disconnect between the Services and OSD. The Services had structured a briefing assuming prior endorsement of the basic concept of GPS, since it was in respose to the DepSecDef tasking memo. However, at the meeting, the Services were challenged by DDR&E on the fundamental requirements.

On August 14, 1973, a meeting was held to develop a plan for Program Advocacy. Dr. Yarymovych, Gen. Stelling, Air Force

Director of Space, plus fifteen other persons were in attendance. Specifics from this meeting were not available, however, there were indications that the Navy had failed to validate the requirement at that time and a follow-up meeting was necessary to review the status of the following ongoing studies:

- o Cost Trades.
- o Military Value.
- o Alternatives to GPS.
- o Relationship to Other Programs.
- o GPS Vulnerability.

During this same time period, Dr. Currie (DDR&E) requested that the DSB develop issues related to the Defense Navigation Satellite Program and report to him in early October 1973. By October 9, 1973, the DSARC I Review had slipped approximately two months, to mid-December 1973. The following shows the revised plan:

Briefings	Documents	Date
	DCP Addendum to Air Staff and Major Commands for Comments	Oct 4
DNSDP Briefing to DSB		Oct 16
	Air Staff/MAJCOM DCP Addendum Comments (NLT)	Oct 19
	OSD Comments on DCP and Addendum Required (NLT)	Oct 23
Chief of Naval Operations Executive Bound		Oct 23
ICA Briefing within AFSC		early Nov
ICA Briefing to AF/CAIG		Nov 12
Initial USAF Review (DCS, ACS, Directors)		Nov 13
	For Coord DCP to OSD	Nov 14
ICA Briefing to SAF/FM& AF/AC		Nov 19
Army SARC		Nov 20
Sec AF/CSAF Review DSARC Briefing		Nov 20
ICA Briefing to OSD/CAIG		Nov 26

Army/Navy Review of DSARC Briefing	Nov 27*
DDR&E Review of DSARC Briefing	Nov 28*
JCS Review of DSARC Briefing	Nov 29*
OSD Staff Review of DSARC Briefing	Nov 29*
Final DDR&E Pre-DSARC Review (if required)	Dec 5 *
DSARC I Review	Dec 11

(* tentative dates)

The data available in the files reviewed did not provide any insight into the changes that may have occurred in the program plan during the August to October 1973 time period. However, from discussions with individuals involved with the program at that time, it was determined that the technical nature of the program was modified. The original concept envisioned a relatively simple satellite with a highly sophisticated ground support segment. The system that finally evolved was one with a more sophisticated satellite and a less capable ground support system. This revised concept provided a satellite that would be less dependent on upgrade information from the ground segment, thereby improving overall system performance during periods of possible communications interference. However, it required clocks on board the satellite with a higher degree of accuracy and stability than were currently not within the state-of-the-art.

The DSARC I Review was finally held on December 13, 1973, with Dr. Curris as the Chairman. The description of the program was briefed; its schedule and estimated cost were outlined earlier in Section II of this report. Actual attendance at the review is shown in Figure G4.

On December 22, 1973, the Deputy Secretary of Defense, William P. Clements, signed the Decision Memorandum. He approved Alternative III from the NAVSTAR DCP, which was the Services' recommended program. The following additional guidance/direction was provided:

- Continue emphasis on life cycle cost minimization. An independent analysis of user equipment cost should be made during Phase I.

ODDR & E

Dr. M. Currie (Chairman)
R. Cooper
L/Gen R. Coffin
G. Sutherland
Col. B. Brentnall
D. Heebner
J. Gansler
T. McDonald

DIA

Dr. E. Speaker

CAIG

LCDR. D. Pilling

JCS

B/Gen B. Lewis
Lt. Col J. Vorhees

AIR FORCE

Dr. W. LaBerge ASAF(R&D)
Gen S. Phillips AFSC
L/Gen D. Crow AF/CVA
F. Ross SAF (R&D)
J. Williams SAF (I&L)
M/Gen H. Collins AF/RD
M/Gen R. Cross AF/RDQ
Col. R. Freaney AF/ACMC
Lt. Col. P. Martin AF/RDSC
Maj. H. Hughes AFSC/SAMSO
Dr. M. Yarymovych AF/CCN
B/Gen H. Stelling AF/RDS (P/M)
Col. R. Hansen AF/RDQ
Col. B. Parkinson AFSC/SAMSO
Lt. Col. R. Oksa

ARMY

C. Poor DASA(R&D)
L/Gen E. Almquist ACSFOR
M/Gen H. Cooksey DCRD
Col. L. Wamsted (Army P/M)

OASD(I&L)

H. Witt
F. Randall
RAdm. D. Webster
D. Spencer
R. Russell
B/Gen. M. Tashjian
Lt. Col T. VanMeter

OASD(C)

D. Brazie
T. Hardy

OASD(T)

Dr. H. Yudkin

DPA&E

Dr. J. Ahearne
Col A. Preyss (USAF)

ODDR&E(T&E)

L/Gen A. Starbird
R. Adm F. Petersen
Col J. Wassenberg
J. W. McCord

NAVY

Dr. D. Potter ASN (R&D)
J. Bowers ASN (I&L)
V Adm W. Moran OP98
V Adm H. Train OP09
R Adm L. Moffet OP09HW
R Adm R. Schneider NAVELEX
P Waterman OASN (R&D)
H. Sonneman OASN (R&D)
R. Adm R. Geiges PME106
Cdr. W. Huston
Cdr. D. Smith OP968

FIGURE G4
ATTENDANCE
NAVSTAR - DSARC I December 13, 1973

- o DTC targets should be established prior to DSARC II. Continuation of program beyond Phase I is dependent on the ability to develop accurate but inexpensive user sets.

- o Competitive development contracts should be used for all user equipment developments.

- o Significant technical risk remains in development of highly stable atomic clocks. Request that adequate long term funding and appropriate technical expertise existing in DARPA and Service laboratories, particularly the Navy, be brought to bear in this development.

- o Missile mid-course guidance appears to be one of greatest potential pay-off areas; however, the program is not currently structured to exploit this. By March 29, 1974, provide descriptive plan with schedule and funding to give added emphasis to development and test of this equipment during Phase I.

- o Provide detailed test plans to Deputy Director, Test and Evaluation, ODDR&E by September 1974.

- o There is a need to take realizable cost avoidance steps afforded through development of NAVSTAR. Cost avoidance schedules and proposed actions should be identified prior to DSARC II. DDR&E will review all positioning and navigation periodically to provide specific recommendations on cost avoidance or phase-out. Request an initial in-depth review prior to October 1974.

Within the Air Force, formal implementation of the DepSecDef decision took approximately six months. In January 1974, the Air Staff notified the Air Force Systems Command of the approval of Phase I. The message requested that the descriptive plan, for added emphasis during Phase I for missile mid-course guidance, be submitted by March 1, 1974. However, this was not formal direction to proceed with the Phase I program. It appears that the plan and supporting briefings occurred as required, but specific documentation was not available in the files reviewed. The initial Program Management Directive (PMD) R-S-4-075(1) was issued on May 2, 1974, and the DCP #133 was approved by DepSecDef on May 11, 1974. The PMD provided the following schedule milestones and financial plan:

- o <u>Schedule</u> (DSARC I Milestone) [90 days threshold]

NTS-2 Launch	Sep 30 '76
NDS-1 "	Mar 31 '77
NDS-2 "	May 31 '77
NDS-3 "	Jul 31 '77
DSARC II	Mar 31 '78

o Financial Plan [P.E. 63421F - USAF F&FP Jan 29 '74]

	FY74	FY75	FY76	FY77	FY78	FY79	Total
Phase I	7.4	25.4	48.8	20.8	12.8	0	115.2
Phase II						29.9	

The Program Office received formal direction to initiate Phase I with the issuance of the Air Force Systems Command (AFSC) Form 56 dated June 24, 1974. This document provided the normal amplifying instructions in various functional areas, but made no substantive changes in the directed program. In the financial area the Form 56 indicated that the FY74 funding of $7.4M had been released, indicated an issue in FY75, and indicated that the revised funding plan, based on the POM dated May 17, 1974, was as follows:

	FY74	FY75	FY76	FY77	FY78	FY79	FY80	Total
63421F (Phase I)	7.4	25.5*	49.5	27.0	14.3	0		123.6
35164F (Phase II)					5.8	35.4	12.3	
	7.4	25.5*	49.5	27.0	14.3	35.4	12.3	----

* "Congressional action may reduce FY75 to $22.9M. DOD has reclama. Program should be planning on the $22.9M."

In a memo to the Secretary of the Navy and Air Force on August 23, 1974, Dr. Currie (DDR&E) expanded the scope of the NAVSTAR Phase I program. The memo requested "that NAVSTAR be used for the satellite position fixing system to provide precision tracking data in support of the Navy's FBM Improved Accuracy Program and that the FBM System Program (FBMIAP) make available $5.8M FY75 funds to the NAVSTAR joint program office for procurement of the additional satellites and launch vehicles." Subsequent year budgeting would be the responsibility of the Air Force. The Air Force was also requested to insure that satellites would be available at the proper time to support the SLBM flight tests and that the FBMIAP priority could be used on relevant efforts in NAVSTAR. This increased scope was implemented by message amendment to the PMD (301043Z Aug 74 (2)).

On November 19, 1974, in a memo to the Assistant Secretaries of the Military Departments (R&D), Dr. Currie summarized some of the significant changes in the baseline program caused by the requirement to support the SLBM IAP:

- Reduced flexibility of satellite launch schedule.
- Significantly increased the available test time each day and expanded test area. Also, precise positioning improved.

- o Assured spare satellites are available.

- o Impacted funding in FY75 and subsequent years.

- o Offered opportunity to accelerate user equipment development and proceed directly to world wide two dimentional capability.

The memo recognized that these impacts had "rendered the DCP somewhat out of date" and requested a draft cover sheet update be provided for coordination by March 1, 1975. In addition, the following direction was provided:

- o The Army NAVSTAR program should be augmented with additional contractor participation in user equipment development.

- o Navy should expand NAVSTAR clock development effort. Should provide a second, parallel cesium clock develop ment. Also, Navy program should include hydrogen maser efforts in FY76 and beyond.

- o The Air Force should provide a briefing during the week of December 2, 1974, on how to acquire world wide, two-dimensional NAVSTAR capability much sooner.

The updated direction and guidance contained in PMD R-S-4-075(4), dated July 7, 1975, shows the evolving state of the program in its initial eighteen months. The program was now being structured to provide a limited global two-dimensional capability by 1981 and a full global three-dimensional capability by 1984. The following outlines the program schedule and financial plan:

- o Schedule

NTS-2 launch	Sep 76	
NDS 1-3 launches	Mar, May, Jul 77	
NDS 4-7 launches	Sep, Nov 77	)new
	Nov 78, Sep 79	)task
Start Phase I IOT&E	Sep 77	)new item
DSARC II	Mar 78	)
Operational Satellite Launches Start	Mar 80)	
Global 2D limited capability	Jun 81)	
DSARC III	Jan 82)	new items
Global 3D full capability	Aug 84)	

- o Financial Plan (FY77-81 POM)

PE 63421F	FY75&P	FY76	FY7T	FY77	FY78	FY79	FY80	FY81	Total
Phase I	31.3	57.9	7.6	29.5	8.0				134.3
FBM Support		16.7	5.6	24.3	13.4	4.6	2.8	0.5	67.9
SLC3E Act.				0.8	3.0	2.0			5.8
	31.3	74.6	13.2	54.6	24.4	6.6	2.8	0.5	208
PE 35764F									
3020					23.9	84.2	48.1	30.7	
3080						.4	13.5	2.6	
3300					0.8	13.0			
3400					1.0	0.8	0.5	0.5	
3600					10.0	43.0	26.7	27.0	
Total					35.7	141.4	88.8	60.8	

B. Threshold Breach

The PMD revision R-S-4-075(5), issued on November 11, 1976, identified deviations in some of the initial program milestones. However, the DSARC II Review date was still being maintained at the expense of compressing all the previous activities. In addition, the financial plans reflected the accelerated user equipment development program and the rephasing of the space segment development and procurement plans. The PMD further intimated that there was a possible cost growth expected and that AFSC should plan to conduct the program with the existing budget. Request for additional funds should only be accomplished if there were no other alternatives.

- o Schedule comparison

Item	Dec 73	Jul 75	Nov 76	Change
NTS-2	Sep 30 '76	Sep 76	Feb 77	-5mos.
NDS 1	Mar 31 '77	Mar 77	May 77	-2mos.
2	May 31 '77	May 77	Jul 77	-2mos.
3	Jul 31 '77	Jul 77	Aug 77	-1mos.
NDS 4	--	Sep 77	Nov 77	--
Start Phase I IOT&E	--	Sep 77	Feb 78	--
NDS 5	--	Nov 77	Dec 77	--
DSARC II	Mar 31 '78	Mar 78	Mar 78	0

- o Financial Plan (AF Budget Submission Oct 76 for FY78-82 & actuals for FY77 and Prior)

PE 63421F	FY75&P	FY76	FY7T	FY77	FY78	FY79	FY80	FY81	FY82	Total
Phase I	31.3	57.4	7.4	37.3	24.3	1.4	2.1	2.0	1.7	164.9
FBM Support	____	17.0	5.9	24.7	12.8	6.2	3.2	0.5	0	70.3
	31.3	74.4	13.3	62.0	37.1	7.6	5.3	2.5	1.7	235.2
PE 35764F										
3020	--	--	--	--	37.8	127.7	117.9	102.2	172.0	
3080	--	--	--	--	--	43.4	6.0	--	--	
3300	--	--	--	--	--	13.0	--	--	--	
3400	--	--	--	--	2.0	2.7	1.7	2.7	3.5	
3500	--	--	--	--	--	--	.2	.4	.4	
3600	--	--	--	--	33.3	58.7	47.9	39.7	15.5	

By February 1977, DDR&E was indicating concern that the character of the program and the nature of the system may be changing adversely. In addition, it was felt that the DSARC II scheduled for March 1978 was more likely to occur in September 1978. Therefore, it was proposed that a DSARC IB be held in August 1977 and the revised DCP to support this review be submitted by June 6, 1977.

Specific details on the preparation activities for the DSARC IB were not available from the files reviewed. However, from discussions with personnel familiar with the program it was determined that technical problems at one of the prime contractors were causing schedule delays and several contractors were in cost overrun conditions. The program was then restructured to stay within the FY77 Budget plus service reprogramming flexibility of $1.9M. This required the issuing of selected stop work orders. FY78 funds were rebudgeted within the program and the POM was adjusted for FY79 and the out years.

An AFSARC review was held on August 15, 1977, and the revised DCP was submitted to the Defense Acquisition Executive (DAE) on September 9, 1977. The following extract from the DCP describes Alternative II, the preferred approach:

"This alternative is the one selected at Milestone I. It leads to a Phase III constellation of 24 satellites providing worldwide three-dimensional coverage. Development under this alternative leads progressively and systematically through development, testing, production, and deployment. This alternative would produce a NAVSTAR GPS which satisfies the needs described previously in this paper. Revisions have been made to the alternative to reduce FY77 expenditures. The result stretches out the Phase I schedule with a consequent slip in Milestone II and causes a restructure of Phase II. Phase II, the full-scale engineering development phase, has as its primary objective the selecting of the user equipment production design.

A constellation of six satellites would be maintained from Phase I and throughout Phase II in place of the nine to eleven planned previously to support a two-dimensional limited operational capability. The planned production of approximately 1000 low cost sets (Z sets) would be deleted. The Phase II Control Segment development would be staggered with facility construction slipped to an FY80 start vice FY79. Phase III would be unchanged basically from the original plan."

The following issues and service positions were contained in the DCP:

- o Will breach of threshold costs in development establish cost growth trend for user equipment which would make production costs prohibitive? The primary cost problem is associated with software which should have no impact on production.

- o Should the Z set (low cost set) be produced in quantity in Phase II? Delete procurement of Z set. Increasing cost and lack of user interest in interim capability for the short period offered.

- o What is DOD policy regarding denial of access and level of denial to non-DOD, civilian and foreign users?

  - oo Capability to deny will be designed into system.

  - oo Separate signal available for civilian use.

  - oo Technique to provide denial will be selected at Milestone II.

In a memo to the DSARC Chairman on October 3, 1977, the CAIG provided the following table which reflects Program Office, ICA, and CAIG estimates of NAVSTAR acquisition costs at that time:

Program Estimate Comparison
(77 $ Millions)

	JPO	ICA	CAIG
Development:			
Phase I	363	363	387
Phase II			
Space Segment	107	110	130
Control Segment	15	13	13
User Segment	188	204	204
Development Total	673	690	734

Procurement:

Phase II			
Space Segment	108	126	130
Launch Vehicles	48	48	100
Control Segment	91	100	100
Phase III			
Space Segment	646	711	718
Launch Vehicles	270	270	308
User Equipment	*	*	2144-2930
Procurement Total	1163	1255	3500-4286
Program Total	1836	1945	4234-5020

*No estimates provided.

The CAIG memo indicated that development costs had risen from about $200M at time of DSARC I to $700M now (FY77 dollars), but this was largely attributable to scope changes.

The DSARC IB Review was held on October 4, 1977, and the DCP approval page was signed by Gerald P. Dinneen (Principal Deputy USDR&E) on November 29, 1977. The services' recommended alternative, Alternative II, was approved with the following additional guidance:

- Program management constraints contained in DCP. If it appears that Milestone II may occur beyond FY79, Air Force should notify DAE with recommendation for need for a review.
- Establish objectives to accomplish a demonstration of feasibility of GPS to support tactical mid-course guidance. Provide a TEMP by May 1, 1978.
- Secondary payload planning and testing should continue. Submit detailed plan to DAE by June 1, 1978. Decision of payloads will be made at Milestone II.
- Program should be designated for reporting under the Selected Acquisition Reports (SAR) process. Ensure a March 1978 report.
- Pursue active program to encourage adoption of NAVSTAR GPS by NATO allies.
- Develop single service procurement plan for user equipment and present to OSD for review. Plan should include an alternative for consolidated depot level maintenance.

- o Develop a clear phase-in, phase-out plan and submit to DAE by July 1, 1978.

On March 24, 1978, PMD R-S-4-075(6) was issued which incorporated the DSARC IB decision. However, the requirement for SAR documentation was rescinded. Mr. Dinneen, in an April 26, 1978 memo, agreed with the Air Force position that this reporting was premature since there was a lack of definitive user equipment production plans, design-to-cost goals and installation schedules. The memo then requested the Air Force develop an "annex to DCP #133 delineating cost, schedule, and quantity data for NAVSTAR GPS user equipment, by Service and type of equipments." This document was required to be submitted by September 1, 1978, along with any other revisions to the DCP.

The GAO Report (PSAD 78-37) issued on April 25, 1978, entitled "Status of the NAVSTAR Global Positioning System", provided the following tables that indicated the estimated cost growth in the program with the basis for the changes indentified for Phase I:

Current Program Office Program Cost Estimate Compared with Baseline (millions[1/])

	Baseline Estimate Dec 1973	Current Estimate Oct 1977	Increase
Phase I:			
Air Force	$131.9	$292.9	$161.0
Navy	29.2	80.4	51.2
Army	16.8	26.0	9.2
Total	$177.9	$399.3	$221.4
Phase II:			
Air Force	$245.6	$557.4	$311.8
Navy	7.8	42.3	34.5
Army	--	54.8	54.8
Total	$253.4	$654.5	$401.1
Phase III:			
Air Force	$383.1	$433.2	$ 50.1
Navy	--	--	--
Army	--	--	--
Total	$383.1	$433.2	$ 50.1
Program Total	$814.4	$1,487.0	$672.6

1/ Then-year dollars.

Changes From Baseline Cost Estimate
for Phase I

Segment	Baseline Estimate Dec 1973	Escalation	Added Scope and Tasks	Cost Increase at Restructuring	Current Approved Program Oct 1977
Spacecraft-support	$71.9	$13.4	$82.9	$3.7	$171.9
Launch Vehicles	22.0	6.1	18.2	6.4	52.7
Control-user	40.3	7.6	46.7	36.5	131.1
Testing	9.4	1.9	.3	.2	11.8
Technical Support-studies-Other	4.5	.8	10.8	12.2	28.3
1977 Escalation Index Changes	--	--	--	--	3.5
Total	$148.1 1/	$29.8	$158.9	$59.0	$399.3

1/ FY74 dollars.

Major contributors to scope change were:

- o Support for Navy's Improved Accuracy Program
  - oo Four additional spacecraft (NDC)
  - oo Four additional launch vehicles to support the additional NDS procurement
- o Development of an advanced atomic clock
- o Additional contractors for competitive alternate designs for user equipment

C. FSD Decision

The DSARC IB decision as implemented by PMD R-S-4-075(7) dated June 15, 1978, set February 1979 for the DSARC II review. Planning activities for this review had started even before the PMD was issued. The Army, in accordance with AR15-14, had issued a guidance memo in April 1978 to prepare for an ASARC II in February 1979 and a DSARC II in March 1979.

In July 1978, Air Force Systems Command (AFSC) conducted an in-depth review of the program and concluded that it was doubtful that the Phase I test objectives could be obtained prior to the Feburary 1979 DSARC II review using a three-satellite test constellation. Failure of a satellite (NTS-2) in orbit and delays in launching satellite NDS-3 were making things extremely difficult. It looked like a slip to April 1979 would be appropriate.

On September 1, 1978, AFSC requested Air Staff support in delaying the DSARC II until April 1979. Air Staff coordination with the Army indicated that May 1979 was a better time. In a message back to AFSC in October 1978, the Air Staff indicated action was underway to obtain approval to move the DSARC II to May 1979. The message requested that AFSC strive for four satellite test data since there was an implied commitment to Congress that this type of data would be available at the Milestone II.

The formal request for rescheduling the DSARC II was submitted by the Assistant Secretary of the Air Force (R&D) in a memo to USDR&E on November 30, 1978. Even before this memo was issued, the Air Staff had initiated the preliminary actions to get to the DSARC II. A small "kick-off" meeting was held on November 16, 1978. Seventeen persons, including representatives from OSD, attended to help establish a preliminary schedule, a summary list of issues, and identify all action officers.

An updated PMD R-S-075(9) was issued on December 8, 1978. This document incorporated the restructured program, the DSARC IB decision, the results of the Air Force FY80-84 budget formulation process, and the revised DSARC II date. The following shows schedule and financial plans:

Schedule Comparison

Item	Dec 73	Jul 75	Nov 76	Dec 78	Change
NTS-2 launch	Sep 30 '76	Sep 76	Feb 77	Jun 77	-9mos
NDS-1 "	Mar 31 '77	Mar 77	May 77	Feb 78	-11mos
NDS-2 "	May 31 '77	May 77	Jul 77	May 78	-12mos
NDS-3 "	Jul 31 '77	Jul 77	Aug 77	Oct 78	-15mos
Start 3-Satellite Test	--	--	--	Nov 78	--
NDS-4 launch	--	Sep 77	Nov 77	Dec 78	--
Start 4-Satellite Test	--	Sep 77	Feb 78	Jan 79	--
NDS-5 launch	--	Nov 77	Dec 77	Apr 79	--
DSARC II	Mar 31 '78	Mar 78	Mar 78	May 79	-14mos

Financial Plan (Air Force Budget Submission Oct 78 for FY80-84 and actual for FY79 and prior)

RDT&E	FY75&P	FY79	FY80	FY81	FY82	FY83	FY84	Total
PE 63421F (All Phase I Efforts	248.0	35.3	5.9	2.0	1.9	0.5	0.5	294.1
PE 64478F (Phase II Space & Cont Seg)		35.3	139.7	78.5	45.2	19.7	7.4	325.8
PE 64778F (User Equip. Excluded Service Pecular)		26.7	52.6	59.3	47.3	20.0	13.1	219.0
Total	248.0	97.3	198.2	139.8	94.4	40.2	21.0	838.9

Procurement	FY80	FY81	FY82	FY83	FY84
PE 35164F (Aircraft Needs)	--	--	--	22.8	100.7
PE 35165F (All Other Costs					
3020($/(#)	--	80/(4)	162.6/(8)	172.7/(8)	182.7/(8)
3080	--	19.7	22.4	6.5	19.4
3300	26.8	--	--	3.0	--
3400	--	--	--	8.4	14.9
3500	0.2	0.5	0.5	0.5	0.5

On December 21, 1978, the USDR&E (C^3I) memo set Janaury 4, 1979 as the date for the initial DSARC planning meeting to review the DCP outline and accomplish other planning efforts. Twenty-six persons attended representing all major organizations involved in the program. The DCP outline developed was quite explicit with each major section of the document identified, including the subsections and the anticipated length (number of lines of print allocated to each). There was also a list of eleven annexes, with subsection provided. The initial planning schedule is shown in Figure G5. At about this time the Joint Program Office was "gearing up" for the next six months of action. The Plans Division, Program Control Directorate was enlarged with the assignment of three Captains. Their task was "to pull all the things together for the DSARC." Emphasis was added in cost estimating by the reassignment of a Major to head up a team effort in this area.

The period from early January 1979 until June 5, 1979, was filled with meetings, briefings and data submittals. There is no accurate record of how many meetings were actually accomplished

Program: NAVSTAR Global Positioning System Date: Jan 4, 1979

DCP #: 133

Milestone II

ACTIVITY/EVENT	PLANNED	ACTUAL	5000.2 CLOCK
1. Joint OSD/Service Planning Meeting	Jan 4, 1979		-(4 to 6) months before DSARC
2. "For Comment" DCP	Feb 24, 1979		-60 days before (S) SARC
3. Comments & Issues back to services	Mar 14, 1979		-45 days before (S) SARC
4. (S)SARC Meeting	Apr 24 - May 1		0
5. "For Coordination: DCP"	May 7, 1979		-15 days before DSARC
6. CAIG Report	May 24, 1979		-3 days before DSARC
7. T&E Report	May 24, 1979		-3 days before DSARC
8. Principals Pre-brief	May 21, 1979		-7 days before DSARC
9. DSARC Meeting	May 29, 1979		0
10. DSARC Action Memo	Jun 13, 1979		+15 days after DSARC
11. DCP Update	Jul 13, 1979		+30 days after Memo

FIGURE G5

DSARC PLANNING SCHEDULE

but the Program Office estimated that approximately 70 meetings/ briefings were conducted. An example of the pre-DSARC activities is shown in Figure G6. This schedule shows the status of the more significant events as of March 22, 1979, the time of the Air Force Planning Conference. It does not show many of the specialized activities such as the two-day User's Conference in March or the requested briefings on "civil use" and "denial of access." Each of these had its own trail of preparatory activities. The total number of person hours expended in reaching the DSARC briefing is incalcuable. However, as an example, the Program Control Directorate had the equivalent of two person years dedicated to this activity. This was just the effort associated with aggregating and formating information, not the actual development of the data. There was also approximately six person months directly expended at the Air Force Product Division on graphics support.

The processing of the DCP identified several issues that had not surfaced during the initial planning conference. The following summarizes some of the more significant items that surfaced in the March/April 1979 timeframe:

- Commitment to satellite production before any meaningful tests on user equipment. OSD(C) proposed delaying DSARC III to July 1982 to cover full production on satellite, user equipment, and ground control center. Desired to reduce program concurrency and recognized greatest cost risk keyed to user equipment.

- Tactical application was questioned. USDR&E (TWP) indicated DCP did not justify any "real" tactical need or provide sufficient data to evaluate tactical benefit. PA&E was even more adament. They felt that coordinate bombing was not a viable tactical all weather mission and did not believe the current test data.

- ASD/MRA&L felt the DCP needed to be expanded in the area of Logistics Data and Goals. Specifically needed were:

  - oo R&M goals, how to estimate and verify.

  - oo Identification of costs to implement accuracy denial.

  - oo Logistic manpower estimates.

  - oo Evaluation of benefits of commercial versus service depot repair.

The Army and Navy SARC Reviews were held separately on May 7, 1979. The ASARC was chaired by the Army Vice Chief of Staff with 48 other persons in attendance. Details on the DNSARC were not available. The following summarize each services' position that was presented to the Air Force SARC on May 8, 1979:

DSARC SCHEDULE

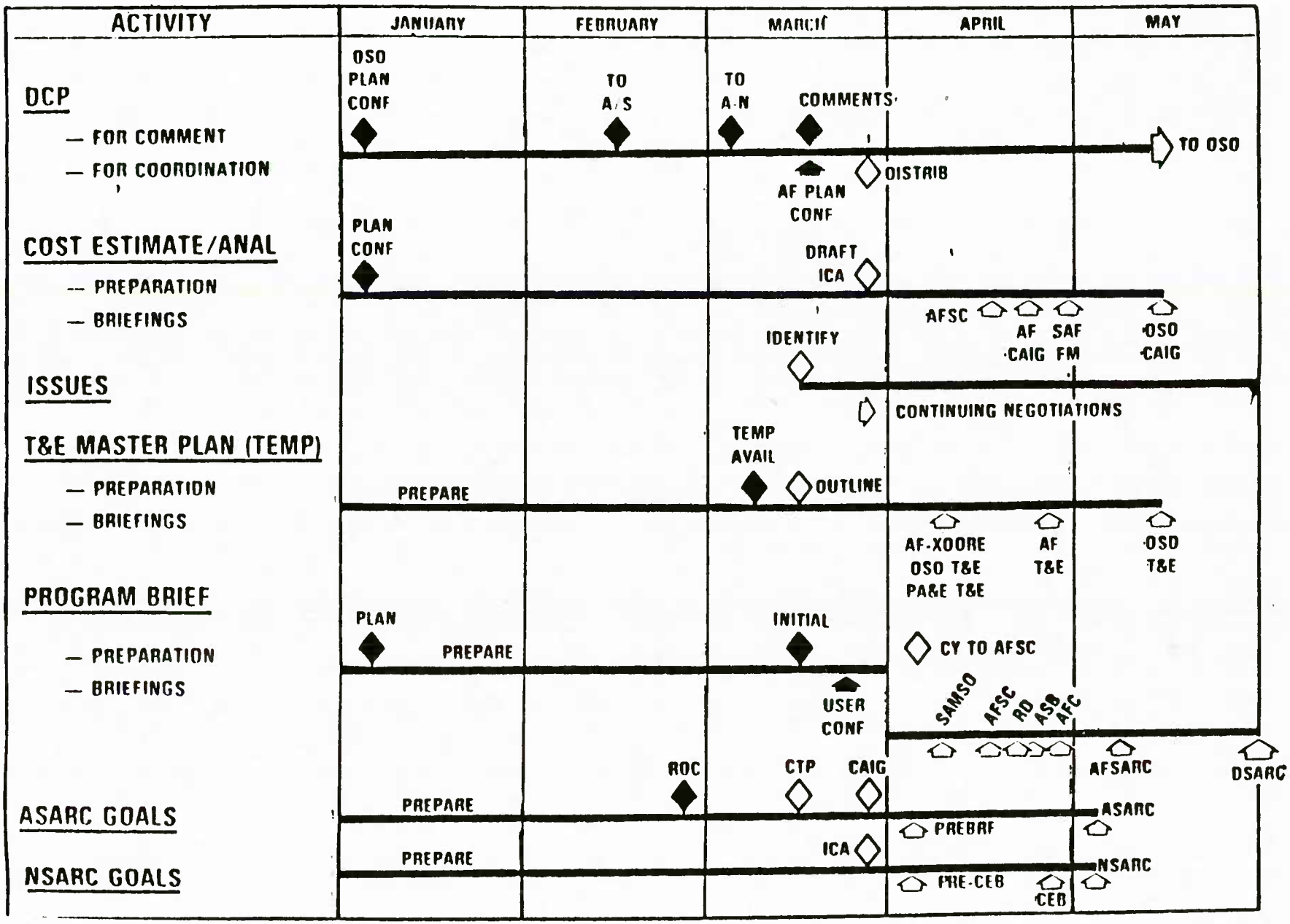


FIGURE G6

o Army -

Supports: Alt.I (3-D, 86 IOC), dual contractor user equipment FSD.

Concerns:

-- Low manpack weight spec (12 lbs) may be adversely driving cost

-- No questions about performance

-- Do not want set operators to have to be highly skilled

o Navy -

Supports: Alt. I (3D, 86 IOC), dual contractor user equipment FSD

Concerns:

-- Navy not sufficiently emphasizing weapons system applications

-- Reasons for designation of SAC as operator

-- Pace of atomic clock technology; interested in pursuing hydrogen maser for improved stability

-- Interoperability with JTIDS (AFSC has studied, recommending signal interfacing to anchor JTIDS)

-- Secondary payloads - who is setting priorities?; concerned that definition and prioritization of payloads not being done at high enough level.

The AFSARC was conducted on May 8, 1979, with the Assistant Secretary of the Air Force (RD&L) as chairman and 49 other persons present. The following is an extract of the AFSARC implementing memo dated May 12, 1979:

..."I approve proceeding to the DSARC for Milestone II decision subject to the following actions:

1. Integrate the Operational Employment/Benefits section of the DSARC briefing to provide stronger support for continuation of GPS, to emphasize tactical force applications/benefits and to improve the flow and overall quality of the presentation.

2. Include Program Cancellation as an alternative and compare the impact of each alternative with the potential cost avoidance of phasing out (or cost of retaining in the case of GPS cancellation) the existing potential alternative systems which GPS could totally or partially replace.

3. Include a new program alternative which slows down deployment of the system and defers construction of an autonomous control capability to significantly decrease annual funding requirements. Reflect this alternative in the FY 1981-1985 POM at the minimum level. In addition, include an increment at the enhanced level in the POM which essentially supports both the Alternative I in the DSARC briefing and the Consolidated Guidance which calls for the FY 1986 Initial Operational Capability.

4. Proceed to DSARC II with the following Air Force Recommendations:

a) Recommend proceeding into Phase II (Full-scale Engineering Development Phase) for the orderly development of the three-dimensional system described in Alternative I.

b) Recommend addition of the Integrated Operational Nuclear Detonation Detection System (IONDS) payload and the AFSATCOM Single Channel Transponder as secondary payloads (the Navigation Mission has priority) on the operational GPS satellites. Additionally, fly the IONDS payload on NAVSTAR satellite #8 and any subsequent RDT&E satellites.

c) Recommend implementation of the selective availability plan based on using clock dither and data manipulation techniques which provide the capability to vary the accuracy obtainable by unauthorized users over a wide range."

This position created the situation in which the Program Manager was cleared to OSD to brief Alternative I as the recommended solution, but the Air Force POM was carrying the funding at the enhanced level, i.e., above the TOA line. Within authorized TOA, the Air Force was supporting a slower and possibly more austere/less capable type of program. This was probably the result of less than enthusiastic support from Air Force users, and the feeling that NAVSTAR was a "national resource" and should be funded from a budget other than that of the Air Force.

The details of the DCP preparation were not available from files reviewed. However, based on discussions with personnel involved at that time, the DCP process at the Air Force/OSD interface was described as the "squeeking wheel" concept. The basic DCP was written and did not change, but each functional area that wanted extra treatment got an Annex added. The total document grew bigger and bigger as the review process continued.

A significant amount of work went into the DCP, but in the end it was never signed.

A pre-DSARC meeting was held with the DSARC chairman on May 24, 1979, to discuss the following issues:

- o Total System Cost
- o System Utility
  - oo Planned and potential applications
  - oo Force effectiveness studies
  - oo Survivability/Vulnerability
  - oo Secondary Payloads
  - oo Phase-In/Phase-Out Plans
- o Master Control Station Siting
- o Number and timing of Milestone III decisions required
- o System Alternatives
  - oo IOC date
  - oo System capability
- o Civil availability

After discussing the last item, it was decided that USD(P) would present a short briefing of this topic at the DSARC review: all other issues would be addressed by the Air Force. The DSARC II was held on June 5, 1979. Figure G7 is the attendance list from this meeting.

The program presented at the DSARC is shown in Figure G8. The funds required to meet the guidance of IOC in 1986 exceeded the FYDP. The following is a comparison of funding requirements versus FYDP for all services (FY $):

RDT&E	FY80	FY81	FY82	FY83	FY84
Required	219.1	194.5	166.4	88.9	63.9
FYDP	219.2	188.2	127.2	63.7	30.4
Difference	+0.1	-6.3	-39.2	-25.2	-33.5

OUSDRE
Dr. Dinneen (Chairman)*
Dr. VanTrees*
Mr. Trimble*
Mr. Greinke
Col. Gilbert

ASD(C)
Mr. Hessler*
Mr. Contos

ASD(MRA&L)
Mr. Shorey*
Mr. Contos

ASD(PA&E)
Mr. Murray*
Dr. Brown

ADV TO SEC DEF ON NATO
Amb. Komer*

ODUSD(Policy)
Adm Murphy*
Mr. Klien

JCS
MG Doubleday*
Cmdr Farrell*

DMA
Mr. Williams
Dr. Martin

NATO
Wing Cmmdr Coriat

NSA
Mr. Ware

DOT
Capt Mohin

NASA
Mr. Sonneman

DIA
Mr. Katz

CAIG
Mr. Margolis*
Maj Maginel

DDT&E
Adm Linder*
Dr. Rabben

DSMC
Mr. Cullin

AIR FORCE
Dr. Mark, Act Sec AF*
Dr. Vosburg, OASec AF(R, D, &L)*
LG Sylvester, AFSC*
MG Brickel, DCS/RD
MG Gray, SAC
MG Yost, DCS/RD
Col Newbeck, TAC
Col Henderson, Joint Prog Dir*
Col Sheffield

NAVY
Dr. Mann*
Adm Kaufmu*
Dr. Quinn
Lt Cdr Hirt

ARMY
LG Keith, DSCRDA*
Dr. Yang, DASA(RDA)
MG Scott, ADCSOPS
LTC Nealon

MARINE CORPS
BG Scott

ASST FOR PROGRAM PLANNING
Mr. Calaway

* Seated at Table
** Briefer

FIGURE G7
ATTENDEES
NAVSTAR DSARC II June 5, 1979

NAVSTAR PROGRAM EVOLUTION

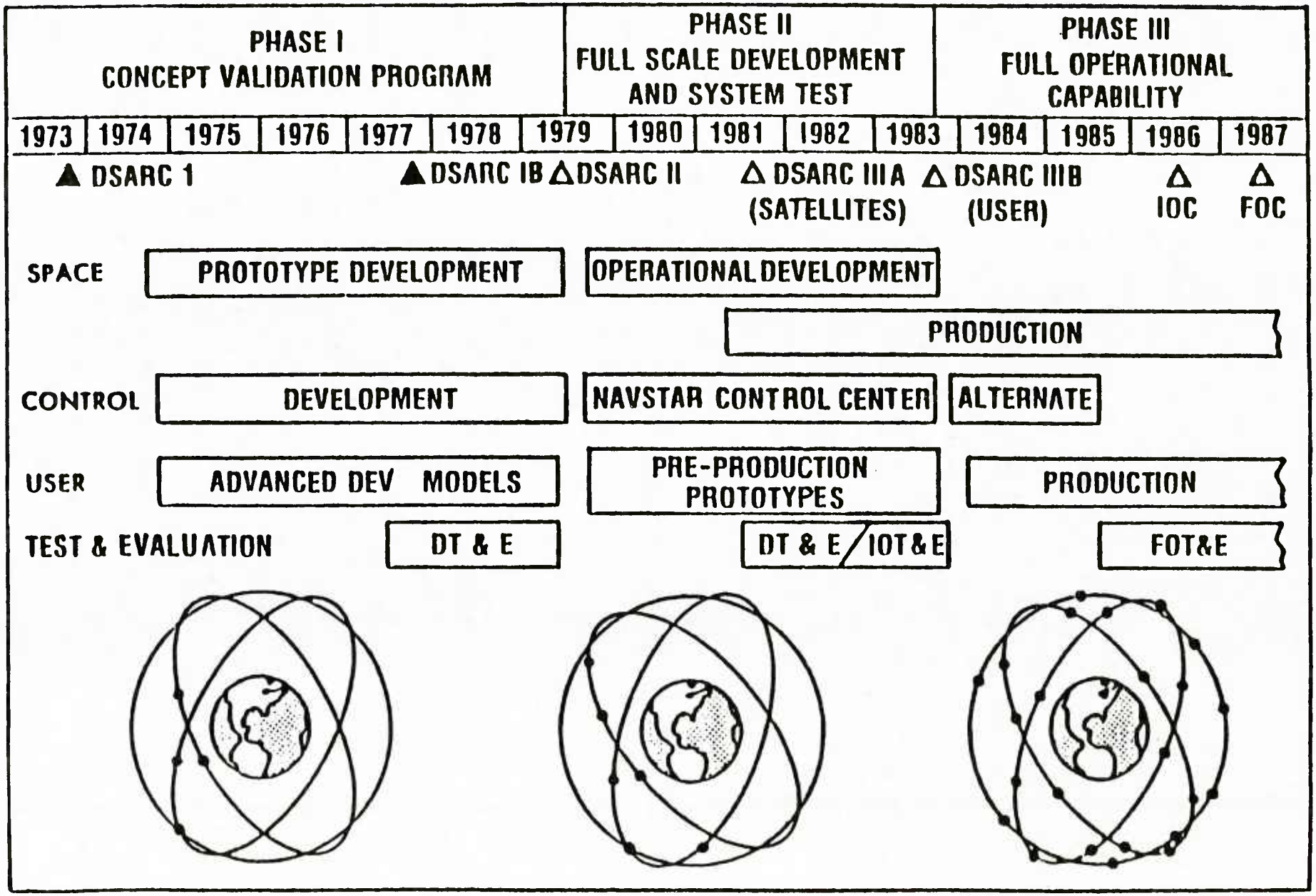


FIGURE G8

Procurement	FY80	FY81	FY82	FY83	FY84
Required	0.6	76.4	186.3	213.1	379.4
FYDP	0	0	139.7	187.3	213.4
Difference	-0.6	-76.4	-46.6	-25.8	-166.0

The need for a timely decision from the DSARC review was acute. The source selection process to determine the dual contractors for the user equipment development was being completed. The final briefing of source selection results was presented to the Secretary of the Air Force on July 11, 1979. FY79 funds had to be released to award selected contracts, otherwise proposals would expire, contractor teaming arrangments would need revision and out-year fiscal planning would have to be adjusted. OSD(C) refused to release FY79 funds to support these efforts because of GPS issues in the POM cycle and the need for DSARC II direction. The SDDM could not clear the coordination of PA&E, CAIG or OSD(C) until after the DRB meeting in mid-July 1979. This meeting would be considering three alternatives: cancel the program; IOC a 3-D system in FY88; or the DSARC recommended program of IOC a 3-D system in FY86.

On July 19, 1979, the Assistant Secretary of the Air Force (RD&L) indicated in a memo to ASD (C3I) that the draft SDDM was technically acceptable and the Air Force would respond to the guidance. The memo also requested that the FY79 funds be released if the SDDM was going to experience any further delays. On the same day the Air Staff issued a message format PMD amendment which directed AFSC to proceed with Phase II. The message stated that the Secretary of Defense had approved the program and the SDDM was in staffing. The SDDM was signed on August 24, 1979.

The SDDM approved the transition of the NAVSTAR GPS program from Concept Validation to Full-Scale Development in accordance with the plan outlined as Alternative 1 of the DCP. The memo indicated that the DSARC was concerned with the system's cost. To indicate this concern, it was stated that the FY81-85 Tentative Program Decision Memo was placing the approved alternative at the Basic level in the budget and a delayed program of reduced scope (Alt #3) at the minimum level. The Secretary's memo further tasked the services to make adjustments to Alternative #1 to reduce cost without delaying initiation of the approved program. The memo had a three-page enclosure that provided specific guidance on many areas in the program. Several of the items would definitely provide upward pressure on program cost at the same time the services were being tasked to cut the program down.

Workload at the Air Staff to support the DSARC II activities was significant. The regular Program Element Monitor (PEM) spent about half his time on the DSARC preparation. An officer was detached from the Program Office and spent nearly six months on

temporary duty at the Air Staff working full time on the DSARC preparation. In addition, the previous PEM, who had retired from the Air Force in the summer of 1978, was rehired as a consultant. It is estimated that 1.25 person years was spent on PEM-like functions to support the DSARC II. The multi-service nature of the program was a definite contributor to this workload.

During the summer of 1979, there was no change in the opinions of the various DSARC principals. Those who favored it prior to the DSARC still supported it, and those against the system were still against it afterwards. Within the anticipated budget foreseen at the time of the DSARC II/DRB reviews, the protagonists were able to fully fund the recommended program.

During the final deliberations on the FY81 FYDP, the DRB cut approximately one-third of the NAVSTAR funding during the FYDP period and provided a new funding profile. Details of this activity were not available, but in a message from the Air Staff to AFSC on December 7, 1979, a feel for the situation can be gained. The message requested comments on a proposed program that would provide 18 satellites in orbit in the 88/89 time period with the following USAF funding:

	FY81	FY82	FY83	FY84	FY85
64778F	125.6	120.6	51.0	4.0	3.0
35164F			5.9	41.3	34.3

AFSC responded on December 13, 1979, and indicated that funding would support a schedule more like 90/91 and that the dollar schedule constraint would impact performance. The next two months were taken up with restructuring the NAVSTAR program and recoordinating this revision with the other services.

With the directed funding reductions, the alternatives were to delay capability or stretch the schedule. All users wanted to hold schedule and defer capability. The original space segment schedule was basically retained by redefining the definition of the "Block II" satellites. The reductions in the number of satellites in the operational constellation from 24 to 18 had very little impact on the up front dollar reduction - this was more closely associated with reducing outyear procurement and O&S costs. User equipment production was delayed and start up would be at slower rates. Also, the Control Segment development was modified by reducing redundancy and reliability. Finally, the complete redesign of the Block I Satellite was deleted. On March 4, 1980, the Secretary of the Air Force forwarded the details of the restructured program to the Secretary of Defense. The memo indicated that "we are immediately implementing the most time sensitive aspects of the restructuring" so as to operate within fiscal constraints. The Secretary of Defense concurred in the recommendations in a memo on May 28, 1980. A revised DCP was submitted in October 1980, but there is no indication that it was

signed. The program was now an 18 satellite constellation and IOC in 1987.

IV. PROGRAM STATUS

Since the restructure of the NAVSTAR program soon after the DSARC II review, the program has experienced a relative degree of stability. The following schedule shows the key milestones completed plus those to obtain full capability:

Activity	Date
DSARC II - Phase I Complete	Jun 79 (A)
Initiate User Equipment FSD	Jul 79 (A)
Operational Control Segment Initiated	Sep 80 (A)
Block II Satellite Modification Initiated	Oct 80 (A)
Satellite Production Contract Awarded	Sep 82 (A)
User Equipment IOT&E initiated	Sep 83
Milestone III	May 84
User Equipment Production Initiated	4Q FY 84
User Equipment Installation Initiated	2Q FY 86
Worldwide 2-D Capability Achieved	3Q FY 87
Worldwide 3-D Capability Achieved	1Q FY 89

Currently, the program is tasked to maintain a 5 satellite constallation to support user equipment DT&E/IOT&E and the Navy's Fleet Ballistic Missile Programs through FY86. User equipments are being integrated into the F-16, B-52G and A-6 aircraft, UH-60 Helicopter, Nuclear Submarine (SSN), Aircraft Carrier (CVN), and M-60 tank for Phase II combined DT&E/IOT&E. The Joint Program Office is tasked with conducting the overall program as described in DCP 133 and preparing for the Milestone III.

APPENDIX H

UH-60
PROGRAM STUDY REPORT

I. SYSTEM DESCRIPTION

The UH-60A (BLACK HAWK)[1/] is a twin engine utility helicopter developed to replace the Army's single engine UH-1 "Huey" for air assault, short-range combat/combat support/combat service support equipment and troop movement, air cavalry, and aeromedical evacuation missions. The BLACK HAWK is designed to carry more than twice the payload of the UH-1 and to transport a combat equipped 11-man squad 42 knots faster in all weather and altitude conditions. Current basic characteristics of the BLACK HAWK are summarized in Figure H1 below and the aircraft is pictured in Figure H2.

Design Gross Weight	16,285 pounds
Speed	145 knots
Endurance	2.3 hours
Vertical Rate of Climb	572 ft/min at 4000 ft/95°F
Armament	2 machine guns(7.62mm)
Payload	11 troops or 2640 lbs. at 4000 ft/95°F/max vertical climb.

FIGURE H1: UH-60A Characteristics

The basic UH-60A flight crew, like the crew for the UH-1, consists of a pilot, co-pilot, and a crewchief/gunner. In a combat environment, a gunner may augment the crew as a fourth member. A medical corpsman is a standard fourth crewmember in all air ambulance units.

The primary UH-60A unit is the Combat Support Aviation Company (CSAC) which can be either a separate unit or a subordinate element of an aviation battalion. Each Army division has an organic aviation battalion with a variable number of CASCs, depending on the type division. In most CASCs, 15 UH-60As will replace 23 UH-1s.

Air cavalry and aeromedical units are the other principal types of Army units selected to received UH-60As as replacements for UH-1s. Seven UH-60s will replace eight UH-1s in air cavalry troops, and the replacement ratio in aeromedical units will be one for one.

1/ During early stages of development, the BLACK HAWK was referred to as the Utility Tactical Transport Aircraft System (UTTAS). For simplicity, it will be referred to as UH-60A throughout this report.

Figure - H2: UH-60A Blackhawk

II. INITIAL PROGRAM SUMMARY

A. Background

While the UH-1 helicopter was an almost indispensable workhorse throughout the Vietnam conflict, that combat experience also pointed out its increasing operating costs as well as its size, power, and survivability limitations. These shortcomings were viewed as unacceptable, particularly in light of the projected threat of the 1980s and advancing technology.

B. Major Acquisition Milestone

The first major milestone in the acquisition of the BLACK HAWK was the Defense Systems Acquisition Review Council (DSARC I/II) recommendation to the Secretary of Defense in May 1971 that the Army proceed with Full-Scale Engineering Development (FSED). The Deputy Secretary Defense (DepSecDef) approved that recommendation by signing Decision Coordination Paper No. 13 on June 22, 1971.

On the basis of that decision, the General Electric Company was awarded a contract for development of the engine in March 1972. Competitive contracts for development of the airframe were awarded to the Boeing-Vertol and Sikorsky Companies in August 1972.

In November 1976, some 51 months after the airframe contract was awarded and following Government Competitive Tests (GCT), a DepSecDef decision, based on DSARC III recommendations, authorized the Army to proceed into the Production and Deployment Phase.

The Army type classified the airframe as standard and awarded a maturation and initial production contract to the Sikorsky Company in December 1976. By October 1979, 19 aircraft had been delivered to the Army, and following an Army Systems Acquisition Review Council (ASARC IIIA) meeting on October 22, 1979, the Secretary of the Army approved continued production. Initial Operational Capability (IOC) was achieved by the 101st Airborne Division (Air Assault) at Fort Campbell, KY, in November 1979.

Figure H3 illustrates the major BLACK HAWK acquisition milestones. Figure H4 chronicles key BLACK HAWK acquisition events.

C. Initial Program Cost Estimate

Based on planned procurement of 1107 aircraft systems, the DCP #13, approved June 22, 1971, estimated the program costs shown in Table H1 below.

Table H1

UH-60A Program Cost Estimate
Millions in FY71 $

	FY72& Prior	FY73	FY74	FY75	FY76	FY77	FY78	FY79	Total
RDT&E	41.8	60.9	88.4	56.7	55.1	40.4	14.0	--	357.3
Procurement	--	--	--	--	--	65.0	65.0	96.0	1,675

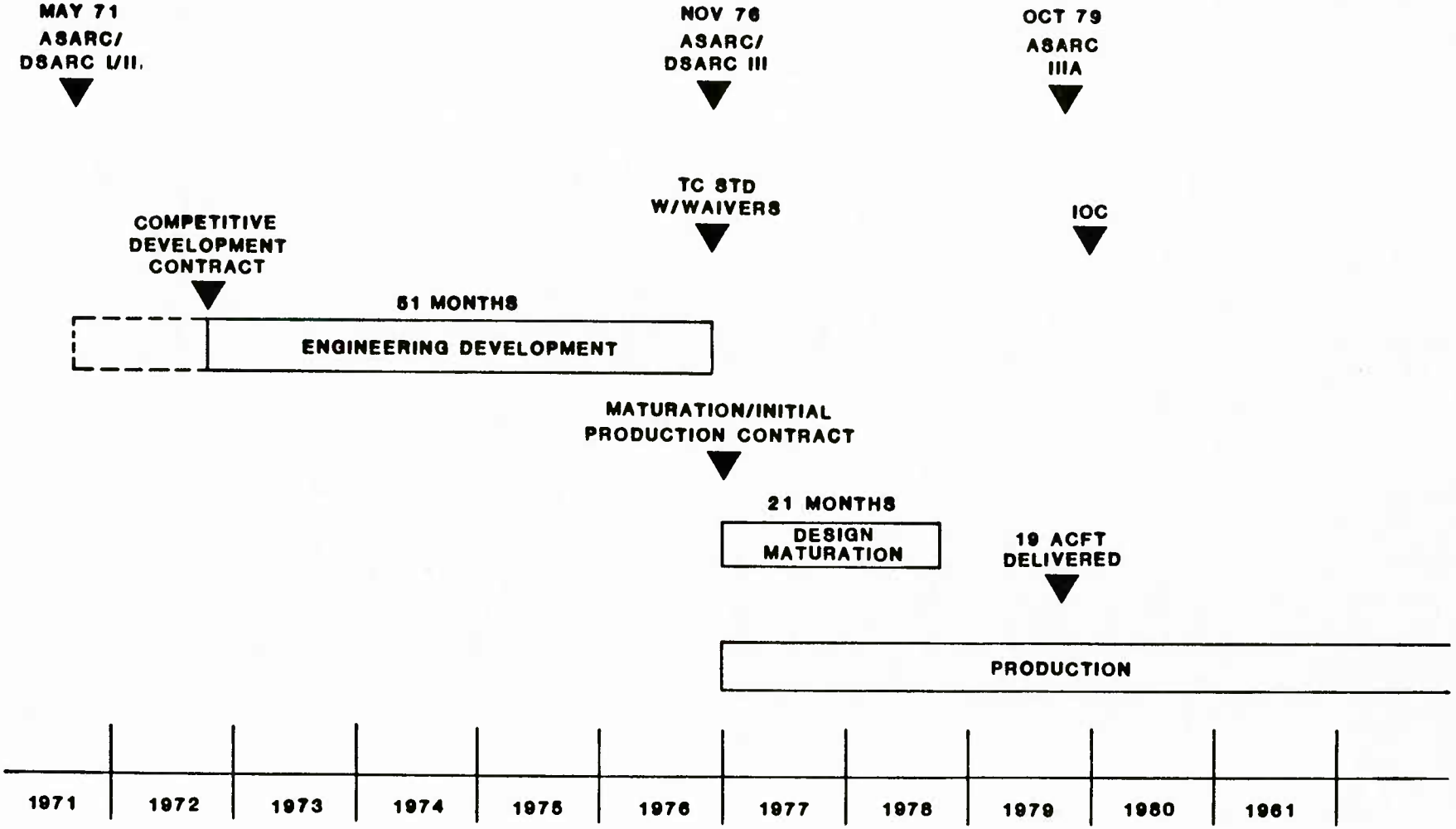


Figure - H3: UH-60A MAJOR ACQUISITION MILESTONES

Date	Event
March 1971	Qualitative Materiel Requirements (QMR) approved.
May 1971	ASARC/DSARC I/II
June 1971	BLACK HAWK approved for full-scale development. (DepSecDef, on the DSARC recommendation, signs Decision Coordinating Paper No. 13.)
July 1971	Engine RFP issued
December 1971	Materiel Need (MN) Approved
January 1972	Airframe RFP issued
March 1972	Engine development contract awarded to General Electric Company
March 1972	Airframe proposals received
August 1972	Airframe prototype development contracts awarded to Sikorsky and Boeing-Vertol
April 1973	Congress reduced prototype development funding
October 1974	Sikorsky first prototype flight
November 1974	Boeing-Vertol first prototype flight
November 1975	Special Reliability/Maintainability Review by Director of Defense (Test and Evaluation)
March 1976	Three prototypes from each contractor accepted by the U.S. Army
March 1976	Government fly-off begins
August 1976	Sikorsky ground test vehicle delivered
September 1976	Boeing-Vertol ground test vehicle delivered
November 1976	ASARC/DSARC III
December 1976	Sikorsky wins production contract with 12 helicopters ordered. Also received option to produce up to 330 more UH-60As over three years
December 1976	GE awarded engine production contract for 53 T-700 engine

FIGURE H4

Chronology of Key Acquisition Events
UH-60A BLACK HAWK

September 1977	S-70 selected by USN as the SH-60B LAMPS III helicopter to replace the SH-2F Seasprite. It differs from the UH-60A in having automatic rotor blade and tail rotor pylon folding, movement of the tail wheel further forward, MAD, and surface search radar. It can carry two MK 46 torpedoes.
October 1978	First flight of production UH-60A
October 1978	First production delivery of UH-60A to U.S. Army
June 1979	Force Development Test and Evaluation of UH-60A begins
October 1979	ASARC IIIA approved continued production of UH-60A
November 1979	Initial Operational Capability (IOC) achieved

FIGURE H4 (Continued)

Chronology of Key Acquisition Events
UH-60A BLACK HAWK

III. PROGRAM EVOLUTION

A. ASARC/DSARC I & II.

The first major milestone for the UH-60A Program was a combined DSARC I/II held in May 1971. For approximately four years prior to that time, the Army had been formulating a concept for a tactical transport helicopter to replace the UH-1. Concept formulation was characterized by comparison of a number of alternative aircraft designs of varying sizes and performances, including improved versions of the UH-1, and conduct of cost and operational effectiveness analyses.

On the basis of those analyses and comparisons, the Army concluded that a new helicopter should be developed to replace the UH-1. In Decision Coordinating Paper (DCP) # 13, the Army proposed cost, schedule and performance goals and offered three alternatives for consideration by the DSARC.

- o Alternative 1: Approve UH-60A development as requested by the Army according to the cost, schedule, and performance goals outlined in DCP #13. (Recommended)
- o Alternative 2: Approve start of a joint effort to develop new utility tactical helicopter based on the 1500 HP advanced technology engine, with the Army as the lead service.
- o Alternative 3: Defer approval of any UH-60A development efforts until the potential for a joint requirement is more fully assessed.

No record could be located as to the actual attendees at the DSARC I/II. However, a list of expected attendees was found attached to a Director of Defense Research & Engineering (DDR&E) memo announcing the proposed DSARC meeting, and is shown in Figure H5. Other records of the DSARC proceedings confirmed the presence of several members of the OSD staff. They are identified by an asterisk.

The first item on the DSARC I/II agenda was a detailed briefing of the proposed program, based on data in DCP #13, by Col. Lauterbach (PM). He emphasized that the objective of the program was to capitalize on the technological gains made since the 1950 vintage UH-1 was developed. These gains included improvements in maintainability, reliability, vulnerability, crash safety, and propulsion. He indicated that particular emphasis would be placed on improving maintainability and reliability.

ODDR&E

*Hon J. S. Foster Jr. (Chairman)
Mr. D. Heebner
Mr. J. Klotz
COL R. McDaniel
BG G. Sylvester

OASD (I&L)

*VADM F. Reich
Mr. J.M. Malloy
BG V. Turner
Mr. F. Meyer
Mr. W. Henderson

OASD (C)

Mr. D. Brazier
Mr. F. VanHoosen
Mr. S. Trodden
*Mr. J. Dietz

NAVY

*Radm D. Davis
CAPT W. Stuyvesent
LTCOL W. Smilanich

AIR FORCE

HON G. Hansen
Mr. C. Hargis
COL J. Garvey
MAJ V. Dander

OASD (SA)

Hon G. Tucker
LTC H. McK. Roper Jr.

JCS

BG W. Bevans Jr.

ARMY

*Hon R. Jonhson ASA (R&D)
*GEN H. Miley AMC
LTG W. Depuy AVCS
*LTG R. Williams ACSFOR
MG G. Sammet DCRD
*COL J. Lauterbach PM
LTC C. Patnode ACSFOR
LTC D. Nixon OCRD
Mr. C. Musgrave AVSCOM

WHITE HOUSE FELLOW

Mr. G. Heilmeir

EXECUTIVE SECRETARY

*Mr. E.J. Nucci

* Attendance Confirmed

FIGURE H5

EXPECTED ATTENDEES
UH-60A PROGRAM DSARC I/II

During the discussion that followed the briefing, the following major issues were addressed:

Multi-Service Requirements - Dr. Foster asked if the Army and Navy agreed that the proposed system would meet both Army and Marine Corps requirements. It was pointed out that the Marines had a minimum lift requirement of 17 troops versus 11 for the Army and that, based on ship to shore transport requirements, the Marines required an endurance of 3.0 hours versus 2.3 hours for the Army. It was also noted that the Army required that the proposed helicopter be transportable in C-130 and C-141 aircraft whereas the Marines had no such requirement.

Reliability and Maintainability - Dr. Foster noted that, given the importance of Reliability and Maintainability (R&M), these factors were not adequately treated in the DCP. The DCP, for example, indicated that 47 percent of operating cost is in maintenance. Dr. Foster challenged the DCP figures for R&M in light of new technology and potential improvements available. The Army indicated that conservative figures for R&M were used to "satisfy the cost analysis experts." Dr. Foster replied, "we can't allow conservative figures to drive design to an unacceptable level and we can't have cost analysis drive the numbers." He expressed the opinion that design should be driven by the shrinking force structure and availability of new technology, and that, while the impact of manpower cost has been realized, it is not recognized as an R&D challenge.

One Engine Versus Two - After discussion of such factors as reliability, maintenance load, and costs, it was apparent that the overriding consideration for favoring a two engine design was the safety of the troops being transported.

Design Philosophy with Respect to Growth - Dr. Foster asked how the proposed UH-60A development program compared to the concept of starting a program based on bare minimum requirements and allowing for growth potential. The Army indicated that growth envisioned would be in capability and reliability rather than size.

Competition - It was explained that three engine contractors already had developed prototypes from which one could be competitively selected for engineering development. It was noted that airframe design selection would be based on competition between two contractors who would produce six prototypes each; two of these would be used for R&M testing.

In closing, Dr. Foster indicated that no decision would be made until Secretary Packard returned on approximately May 24, 1971. In the meantime, he requested that the DCP be modified to reflect the following DSARC discussion points:

- Definitive statement of Marine Corps (MC) requirements versus estimated costs and design tradeoffs necessary for the Army to satisfy the MC requirements.

- o Statement that troop safety is the overriding consideration for designing the new aircraft with two engines rather than one.

- o Definitive statement of the requirement for transportability in C-141 aircraft.

- o Justification of the urgency of the program.

- o Strengthen treatment of R&M in the DCP and establish thresholds for these principal design objectives.

- o Discuss need for built-in versus plug-in auxillary power units.

- o Discuss competition and contract plan for the prototype development, test, and evaluation.

- o Provide a range of costs for R&D and procurement.

The DCP # 13 was modified on May 24, 1971, and approved by Secretary of Defense Packard on June 22, 1971. The approval authorized the Army to proceed with full-scale engineering development. General Electric (GE) was awarded a Cost Plus Incentive Fee (CPIF) contract for development of the engine on March 6, 1972. Competitive CPIF contracts were awarded to Boeing-Vertol and Sikorsky Aircraft on August 30, 1972, for development of the airframe.

B. Critical Acquisition Events Between DSARC II & DSARC III

1. The report of the House Appropriations Committee concerning the FY73 budget request called for a decrease in the number of flying prototypes from six to three for each contractor with a corresponding reduction in funds.

On the basis of this Congressional action, the Army advised DDT&E that the high RAM criteria, a basic objective of the program, could not be achieved with a reduced number of prototypes. The DDT&E suggested that the Army slip the program in order to accumulate required test hours to verify RAM, but the Army did not desire to extend development time. The DDT&E, therefore, established a special RAM review as a program milestone to be conducted between October and December 1975, prior to the FY77 budget submission.

Program changes necessitated by the Congressional reduction were documented by the Army in an undated Draft Cover Sheet # 1 to DCP # 13. Those changes are summarized in Figure H6 (Schedule & Performance) and Table H2 (Cost Profiles). The cover sheet also cited ten critical test issues which are summarized in Figure H7.

- Start of GCT delayed 4 months and GCT duration decreased by 2 months.
- LRIP selection delayed 2 months.
- Verification tests in Maturity Phase delayed 7 months.
- PEP initiated prior to selection of single contractor.
- Flight test program altered - reduced contractor and Army flying.
- Increased Ground Test Vehicle (GTV) testing.
- Delayed aircraft demonstrations and surveys until Maturity Phase.
- Delayed component and subsystem qualification tests until Maturity Phase.
- Army's best estimate of Reliability (MTBF) values changed from 2.6 hrs to 2.3 hrs at GCT and from 4.0 hrs to 3.2 hrs at end of Maturity Phase. However, MTBF of no less than 4.0 is to be achieved by the time the full scale production decision is made.
- Army's best estimate of Maintainability (MMH/FH) Values changed from 4.3 to 4.8 at GCT and from 2.8 to 3.2 at end of Maturity Phase. However, MMH/FH should not exceed 2.8 (fault corrective) by the time the full scale production decision is made.

FIGURE H6

PROPOSED SCHEDULE & PERFORMANCE CHANGES
DRAFT COVER SHEET #1 TO DCP #13

Table H2

Cost Profiles Based on
Escalation & Congressional Action
Draft Cover Sheet #1 to DCP #13

		FY72 & PRIOR	FY73	FY74	FY75	FY76	FY77	FY78	FY79	TO COMPLETE	TOTAL
DCP											
(6 Prototype)	RD	41.8	60.9	88.4	56.7	55.1	40.4	14.0			357.3
(Constant FY71$)	PEMA						65.0	65.0	96.0	1449.0	1675.0
	QTY						(10)	(45)	(66)	(986)	(1107)
DCP											
(6 Prototypes)	RD	43.6	66.8	99.9	65.9	66.0	49.9	17.8			409.9
Escalated Cost	PEMA						72.1	70.3	104.4	1650.6	1897.4
(FY72 Base)	QTY						(10)	(45)	(66)	(986)	(1107)
Current Program (3 Proto-types)	RD	34.1	50.4	102.7	54.1	62.8	84.1	35.7	2.1		426.0
Escalated Cost	PERM						73.7	105.7	87.6	1982.6	2249.6
(FY74 Base)	QTR						(9)	(24)	(24)	(1050)	(1107)

1. Development & Clearance of Flight Envelope
2. Performance Characteristics versus Specification Requirements
3. Satisfactory Completion of Contractor Demonstration
4. Integration of Navigation & Communication Systems
5. Mission Performance and Flight Characteristics in Extreme Environments
6. Flight in Moderate Icing
7. Achievement of RAM Goals
8. Deployability in C-130, C-141, and C-5 Aircraft
9. Achievement of Power Margin in Production Engine
10. Identification and Correction of Reliability Associated Engine Failures

FIGURE H7

CRITICAL TEST ISSUES
DRAFT COVER SHEET #1 TO DCP #13

Correspondence in the DSARC file indicates that the Draft Cover Sheet # 1 was reviewed by OSD representatives in August 1974, but not approved by the DDR&E until September 1975. The OASD (I&L) informed DDR&E on August 13, 1974, that they found the program changes acceptable, except for the reduced reliability (MTBF) and maintainability (MMH/FH) goals to be achieved at the start of GCT and the end of the Maturity Phase. It was suggested that, in order to compensate for the reduced number of prototypes, the number of flight hours per day per test vehicle be increased rather than reducing the intermediate R&M goals. Later documents indicate that neither the original MTBF goals of 2.6 hours at GCT and 4.0 hours at the end of the Maturity Phase nor the 2.8 MMH/FH Maturity Phase goal were reduced as proposed in the Draft Cover Sheet # 1. However, the original 4.3 MMH/FH GCT goal appears to have been increased to 4.8 MMH/FH as proposed.

2. Both airframe contractors achieved first flight on schedule during the 2nd Qtr, FY75. However, the adverse effects of inflation, redesigns, and workarounds due to unavailability of materials, and "price quoted on delivery policy" by vendors, resulted in FY75 funding shortages. Contractors proceeded at their own risk with any added appropriations to be at the discretion of Congress. Congress was advised of the overrun and the Army's plan for FY75 payback to be made in FY76 and 77. This was approved and appropriated by Congress.

3. The Army awarded the Maturity Phase contract to the engine contractor (GE) on March 6, 1975. PEP contracts were awarded to both airframe contractors and the engine contractor in September 1975.

4. Correspondence in DSARC files indicates that the Director of Defense Research and Engineering, Malcolm R. Currie, in a August 19, 1974, memo to the Assistant Secretary of the Army (Research and Development), called for a special DSARC review. The DDR&E indicated that the need for such a review was based on preliminary information his office had received that the BLACK HAWK prototypes were not capable of being transported in C-130 and C-141 Air Force aircraft as called for in DCP # 13. The DDR&E stated that this apparent breach in the terms of the DCP raised major concerns about the future direction of the program.

Another memo scheduled the special program review for December 12, 1974, and outlined the agenda. The Army was to make a 30-minute presentation concerning the current status of the program and specifically address air transportability, design-to-cost, projected program funding, source selection criteria, and the Army's proposed plan for future conduct of the program in accordance with DCP # 13, Cover Sheet #1. One hour was allocated following the Army briefing for DSARC discussion.

No evidence could be found to confirm that this scheduled special DSARC review was ever actually held, and no major changes

in program direction were made during this time period which could be attributed to the episode.

5. As a result of further cost overruns in early FY76, both airframe contractors were informed that added funds for prototype development would not be available. Both contractors were required to put forth their best efforts to deliver prototypes for Government Competitive Testing (GCT) within funds remaining in the engineering development contract. That portion of the contract relating to contractor support during GCT was restructured from CPIF to Firm Fixed Price (FFP).

6. As a result of an in-flight failure and the crash of Boeing-Vertol's number 1 prototype on November 19, 1975, the start of GCT was rescheduled from February 1 to March 20, 1976. Three flying prototypes from each contractor were accepted by the government on March 17 and 19, 1976. Development and Operational Testing (DT II and OT II) were completed on schedule in September and December 1976, respectively.

C. ASARC/DSARC III

1. Preparations for ASARC III

The Army began formal preparation for ASARC III in June 1976 by publishing a plan which assigned responsibilities to various staff offices and field commands; identified key documentation to be prepared; called for formation of a special ASARC Working Group to convene 5 months prior to ASARC and to consist of representatives of ODCSRDA, ODCSOPS, OCOA, DARCOM, and TRADOC; scheduled the ASARC for 2 weeks prior to the DSARC and a preliminary review 2 weeks prior to the ASARC; and offered three broad program alternatives to consider -- 1) terminate the program; 2) proceed into LRIP; or, 3) enter full scale production. The Army's planning schedule is summarized in Figure H8.

On October 4, 1976, the Secretary of the Army sent a memorandum to the Deputy Secretary of Defense concerning the BLACK HAWK Program decision procedures, which emphasized that decisions concerning the UH-60A were closely interrelated with those for the advanced attack helicopter because of the schedule and budget cycle, and that both program decisions must proceed on a parallel synchonized schedule. A copy of the memorandum is included as Enclosure 1 to this Appendix.

On November 4, 1976, the Army announced that the preliminary ASARC and the ASARC would be held on November 15 and 24, respectively. The Army, in the same announcement, published a UH-60A milestone list which is summarized in Figure H9.

ACTION	PLANNING DATE	AGENCY FURNISHING	AGENCY FURNISHED
Initiate preparation of Service Draft DCP	Jun 76	DARCOM	ODCSRDA
Baseline Cost Estimate	8 Sep 76	DARCOM	OCOA
Independent Cost Estimate	8 Sep 76	DARCOM	OCOA
Publish DT II Report	24 Sep 76	DARCOM	ODCSRDA
Materiel Need Update	4 Oct 76	TRADOC	ODCSOPS
BOIP Update	4 Oct 76	TRADOC	ODCSOPS
DCP #13 Draft Submitted	4 Oct 76	DARCOM	ODCSRDA
Publish OT II Report	4 Oct 76	OTEA	ODCSOPS
Coordinate Test Plan	4 Oct 76	DARCOM	ODCSRDA
Development Plan Update	4 Oct 76	DARCOM	ODCSRDA
Cost Analysis Brief*	8 Oct 76	OCOA	ODCSRDA
Draft COEA Study Report to SAG Members	15 Oct 76	TRADOC	---
DT II Independent Evaluation	31 Oct 76	DARCOM	ODCSRDA
OT II Independent Evaluation	31 Oct 76	OTEA	ODCSOPS
Final COEA Study Report to DA	5 Nov 76	TRADOC	ODCSOPS
Preliminary Review	18 Nov 76		
ASARC III	2 Dec 76		
Service Draft DCP to OSD	9 Dec 76		
CAIG Briefing	Dec 76		
DSARC III	16 Dec 76		
UH-60A Contract Award	5 Jan 77		

* Required 6 weeks prior to preliminary review in order to conduct affordability analysis.

FIGURE H8

UH-60A Program
Army Planning Schedule for DSARC III

Best and Final Offer	8 Nov
SSAC Prebrief by SSEB at AVSCOM	12 Nov
For Coordination Draft DCP Distributed by OSD	15 Nov
*Pre ASARC (Generic Aircraft)	15 Nov
*Pre DSARC Subprincipals Prebrief (Generic Aircraft only)	16 Nov
SSA Prebrief by SSAC	17 Nov
OSD Source Selection Procedure Briefing (OSD Principals)	18 Nov
CAIG Briefing	22 Nov
SSAC Final Brief by SSEB at AVSCOM	19-20 Nov
*ASARC (Generic Aircraft)	24 Nov
Source Selection Prebrief (Army Principals designated by ASA (R&D))	29 Nov
*SSA Brief on Final Results (Source Selection)	29 Nov
DSARC (Generic Aircraft)	30 Nov
Secretarial Notation (D&F)	1 Dec
*DEPSECDEF Decision Meeting (limited Principals)	2 Dec
Contract Award	2 Dec
Congressional Notification	2 Dec

* Key Decision Milestones

FIGURE H9

UH-60A PREPRODUCTION MILESTONES
(November - December 1976)

2. DCP # 165 & ASARC III Decision

In preparation for the ASARC/DSARC III the Army prepared DCP # 165, dated November 18, 1976, which superceded the June 22, 1971, DCP # 13 and the September 17, 1975, Cover Sheet # 1. The DCP # 165 offered the following two program alternatives:

- Initiate Full Scale Production of 85 Aircraft (FY77-15, FY78-24, FY79-46); continue the Maturity Program; and procure 1107 aircraft.
- Initiate Full Scale Production of 200 aircraft (FY77-15, FY78-56, FY79-129); continue Maturity Program; and procure 1107 aircraft.

The alternative calling for production of 200 aircraft was recommended as being the most cost effective. Following presentations outlined in Figure H10 and discussion during ASARC III on November 24, 1976, the Vice Chief of Staff, Army (Gen. Kerwin) approved the 200 aircraft production alternative as the Army position to be taken at DSARC III on November 30, 1976.

3. Preparations for DSARC III

In addition to the program alternatives discussed above, DCP # 165 also reiterated some of the program goals and thresholds shown in Table H3.

Table H3
UH-60A Program Goals/Thresholds

		THRESHOLDS	
	GOAL	DSARC III	END OF MAT PHASE
*Cruise Speed (KTAS)	145-175	140	145
*Vertical Climb (ft/min @ 95% IPR)	450-550	350	350
*Endurance (Hrs)	2.3	2.12	2.3
Air Transportability	1 in C-130 2 in C-141	-- 2 in C-141	1 in C-130 2 in C-141
RAM			
MTBF (Hrs)		2.6	4.0
MSN Reliability		---	0.987
Fault Corrective (MMH/FH)		4.8	2.8
Preventative (MMH/FH)		---	1.0

* All at 4000', 95°F with crew of 3 plus 11 troops.

	Presentor	Time
Need	ODCSOPS	5 min
COEA	TRADOC	20 min
System & Program Description, Alternatives, Schedule, Risk, RAM, Cost, DT II Results	PM	25 min
OT II Results	OTEA	10 min
Cost Analysis Brief	COA	5 min
Affordability	ODCSRDA	5 min
Conclusions & Recommendations	PM	5 min
		1 hr 15 min

FIGURE H10

AGENDA
BLACK HAWK ASARC III
November 24, 1976

A CAIG review conducted for the DSARC III, dated November 29, 1976, made the following fundamental observations:

- An Army independent estimate of Operation and Support (O&S) costs was $371,000 per aircraft per year and 9.1 men per aircraft to operate, maintain, and support it in the field.

- The PM estimate of O&S costs was $285,000 per aircraft per year and 7.1 men per aircraft. Does not include personnel required for "behind-the-lines" support functions.

- The PM estimates that the system will cost about the same to operate and support as the current operational UH-1H helicopter it will replace. The independent estimate opines that the O&S costs will be 30% higher on a per aircraft basis.

In addition to the DCP # 165 and CAIG report, the DSARC file also contained a summary of the following GCT results provided to the DSARC III:

- Both candidates have met the 2.6 hour MTBF goal.

- Both candidates have met the 4.8 MMH/FH fault corrective goal.

- Independent evaluation by the U.S. Army Operational Test and Evaluation Agency (OTEA) supports entry into production with either candidate and finds no issues which require conduct of an OT III.

- Performance thresholds for vertical climb have not been met.

- Cruise speed and endurance thresholds have been achieved.

4. DSARC III

The DSARC III was held on November 30, 1976; Figure H11 lists the attendees and Figure H12 shows the agenda.

No record could be found concerning actual deliberations of the DSARC III. However, in a January 19, 1977, Memorandum For The Secretary of the Army, the Deputy Secretary of Defense, based on DSARC III recommendations, authorized the Army to proceed with the plan for production of 200 aircraft through FY 1979. The Memorandum, which is attached as Enclosure 2 to this Appendix, also placed some specific requirements on the Army; these are summarized below.

- Emphasize management of O&S costs.

ODDR&E

Dr. M. Currie
Mr. R. Parker
Mr. W. Stoney
Mr. C. McKinley
Mr. G. Sutherland
Dr. P. Glance
GEN W. Lotz, Jr.
ADM L. Colemorgan
COL J. Burress

OASD (I&L)

Mr. D. Babione (Chairman)
Mr. J. Gansler
Mr. F. Myers, Jr.
Mr. H. Ellsworth (Executive Secretary)
COL J. Akridge

ARMY

Mr. N. Augustine, Under Sec of Army
Mr. E. Miller, ASA (R&D)
Mr. H. Brownman, ASA (I&L)
LTG H. Cooksey, DCSRDA
LTG F. Camm, DCG, TRADOC
LTG G. Sammet, Jr., DCG, DARCOM
Mr. R. Trainer, DSRAO, ODSCRDA
MG W. Latham, CG. USAIC & FT Benning
MG M. Ross, ADCSOPS
MG J. Lauer, Dir, Wpn Sys
COL R. Kenyon, PM

OASD(C)

Mr. L. Wacker
Mr. F. Speck
Mr. C. Cardiff

OASD (P&E)

Mr. E. Aldridge
Mr. J. Finsterle
Mr. W. Krulak

CAIG

Mr. M. Margolis
MAJ J. Holeman

JCS
BG R. Winger J5
LTC G. Miller J5

FIGURE H11

ATTENDEES
DSARC III - UH-60A PROGRAM
November 30, 1976

Army Briefing	45 Minutes
T&E Report	15 Minutes
CAIG Report	15 Minutes
Production Readiness Report	5 Minutes
DSARC Executive Session	30 Minutes

FIGURE H12

UH-60A PROGRAM - DSARC III AGENDA
November 30, 1976

- o Continue efforts to reduce weight and vibration in production aircraft.

- o Provide DDT&E with a Test and Evaluation Plan for the Production/Deployment Phase.

- o Provide ASD (MRA&L) a Training Equipment Acquisition Plan.

- o Revise the DCP within 30 days.

D. SUMMARY of UH-60A PROGRAM OFFICE PREPARATIONS FOR DSARCS

For each of the DSARCs held for the UH-60A Program (DSARC I/II - May 1971 and DSARC III - November 1976), the Program Office began preparations some eight months prior to the scheduled ASARC meeting date. The Program Manager did not, however, find it necessary to alter the office's basic organizational structure or operational procedures in order to accommodate the additional workload. The Program Office took an active role in the process of identifying issues and preparing the draft DCP. Office representatives supported and participated in approximately 17 coordination meetings/briefings prior to each ASARC/DSARC: one per month for 7 months at the DA/DARCOM level; one per month for 7 months at the Program Office level; and one per week during the eighth month at the Program Office level.

In both cases, the DSARC decisions were consistent with the Program Office recommendations, and no major changes had to be made to the basic program structure as a result of DSARC actions.

The same Deputy Program Manager (Civilian) has been assigned to the UH-60A Program since 48 months prior to the DSARC I/II in May 1971. The Program Manager (Colonel) at the time of the DSARC I/II had been on board for 30 months. The PM at the time of the DSARC III, had been assigned for only one month.

IV. PROGRAM STATUS

A. DCP # 13, November 1, 1977

In early 1977, the Army submitted to OSD a revised DCP # 13, which superceded the DCP # 165 prepared just prior to DSARC III. The revised DCP # 13 reiterated previously established goals and thresholds, restated the ten critical issues shown in Figure H6 supra, tentatively scheduled an FDTE for the 2nd Qtr FY79, and called for an ASARC IIIa to be held during the 4th Qtr, FY79. The DCP was finally approved by OSD on November 1, 1977. In a November 23, 1977, memorandum returning the approved DCP # 13 to the Army, OSD requested that resolution of the ten critical issues in DCP # 13 be submitted and briefed to OSD prior to execution of the FY80 procurement option.

B. ASARC IIIa

On October 22, 1979, an ASARC IIIa was held to review the BLACK HAWK Maturity Program and critical test issues prior to briefing OSD on October 23, 1979; to obtain an Army position on the Program prior to exercising the FY80 procurement option, planned for late October; and to reaffirm the production goal of 1107 aircraft.

At the time of the ASARC IIIa, the production program was experiencing cost growth due principally to contract costs and Army affordability constraints. Contract cost growth was primarily attributed to airframe materiel and labor cost increases and airframe performance awards based on weight reduction. Table H4 illustrates the growth in costs.

Table H4

UH-60A Program Cost Growth
(Escalated $)

	DCP #13 Nov 77 1/	FY80 BUDGET 2/	FY81 BUDGET 3/
Procurement Cost	2.98B	3.18B	5.25B
Procurement Unit Cost	2.69M	2.87M	4.74M

1/ 15 per month production rate.
2/ 12 per month.
3/ 8 per month.

The following assessment of the Program was made during ASARC IIIa:

- o System performance is satisfactory and production should continue.

- o Most DCP critical test issues have been satisfactorily resolved; incompleted work is low to moderate risk; minor shortfalls in performance are not operationally significant; RAM should improve with system maturity.

- o In assembling the FY81 budget, the Army determined that the system is affordable at a production rate of seven or eight per month through the POM years; this decision was reviewed in the PPBS process.

- o BLACK HAWK DCP quantity (AAO) should be 1107. Current production profile (approximately 8 per month, FY 81-85) should be retained until affordability of all Army programs is examined in the next PPBS cycle.

The Vice Chief of Staff, Army (Gen. Vessey) approved the forwarding of an ASARC IIIa recommendation for continued production to the Secretary of the Army, and the Secretary of the Army, in a November 9, 1979, memorandum to DCSRDA, formally approved continued production of the UH-60A system.

In compliance with OSD's November 23, 1977, request for a briefing prior to execution of the FY80 system procurement option, the Army provided OSD with an assessment of the program status on October 23, 1979, one day after the ASARC IIIa. The Army assessment consisted of a briefing and a memorandum which is included as Enclosure 3 to this Appendix.

SECRETARY OF THE ARMY
WASHINGTON

4 OCT 1976

MEMORANDUM FOR DEPUTY SECRETARY OF DEFENSE CLEMENTS

SUBJECT: UTTAS/AAH Program Decision Procedures

Both the UTTAS and AAH programs are progressing well toward their DSARC and source selection milestones later this year. Flight testing is now complete, the source selection boards are deep into their evaluations, and our respective staffs are maintaining continuing dialogue to insure that all issues are defined and properly addressed.

We have prepared a comprehensive plan to obviate pitfalls which might otherwise complicate the decision process or possibly delay the programs. Two critical decisions face us, source selection of a winning contractor and a DSARC program decision (DSARC III for UTTAS and DSARC II for AAH). Ideally, these decisions should be made independent and chronologically separate from one another. Realistically, however, the decisions are closely interrelated because of schedule and budget cycle. The visibility, magnitude, and competitive nature of our "Big Five" programs dictate that the two decisions move on a parallel synchronized schedule.

Consequently, I have reviewed the XM1 decision plan which you approved in March, applied lessons learned from those deliberations, incorporated additional coordination points and now present for your approval a decision scenario which will facilitate a thoroughly analyzed and timely decision process. The decision process will be spaced over a three week period, the first week for prebriefs and coordinations through the ASARC/DSARC subprincipals, one week for final resolution of issues and coordination of the DCP, and the last week for decision briefings. Final decision briefings will be scheduled so as to permit time for the DSARC principals to discuss the program decision with you prior to our meeting on the source selection; however, all DSARC principals and you will have received a detailed briefing on the procedures and methodology used in the source selection process approximately two weeks prior to the DSARC. Having had this procedural prebrief and the benefit of the DSARC, the principals will have an insight as to how we arrived at the source selection results.

13655

While the actual source selection data will not be discussed at the DSARC, I am prepared, if the need arises and you so desire, to meet separately with the principals after the DSARC but before meetings with you on the decision.

With respect to participating personnel, the principals involved in our XM1 discussions appear to be appropriate in this case as well. Specifically, our meeting on the final decision should include the DDR&E, ASD(I&L), GC, ASD(C), Dir(P&E), USA, CSA/VCSA, ASA(R&D)/(I&L), Dep DDR&E(T&E), Project Manager, and Source Selection Advisory Council members as appropriate. In the preparatory and deliberation phases, however, designated OSD representatives will be given access to test and cost data as necessary.

The critical steps by phase and week/date are reflected in the inclosure. From the proposed schedule, you will note that the UTTAS and AAH decision cycles move concurrently but do not conflict.

Subject to your approval of this scenario and the recommended schedule, we will coordinate the details with your staff.

Martin R. Hoffmann

Inclosure
As stated

UTTAS/AAH DECISION MILESTONES

		UTTAS	AAH
I.	Preparatory Documentation Phase		
	- For Coordination Draft DCP distributed by OSD	15 Nov	22 Nov
	- Pre-DSARC (Subprincipals)	16 Nov	23 Nov
	- Information Brief on Source Selection Procedures (DSARC Principals)	18 Nov	24 Nov
II.	Deliberation Phase		
	- Final Coordination of DCP	22-26 Nov	29 Nov-3 Dec
III.	Final Decision Phase		
	DSARC	30 Nov	7 Dec
	- SA Decision Review with DEPSECDEF	2 Dec	9 Dec
	- Contract Award and Congressional Notification	2 Dec	9 Dec

THE DEPUTY SECRETARY OF DEFENSE
WASHINGTON, D. C. 20301

JAN 1 8 1977

MEMORANDUM FOR The Secretary of the Army

SUBJECT: Utility Tactical Transport Aircraft System (UTTAS)
DSARC III

Based on the recommendations of the DSARC review of the UTTAS program on 30 November 1976, you are hereby authorized to proceed with your recommended plan for the production of 200 aircraft through FY 1979. The following specific requirements are provided:

- Continued priority emphasis will be given to management of operating and support costs in accordance with the DCP goals and readiness objectives.

- Army will continue its priority efforts to reduce weight and vibration levels to assure optimum performance (within DTC goals) of production aircraft.

- A Test and Evaluation Master Plan (TEMP) for the UTTAS production deployment phase will be provided to DDT&E for review and OSD coordination by 30 April 1977. The TEMP will specify the 200 hour test period for demonstration of RAM production goals, tests to improve the confidence level for achieving mean-time-between-removal of dynamic component goals, and the Army's assessment and recommendation regarding the need for OT III.

- A training equipment acquisition plan for flight simulators will be provided ASD(M&RA) for review and OSD coordination by 30 June 1977. In accordance with DoDI 7041.3, the plan will include an economic analysis addressing cost savings in both fuel and flight hours.

- The DCP will be revised within 30 days of this memorandum and submitted to OSD for approval. The revision will contain the technical and cost data of the selected production contractor including the necessary resources to achieve the guidance cited above.

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, D.C. 20310

23 OCT 1979

MEMORANDUM FOR DEPUTY UNDER SECRETARY OF DEFENSE, RESEARCH AND ENGINEERING (TACTICAL WARFARE PROGRAMS)

SUBJECT: Successful Completion of UH-60A BLACK HAWK ASARC IIIA

Reference is made to your memorandum, 23 November 1977, subject: DCP #13, Utility Tactical Transport Aircraft System.

Your memorandum approved the DCP and requested that test results of the maturity program and the resolution of all critical issues be briefed to OSD prior to the execution of the 1980 option to the production contract. DCP No. 13 established a milestone ASARC IIIA for the purpose of Army review of these issues.

The Army has completed a review of the maturity testing and critical issues. A summary assessment of this review is at Inclosure 1.

Failure to award a production contract by 31 October 1979 would incur additional expense and production break due to production lead time. Although all DCP critical test issues have not been completely satisfied, their total risk is so low that a production delay is not prudent.

The ASARC IIIA has concluded that BLACK HAWK performance is satisfactory and the system should continue in production.

A briefing of the results of the maturity testing and the resolution of the critical issues is scheduled to be presented to you on 23 October 1979. The FY 80 production contract will be awarded simultaneously with a modification of the FY 79 production contract on or about 31 October 1979.

Percy A. Pierre
Assistant Secretary of the Army
(Research, Development and Acquisition).

3 Incl
1. Assessment
2. Performance Summary
3. RAM Goals

ASSESSMENT

1. Maturity program has progressed satisfactorily with BLACK HAWK exceeding most major performance requirements while accumulating approximately 3,300 flying hours.

2. DCP critical test issues have been satsifactorily resolved with the exception of the following:

a. In-ground-effect middle and high altitude test not yet conducted due to program slippage. Scheduled for completion in November 1979. Risk is low.

b. External load capacity to 7600 lb. not yet demonstrated due to schedule slippage. Scheduled for demonstration to 8,000 lb. in November 1979. Risk is low. (See Inclosure 2).

c. Cockpit vibrations slightly exceed specification (.15 g vs. .10 g) between -30 knots (downwind hover) and +30 knots. Vibration levels are lower than any operational helicopter and acceptable to the Army. (See Inclosure 2).

d. High altitude and arctic testing not completed due to program slippage. Scheduled for completion in March 1980. Risk is low.

e. Production validation testing of rotor blade deice system for moderate icing conditions not completed. Scheduled for completion by March 1980. Risk is low and associated with deice kit only.

f. Demonstrated mission reliability is .976 versus specification of .987. All other RAM-D goals have been exceeded. Demonstrated RAM-D significantly higher than other aircraft systems at comparable stage. Acceptable to the Army. (See Inclosure 3).

3. Six hundred hour Force Development Test and Experimentation (FDTE) conducted by 101st Airborne Division (Air Assault) assessed no major deficiencies or shortcomings, but noted improvement required to redesign door gun mounting and increase cockpit air circulation. The Army will resolve this finding through the PIP process.

4. The BLACK HAWK initial procurement contract has experienced significant cost growth principally due to contract cost and Army affordability constraints. These constraints may extend the aircraft procurement through FY 92. The flyaway cost, expressed in constant dollars, has increased by approximately 35% since the DCP #13 was approved. The reduction in rate of procurement was reviewed by OSD PDM and affirmed by APDM in the FY 81 POM cycle.

INCL 1

MINIMUM PERFORMANCE REQUIREMENTS SUMMARY

PARAMETER	GOAL III/IIIa	MILESTONE III		MILESTONE IIIa	
		Threshold	Demonstrated	Threshold	Demonstrated
Payload (Troops/lbs)	11-2640	11-2640	11-2640	11-2640	11-2640[1]
External Load (lbs)	7000/8000	6000	7150	7600	8000[2]
Cruise Airspeed (KTAS)[3]	145-175	140	145	145	145[6]
VFPC (fpm) IRP[3]	450-550 95%	350 100%	375 100%	450 95%	700
Endurance (hr)[3]	2.3	2.12	2.3	2.3	2.3+
Air Transportability	1 in C-130 2 in C-141	- 2 in C-141	1 in C-130 2 in C-141	1 in C-130[4] 2 in C-141	2 in C-141 6 in C-5
Empty Weight (lbs)	-/10900	-	11185	10900	10400
Cockpit Vibration (g's)	.05/.10	-	.10	.10	.05-.10[5]

1. Alternate seating for 14.
2. 8000 lbs ground qual, 7500 lbs flown, 8000 lbs to be flown 9 Nov.
3. At 4000 ft, 95°F with a crew of 3 and 11 troops.
4. Demonstrated with Mock-up aircraft only, C-130 rqmt deleted.
5. Above 30 knots airspeed.
6. At contract power level and weight, airspeed was demonstrated to be 143 knots. Taking credit for actual power and weight, aircraft can achieve 145+ knots.

BLACK HAWK DCP # 13 ISSUE 7

ISSUE: DEMONSTRATION OF ACHIEVEMENT OF RELIABILITY, MAINTAINABILITY AND DERIVATIVE AVAILABILITY GOALS.

DISCUSSION

RAM

PARAMETER	MILESTONE IIIA	
	THRESHOLD	FDTE (200 HR)
MISSION RELIABILITY	.987	.976
MTBF	4.0	4.12
FAULT CORRECTION MMH/FH	2.8	.37
PREVENTATIVE MMH/FH	1.0	.47

ANALYSIS INDICATES MISSION RELIABILITY/MTBF THRESHOLDS CAN BE ATTAINED.

TESTS REMAINING: NONE

OPERATIONAL IMPACT: CHANGES TO IMPROVE RAM

RISK: LOW

APPENDIX I

FVS
PROGRAM STUDY REPORT

I. SYSTEM DESCRIPTION

The Bradley Fighting Vehicle System (FVS) consists of the Infantry Fighting Vehicle (IFV), M2, formerly the Mechanized Infantry Combat Vehicle (MICV); the Cavalry Fighting Vehicle (CFV), M3, formerly the Armored Reconnaissance Scout Vehicle (ARSV); the Vehicle Rapid Fire Weapon System - Successor (VRFWS-S), M242; the Firing Port Weapon (FPW), M231; and Training Devices.

The IFV and the CFV appear outwardly identical, but carry different crews and weaponry to accomplish their unique missions. The IFV carries a ten-man infantry squad and is equipped with six FPWs which are derivatives of the M16 rifle. The CFV has no FPWs carries a crew of five and carries more anti-tank missiles. Both vehicles mount an externally powered dual feed 25mm gun, supplemented by a 7.62mm coaxial machine gun. Both guns are fully stabilized and can, therefore, be fired on the move. In addition, each vehicle carries the TOW anti-tank guided missile system (Figure I 1).

The IFV is designed to meet the requirement for moving troops on the battlefield while simultaneously providing fire support for combined arms operations with the new M1 Abrams Tank and Advanced Attack Helicopter (AH-64A): these capabilities are not available with the current Armored Personnel Carriers (M113). The CFV is designed to provide the scout and armored cavalry units with an around-the-clock capability for screening, reconnaissance, and security missions exceeding that of any present cavalry vehicle. Areas of improvement include mobility, firepower, survivability, and compatibility with the M1 tank.

Because of the experience gained from the MICV effort, the BFVS Program commenced with Full Scale Engineering Development (FSED). In addition to being accelerated to meet a Congressional production mandate, the program also involved the concurrent development of two vehicles -- the IFV and CFV. The turret was a new concept with its integration of TOW and the 25 mm gun (also being developed). A single integrated sighting system for the turret mounted weapons with a day/night capability was also required to be designed.

FIGURE I-1

II. PROGRAM SUMMARY

A. Background

The BFVS program has evolved from earlier programs that include a combat vehicle project started in 1968, the separate MICV and ARSV projects initiated in 1972, the combined MICV/MICV-Scout program established in 1975, and finally the FVS program that was established in November 1976 following the 1976 Army decisions that: 1) the MICV would serve as a common vehicle for both the infantry and scout use; 2) the TOW missle system would be mounted on both vehicles; 3) the weapon station would be enlarged to accomodate two persons, and 4) the 25mm gun (Bushmaster) would be the main armament. This program is an excellent example of one that had a "soft base", where the Army agonized over requirements while the program continued. However, only small changes have been made in the fighting vehicle system requirements since the 1976 Army decision based on the threat perceived for the 1980s and beyond. Figure I 2 presents the FVS Acquisition Schedule following the 1976 decision.

B. The FVS Program

1. Acquisition strategy was guided by 1977 Congressional direction to achieve production no later than May 1981. All actions were directed towards meeting that objective. FMC Corporation, which had won the earlier MICV competition, was awarded an engineering development contract for the infantry and cavalry fighting vehicles. Competitive contracts had been awarded in February 1976 to Hughes Helicopter Company (HAC) and Ford Aerospace and Communications Corp (FACC) for the 25mm gun development. The ammunition development had been awarded to FACC in July 1976. In order to achieve the May 1981 production requirement, long lead material was contracted for beginning in FY77 (Nov 1978) and authority for production was scheduled for late CY 1979 (ASARC/DSARC III) following completion of required testing. A four year sole source production contract was planned in order to avoid a break in production until the competition scheduled for 1984.

2. Early IFV/CFV cost estimates were based on MICV data and concept drawings of the two-man turret. These 1977 estimates indicated that, in FY78 dollars and based on a quantity of 6,882 vehicles, the unit procurement price would be $370,000. It was soon recognized that this data was not adequate to support budget submissions. In 1978, a complete bottoms-up estimate was made by FMC. The estimate included the FMC submissions as well as those from the major sub-contractors and vendors and resulted in a cost of $495,000 (in FY78 dollars) for the procurement of 6,882 IFV/CFV vehicles. The acquisition strategy called for an aggressive cost reduction program with the prime contractor.

FVS ACQUISTION SCHEDULE - 1976

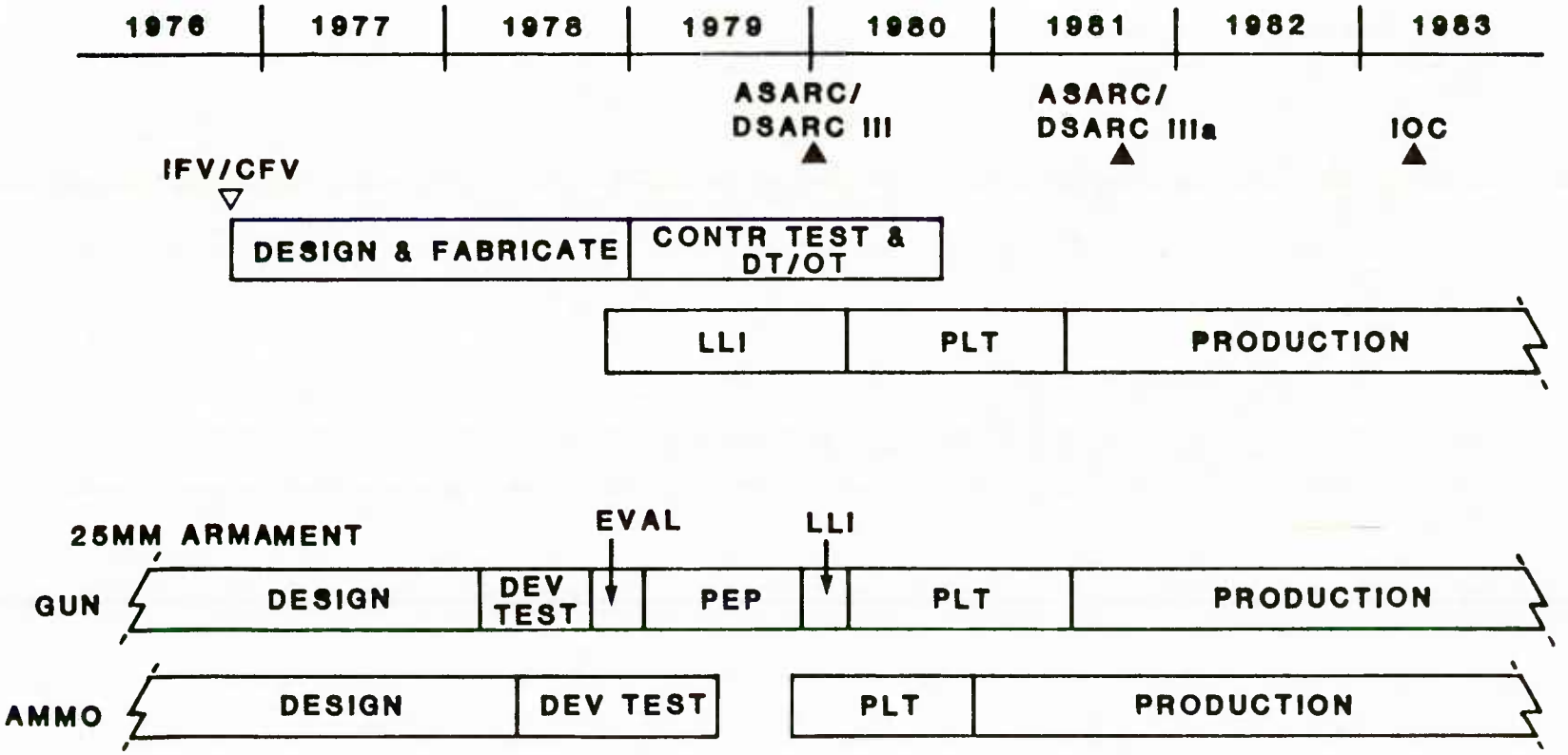


Figure I2

III. PROGRAM EVOLUTION

A. General

The history of the FVS program reviews is complicated by the fact that initially there were four separate projects -- three of which were DSARC programs (MICV, ARSV, and VRFWS-S). The fourth was the FPW project. During the period between 1969 and 1976, these programs underwent the following reviews:

1. December 1969 - Review of the VRFWS-S (Bushmaster project (DCP #81)). No data available. The project office moved in 1975 from Rock Island, IL to Warren, MI. Only 2 of the 35 project personnel made the move.

2. October 1971 - Review of the ARSV project (DCP #71). Data not available. Project combined with MICV in 1975, then cancelled in 1976.

3. December 1971 - A DSARC II Review held for the MICV (DCP #30). Because the MICV project later became the basis for the FVS Program, this review will be discussed in more detail in the following pages.

4. 1975 - A DSARC II Review held for the VRFWS-S. One of the results was the decision to compete the gun and ammunition in full scale development. Little specific data regarding the review was available.

5. February 1976 - DCP #30 (MICV) was rewritten to incorporate earlier guidance and combine all of the projects (MICV, MICV-Scout, FPW, and VRFWS-S) into one program. Submitted to OSD at the time of an administration change, the DCP remained unsigned for over three years. No requirement for an OSD Review of the new program was established.

B. The MICV Project

The date for the MICV December 1971 DSARC I (mentioned briefly in Part A) was set at the request of the Project Office in order that authority to proceed to Engineering Development could be obtained. Neither the PM (an LTC) nor the DPM had had prior DSARC experience. The PMO was under the command of TACOM at the time, so that its review chain included TACOM, DARCOM, HQDA, and OSD.

Records were not available to determine the extent of the preparatory effort necessary to meet the ASARC/DSARC requirements or the specific issue guidance received. However, the project personnel who experienced the reviews reported that it was a relatively easy review where "to swim or not to swim" became a cost effectiveness issue that was resolved in favor of a swimmer. The DSARC recommended that the program proceed to Engineering

Development. The DepSecDef signed DCP #30 in April 1972. Although he stated agreement with the Army that there was a firm requirement for the system and that replacement of the M113 was essential, he expressed concern with the length of the program.

Subsequently, the Army submitted a revised DCP, shortening the program by one year. The shortened schedule called for an August 1978 IOC for MICV. The revised DCP was approved by the DepSecDef on September 25, 1972.

Initially, it was the Army's intent to develop a one-man 20mm gun station MICV and produce it in the summer of 1976. However, the Secretary of the Army directed a program review based on the perceived threat for the 80s and beyond. As a result, the Mechanized Infantry Combat Vehicle Task Force (Larkin Task Force) was established in August 1976 which conducted a three-month study to examine the requirements not only for the infantry fighting vehicle, but also for the cavalry fighting vehicle. The study recommended a two-man weapon station with both the 25mm Bushmaster cannon and the TOW anti-tank missile, and that the vehicle be common to both the infantry and the cavalry. The recommendation was accepted by the Secretary of the Army in November 1976. It was initially intended to place into production the one-man station 20mm MICV until the two-man station vehicle was ready. However, this approach was abandoned in March 1977 as not cost effective and all effort was directed toward what is known today as the IFV and CFV. The Army no longer had to support two fighting vehicle configurations.

Later in 1977, a Congress imposed production goal was established by Section 206(b) of the DoD Authorization, Public Law 95-79, 30 July 1977: "(b) The Secretary of the Army shall structure the development program for the MICV to provide for initiation of production of such vehicle not later than May 31, 1981".

In September 1977, Congress directed that DA conduct a requirement and design validation for the IFV/CFV. In early October 1977, DA organized the IFV Task Force, headed by MG Crizer, which subsequently reported its findings to Congress in mid-April 1978.

C. <u>The Fighting Vehicle System Program.</u>

Under the provisions of the revised DCP #30, the FVS Program was established as a tenant at the U.S. Army Tank Automative Command, Warren, Michigan.

1. 1978 ASARC Events -- The Army conducted Special ASARC Reviews of the FVS Program in 1978 because of Congressional and OSD requirements. During review of the FY79 DoD budget request, all IFV/CFV procurement funds were deleted and designated to be used for M113 product improvement. HQDA memorandum to OSD on

January 25, 1978, requested reconsideration of the budget action. In reply, the Under Secretary of Defense directed the Army to evaluate less costly derivative vehicles and the force structure change, if any, required to support an optimal mix of current and derivative vehicles. The results of an expanded COEA and the Army recommendations concerning the future direction of the program were to be submitted to OSD by July 28, 1978. The Army was also required to provide plans for redirecting the R&D program for procurement of the IFV/CFV in various weapon configurations. A February 1978 ASARC addressed the OSD requirement for the R&D plan. A Special Study Group headed by M.G. Mahaffey, was formed in March 1978 to look at less costly versions of the IFV/CFV and evaluate cost tradeoffs between dedicated anti-tank and dismounted combat capability which increase overall force effectiveness. Its report was presented to the July Pre-ASARC which also determined the future direction of the IFV/CFV program to be recommended to OSD by July 28, 1978. Attendees at the July review are listed in Figure I3.

2. ASARC/DSARC III - Production

a. Preparation -- Preparation for the ASARC/DSARC III Reviews was formalized by a January 31, 1979, HQDA guidance letter.[1] The letter outlined the schedule for a Preliminary Review on November 20, 1979, an ASARC on December 20, and a DSARC on January 17, 1980. The purpose of these reviews was to determine if IFV/CFV was ready to enter production and, if so, at what rate. Program alternatives for consideration at the reviews are shown in Figure I4.

The guidance letter was the effort of an ASARC Ad Hoc Working Group (AHWG) chaired by the Department of the Army System Coordinator (DASC) and established at an initial meeting on January 9, 1979. The AHWG membership consisted of representatives from each Army Staff element, (Secretary and Service), testing activities, material developer, combat developer, and intelligence command. The letter, known as a "tasker", specified the AHWG responsibilities (Figure I5), provided a schedule of events leading to the reviews (Attachment A), listed the responsibilities of the Army Staff and the Major Commands (Attachment B), and the documentation requirements (Attachment C).

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[1] DA, ODCSRDA letter; Subject, Guidance Letter, Infantry Fighting Vehicle/Cavalry Fighting Vehicle (IFV/CFV) ASARC/DSARC III Meeting Preparations, January 31, 1979.

DCSRDA	MG Vinson
	Mr. Gale
	BG Wagner
	COL Glock
	LTC Heath
	MAJ Coomer
DCSOPS	MG Richardson
	Mr. Riente
	MAJ Mason
ASA(RDA)	Mrs. Clements
	COL Ameel
ASA(IL&FM)	Mr. Russ
DUSA(OR)	MAJ Larson
DCSLOG	MG Nord
	Mr. Nolan
PA&E	Mr. Hamilton
	MAJ Riley
DARCOM	MG Lunn
TRADOC	MAJ Simcox
COA	Mr. Shaw
	LTC Miller
GC	Mr. Gamboa
DCSPER	COL Neuberger
OTEA	MAJ Lawn
DAIRO	LTC Rash
ACSI	LTC Hope
	MAJ Siebert
SRAO	Dr. Trainor
	COL Balzhiser
	COL McDonald
	MAJ Bind
TSM,FVS	COL Dunaway
PM, FVS	BG Sheridan
	Mr. Salter
	Mr. Mooney
	MAJ Klaver
SSG	BG Mahaffey
	COL Davis
	Mr. Hunt
	MAJ Parker
	CPT Baird

FIGURE I3
Attendees
IFV/CFV Preliminary Review
July 13, 1978

1. Proceed into full production/deployment; conduct production testing. (Combine with either a, b, or c below.)

   a. Expand production to fifty (50) vehicles per month.

   b. Expand production to eighty (80) vehicles per month.

   c. Expand production to one hundred twenty (120) vehicles per month.

2. Proceed into limited production/deployment. Conduct combined DT/OT III to confirm acceptability of production vehicles prior to initiating full production. (Combine with either a, b, or c below.)

   a. After successful combined DT/OT III and DA IPR expand production to fifty (50) vehicles per month.

   b. After successful combined DT/OT III and DA IPR expand production to eighty (80) vehicles per month.

   c. After successful combined DT/OT III and DA IPR expand production to one hundred twenty (120) vehicles per month.

3. Continue in full-scale engineering development; conduct DT/OT IIA, as required, to verify correction of remaining significant DT/OT II deficiencies. After verification, reintroduce to ASARC/DSARC decision process.

4. Terminate the program; continue with the M-113 Product Improved fleet.

FIGURE I4

IFV/CFV Program Alternatives
ASARC/DSARC Milestone III

(1) Insure that all DA and OSD requirements for the ASARC/DSARC review are met.

(2) Develop and maintain a comprehensive plan and schedule of events to prepare the system for the Preliminary Review and ASARC/DSARC reviews.

(3) Facilitate staffing and coordination of the DCP.

(4) Facilitate preparation and approval of the MSRS.

(5) Resolve minor issues and clearly define major issues that will be presented at the Preliminary Review.

(6) Review and analyze advance or draft ASARC/DSARC documentation as it becomes available to determine additional requirements.

(7) Assist the DASC in fulfilling various administrative requirements in preparing for the ASARC review; e.g., preparation of ASARC Data Books.

(8) Review the adequacy of past tests, results, and evaluations, planned tests, and appropriate alternative test strategy.

Figure I5
AHWG Responsibilities

The FVS Program Manager was a Brigader General who had been with the program since January 10, 1979. His charter provided for him to report directly to the Commanding General, U.S. Army Materiel Development and Readiness Command (DARCOM). The PM was delegated by the Secretary of the Army the full line authority of the CG, DARCOM for the centralized management of the FVS.[2]

The Deputy PM had been with the program for four years and, although he had not experienced a FVS DSARC, he had acquired DSARC experience with other systems.

The Division Chiefs in the FVS Program Office had been with the program for two or more years. No organizational changes were made specifically because of the DSARC requirement.

The date for the DSARC was based on the acquisition strategy and the May 1981 production goal directed by Congress in 1977.

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[2]Program Manager Charter, PM-FVS, 5 April 1979.

FVS Program Office preparations began in January 1979 (a member of the project office was on the AHWG). The list of Milestones/Footstones in Attachment D indicates the extent of the documentation requirements for the DSARC presentations.

Most issues were resolved during the DSARC preparation period. It was thought that production rates would be the real issue along with cost, which is always an issue.

Although it is difficult to quantify the PM effort in man hours and dollars dedicated to DSARC preparations, some indication of the magnitude becomes apparent from the following list of program office activities between January 1979 and January 1980:

- The PMO implemented the HQDA guidance by assigning office responsibilities for the required tasks.
- On June 14, 1979, at a meeting to comment on first draft DCP, the AHWG decided to conform to the new DCP format (based on recent draft revisions of DoD Directives 5000.1 and 5000.2). This required that the major events schedule be adjusted, and a revised "tasker" was published on July 11, 1979.
- An OSD Milestone Meeting was held on August 3, 1979, chaired by DDR&E to discuss issues, DSARC requirements, and milestones to meet them, to include why other systems were eliminated from further consideration.
- A PMO ASARC/DSARC Task Force was formed in August to review the DCP, IPS, Milestone Reference File, current issues and the schedule. Ad Hoc members worked through the task force members to implement required actions.
- Nearly the entire PMO was fully occupied in DSARC preparations for the next three months.
- Preparations also required a large contractor effort including, for example, a $1M Production Readiness Review (PRR) over a period of six months that took only several minutes to present at the DSARC.
- A series of briefings, meetings, and reviews were held that extended from January 1979 to January 1980 to include:
  - DARCOM
  - HQDA
  - OSD (MRA&L, T&E, CAIG)
  - Preliminary Review for ASARC-Nov. 20, 79
  - Prebrief to VCSA-Dec. 17, 79

- oo ASARC III-Dec. 20, 79
- oo DSARC Pre-brief-Jan. 17, 80
- oo DSARC III-Jan. 22, 80

- o In addition to preparing for the DSARC, the PMO also had to support ongoing program management functions and the following external requirements:

  - oo Army Audit Agency started an audit on May 24, 1979, with the objective of determining whether the information to be provided for the ASARC/DSARC was adequate to procure the IFV/CFV. The study was terminated in September without a report.

  - oo The General Accounting Office began an audit in August 1979 to review the FVS program.

  - oo The Department of the Army Inspector General scheduled an inspection in November 1979.

  - oo A Department of the Army Program Review was held on June 21, 1979.

b. ASARC III - December 20, 1979 -- The purpose of this review was to determine if the IFV/CFV Program was ready to proceed into the production phase.[3] Following discussion of the acquisition strategy (two versus four year sole source option, suggested by OSD) and affordability (concluded to be affordable), both the developer and user recommended production. The ASARC members agreed and the VCSA directed that the IFV/CFV system proceed into production and be type classified standard. The VCSA recommendation to the Secretary of the Army (SA) was approved on January 30, 1980. The list of ASARC III attendees is shown in Figure I6.

c. Pre-DSARC Events -- During the period between December 21, 1979, and the DSARC on January 22, 1980, the DSARC presentation was refined, questions from the ASARC were answered, and further reconciliation of issues with the OSD staff was accomplished. The Army representatives to the DSARC were prebriefed and there were five pre-briefs to OSD (T&E, MRA&L, and CAIG) during the period between January 4 and 16. In most cases, these briefings were presented by the PM with staff back-up.

d. DSARC III - January 22, 1980 -- By the time it got to the DSARC, the Army knew that there were few technical issues for DSARC consideration. However, it knew from pre-DSARC activities with OSD that there were cost, test, ammunition, and competition

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[3]Memorandum for ASARC Members, Minutes, IFV/CFV ASARC III, 21 Jan 1980.

DARCOM
GEN Guthrie
MG Sheridan
BG Bolte' - PM
COL Sowers
Mr. Salter
Mr. Kramer

OASA(RDA)
Dr. Pierre
LTC Mullally

OASA(ILFM)
Mr. Gibbs
COL. O'Quinn
LTC(P) Perkins

OASA(MRA)
Mr. Manning

ODCSOPS
LTG Otis
MG Mahaffey
COL(P) Maddox
MAJ Ballard

DUSA(OR)
Mr. Hardison

OGC
Mrs. Lister
Mr. Nissel
MAJ Gamboa

OTEA
MG Kirwan
Mr. Hollis
LTC Lawn

OCLL
COL Gorns

SRAO
COL Balzhiser
COL McDonald
LTC D. Click

OVCSA
GEN Vessey
LTG McGiffert
LTC I. Click

TRADOC
GEN Starry
MG Grange
MG Lynch
COL Jones - TSM
MAJ Annan

ODCSRDA
LTG Keith
BG Shea
LTC Heath

ODCSLOG
MG Konopnicki
Mr. Dolan

ODCSPER
MG Long
MAJ Hariston

PAED
MG Roddy
LTC Riley

OCA
LTG West
Mr. Clark

OACSI
COL Baldwin

AFMCO
MG Lawrence

OCE
BG Kem

FIGURE I6

IFV/CFV ASARC III
Attendees
December 20, 1979

issues. These were areas in which full agreement with the OSD staff had not been reached prior to the DSARC.

The DSARC recommended that IFV/CFV Program proceed to full production. The Secretary of Defense Decision Memorandum (SDDM) of February 1, 1980, (Attachment E) approved the DSARC recommendation but added eleven conditions -- conditions that had been discussed casually during the DSARC proceedings. The Army had no opportunity to comment on the SDDM but PMO personnel said that there were no real surprises in the SDDM -- they recognized all of the issues from the pre-DSARC staffing efforts. However, production approval had been obtained and that made the DSARC effort worthwhile.

3. Preparations for Special ASARC/DSARC

The February 1, SDDM required an IFV/CFV DoD program review to be held in September 1980. This review ultimately became a special DSARC to be preceeded by a special ASARC. Two ASARC reviews were originally scheduled: one for July 17, 1980, to determine the competition strategy for FVS; and the second for August 21, 1980, to review the presentation to OSD in September. In addition, a preliminary review was scheduled for August 12, 1980.[4]

A July 18, 1980, Special ASARC (requested by the ASA (RDA)) was prompted by the Senate Armed Services Committee (SASC) wording of the FY81 Appropriation Law which directed the Army to select a second source for the IFV/CFV and required production of a least five vehicles using FY81 funding.

The PM presented two alternative strategies that were considered by the ASARC as unacceptable. The Acting Chairman (DCSRDA) directed that the PM prepare a new alternative for presentation to the ASA(RDA) and DCSRDA on July 21, 1980. In total, at least fifty alternatives were considered.

Another meeting of the ASARC was scheduled for September 4, 1980, to establish an Army position on the FVS competition strategy and cost reduction program in accordance with the DSARC III decision.

On September 8, 1980, OSD notified the Army that the FVS program review, as required by the February 1, 1980, SDDM, would be held on September 23. Cost reduction/control and development of an early competition strategy would be OSD's greatest concerns and would receive the most emphasis at the program review. The OSD memorandum was in response to an Army request that OSD review

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[4] Memorandum for ASARC Members; Subject, Fighting Vehicle Systems (FVS) Review by the ASARC, July 2, 1980.

the status of actions required on the SDDM and set forth those actions requiring discussion at the September 23 review.

On September 17, 1980, the ASA(RDA) requested that OSD postpone the FVS review until mid-October. ASA(RDA) also requested that FY81 FVS funds be released prior to the OSD review, with the understanding that they would not be obligated for an FMC Corporation procurement contract until after the review.

The request for postponement was approved, however, the USDRE stated that he felt it was inappropriate to release FY 81 funds prior to the review, since there were a number of significant issues still to be resolved.

The ASARC convened on October 1 to approve an acquisition strategy and to review the PM's cost reduction program. The presentation and discussions centered on the following major issues:

a. There is a strong desire at all levels to compete the vehicle for other than purely economic reasons.

b. There is no conclusive evidence from all the economic analyses that competition does or does not save money.

c. Any sensible competitive program requires a funding profile that exceeds what is currently in the 82-86 FYDP.

d. To approve any of the programs requires that the Army address how the program can be funded.

The decision of the ASARC was to present the Army decision to the DSARC as follows:

a. The Army will compete the vehicle assembly function although the quantitative evidence to predict savings is inconclusive, and the analysis does not show a clear economic superiority for any course of action.

b. The OSD alternative is not executable due to the schedule on which it is based.

c. Of the remaining two alternatives, the Army Program Revised has the least risk and impact on the near years and is the preferred approach.

d. Identified with this alternative are three funding increments that must be added to the Army's TOA to make the course of action viable. These are:

- Additional funding necessary to implement the 2d Source Strategy, thus permitting purchase of the same vehicle quantities that are affordable within the current sole source program funding.

- o Additional funding necessary to implement the 2d Source Strategy and buy a quantity of vehicles for each year that is sufficiently large to permit economic production rates for both producers.

- o Additional funding necessary to implement the 2d Source Strategy and buy each year the quantities originally called for in the 82-86 POM.

The VCSA also provided guidance on the manner in which the Army's recommendation would be carried to the OSD Review.

The DSARC was held on October 16, 1980. FVS acquisition strategy was the only issue - the others had been resolved with the OSD staff prior to the DSARC. Attendees are listed in Figure I7. In his subsequent memorandum to the Secretary of the Army, the USDRE directed the following actions (not inclusive):

- o Take steps during FY81 to establish a potential second source for production of FVS. Solicit proposals and award production analysis contracts to the 3-4 best offerors.

- o Take immediate action to break out certain principal subcontractors from the prime contractor as proposed by the Army on October 16.

- o Initiate a competitive development to result in a TOW II PIP ISU.

By separate action, steps were taken by the USDRE to release FY81 funds to provide continued support to the FVS program.

In his memorandum forwarding the October 16, 1980, DSARC Decision, the Deputy ASA(ACQN) pointed out that the direction given was not intended to restrict alternative approaches to solving any FVS problem. Should HQDA wish to adopt any alternatives, the Principal Deputy USDRE would have to be briefed prior to implementation.

The DA Staff had several problems with the DSARC Decision. First, no funds were provided to accomplish the second source effort, in spite of the Army's consistent position that such funds must be added to the TOA. OSD had taken no action to add funds for second sourcing.

The efforts required to prepare for the Special ASARC/DSARC were described by program office personnel as being less than those necessary for ASARC/DSARC III. Some of the divisions and offices were hardly involved and the entire process was less structured than the Milestone III requirements.

The PM (a BG) reported directly to HQDARCOM and had been with the program since July 2, 1980; i.e., he was assigned as PM

OUSDRE
Dr. LaBerge
Mr. Trimble
Mr. Hardison

ASD(C)
Dr. Borsting
Mr. Walters

USD(Policy)
Col. Murphy

ASD(MRA&L)
Mr. Danzig

ASD(PA&E)
Mr. Murray
Mr. Mayer

JCS
BG Hagen
LTC Costello

CAIG
Mr. Margolis

D,DT&E
Adm. Linder
Col. Anderson

Army
Dr. Pierre, ASA(RDA)
Gen. Guthrie, DARCOM
LG Keith, DCSRDA
MG Maloney, Dir. Weapons Systems
BG Kenyon, Dep. Dir., Requirements
Mr. McGregor, Dir., SRAO
BG Whalen, PM
Mr. Daoulis, DASA (AQN)
Col. Jones, TSM
LTC Deter, DASC

DSMC
Mr. Paternoster

FIGURE I7

FVS Program Review
Attendees
October 16, 1980

in the period between the DSARC III and the Special DSARC. The DPM had been with the program for over five years. Both the PM and the DPM had had previous DSARC experience, the PM with another program, and the DPM with the FVS Program.

Some of the briefing requirements from March 4, 1980, to the DSARC on October 16, 1980, are listed in Figure I8.

The actions started by the February 1, 1980, SDDM and further defined by the October 16, 1980, DSARC decision were not settled until October 1, 1982, when the decision was made not to go with second source production of the IFV/CFV vehicle.

DATE	BRIEFER	BRIEFED
March 4, 1980	PM	SASC
March 6, 1980	PM	HASC
April 25, 1980	FMC	OSD(MRA&L)
May 21, 1980	PM	OSD Comptroller
May 28, 1980	PM	OSD (MRA&L)
Jun 20, 1980	DPM	DARCOM (GEN Guthrie)
Jun 20, 1980	PM	HQDA(DCSRDA, ASA(RDA))
Jun 23, 1980	PM	DARCOM
July 18, 1980	PM	Special Meeting of ASARC
July 21-22, 1980	PM	HQDA (DCSRDA)
July 30, 1980	PM	HQDA (ASA(R&D))
Aug 13, 1980	PMO	AHWG
Aug 27, 1980	PM	OSD (Dr. LaBerge)
Sep 8, 1980	PM	DARCOM (MG Lunn)
Sep 11, 1980	PMO	DARCOM (Pre-T&E/MRA&L Brief)
Sep 17, 1980	PM	OSD (MRA&L, T&E)
Sep 23, 1980	PM	Pre-ASARC
Sep 30, 1980		Prebrief DCSRDA
Oct 1, 1980	AM	Brief VCSA
Oct 1, 1980	PM	ASARC
Oct 9, 1980	PMO	MRA&L
Oct 10, 1980	PMO	MRA&L
Oct 16, 1980	PM	DSARC

NOTE: Many briefings regarding second source actions subsequent to DSARC. Second Source issue not settled until October 1982.

FIGURE I8

Special ASARC/DSARC Briefings

IV. PROGRAM STATUS

The first production models were delivered in May 1981 and the first units will be equipped with IFVs and CFVs early in 1983. The Army requirements amount to 6,882 vehicles, of which approximately 1,100 are under contract, and a 600 vehicle procurement is planned from FY83 funds.

ATTACHMENT A

SCHEDULE OF MAJOR EVENTS
IFV/CFV ASARC/DSARC III

EVENT	PLANNING
New Equipment Training (Continuing)	Jan 2, 79
ASARC Ad Hoc Working Group Convened	Jan 9, 79
ASARC/DSARC Guidance Letter (Tasker) Published	Jan 31, 79
Initial Production Readiness Review	
FMC	Feb 20, 79
VRFWS Contractor	Feb 29, 79
Material Systems Requirements Specifications Initiated (MSRS)	Mar 5, 79
QQPRI/BOIP Provided	Mar 30, 79
DCP Outline Provided	Apr 12, 79
Logistics Support Plan (LOGCAP)	May 1, 79
First Draft DCP to HQDA	May 15, 79
Material Need Updated	May 31, 79
MSRS Approval Meeting	Jun 5, 79
DA Comments on Draft DCP to PM, Fighting Vehicle Systems	Jun 15, 79
OSD Milestone Planning Meeting	Jun 28, 79
Preliminary Production Baseline Established	Jul 15, 79
Production Readiness Review Completed	Jul 26, 79
Acquisition Plan Updated	Jul 31, 79
IFV/CFV Transportability Approval	Aug 1, 79
Preliminary Appraisal Paper to VCSA 1/	Aug 10, 79
Second Draft "Comment" DCP to HQDA	Aug 15, 79

1/ Contingent upon TRADOC conducting a field review.

Human Factors Engineering Analysis Appraisal to HQDA	Sep 12, 79
"For Comment" Draft DCP to DAE	Sep 18, 79
Baseline Cost Estimate/Cost Analysis Brief Review	Oct 9, 79
Affordability Analysis Initiated	Oct 11, 79
Manpower Analysis Paper	Oct 20, 79
Testing Review Conducted	Oct 25, 79
Integrated Logistic Support Appraisal	Nov 5, 79
Test Evaluation Master Plan	Nov 5, 79
ASARC Data Books Distributed	Nov 8, 79
COEA/CTEA Emerging Results to HQDA	Nov 14, 79
DT II Independent Evaluation	Nov 17, 79
OT II Emerging Results	Nov 17, 79
Preliminary Review	Nov 20, 79
"For Coordination" DCP to HQDA	Nov 28, 79
SRAO Analysis Paper	Nov 29, 79
COEA/CTEA Final Report	Dec 5, 79
ASARC Meeting	Dec 20, 79
ASARC Recommendation Forwarded to OSD ("For Coordination" DCP included as an Enclosure.)	Dec 27, 79
OT II Final Independent Evaluation	Jan 3, 80
Pre-Brief of Director, T&E OUSDRE	Jan 3, 80
Cost Briefing to OSD (CAIG)	Jan 4, 80
DSARC Meeting	Jan 17, 80
Establish Final Production Baseline	Jan 17, 80
Develop Distribution Plan	(TBD)
DSARC Decision Distributed	(TBD)
Final DCP Distributed	(Within 30 days of receipt of OSD decision)

ATTACHMENT B

Responsibilities

a. Commander, US Army Materiel Development and Readiness Command.

(1) Update the DCP including required information on the technical assessment, resources, manpower, logistics, and test and evaluation.

(2) Provide cost and performance data to HQDA and TRADOC as required.

(3) Provide representation to IFV/CFV AHWG.

(4) Provide documentation as specified at Enclosure 4.

(5) Present the program description, issues, producibility, alternatives, cost, schedule, and standardization/interoperability (developer) portions of the program decision reviews.

(6) Conduct Human Factors Engineering Analysis.

(7) Provide Developmental Testing (DT) results.

b. Commander, US Army Training and Doctrine Command.

(1) Update and submit requirements documents, as required, in accordance with instructions issued by ODCSOPS/DA (DAMO-RQ).

(2) Assist DARCOM in preparation of DCP.

(3) Provide current QQPRI and BOIP containing manpower and personnel information.

(4) Assist DCSOPs in validation of procurement quantities.

(5) Provide representation to IFV/CFV AHWG.

(6) Provide documentation as specified at Enclosure 4.

(7) Present requirement and operational concept portion of the decision program reviews. Provide to the materiel developer and logistician an organizational logistic structure plan based on approval doctrine that identifies appropriate force structure elements that will be responsible for all levels of field logistic support in the tactical and nontactical environment.

(8) Be prepared to state and discuss identified user concerns on IFV/CFV-related issues.

(9) Provide Manpower Analysis Paper II (MAP III) as specified in reference 1y.

c. Program Analysis and Evaluation Directorate (OCSA).

(1) Provide representation to the IFV/CFV AHWG.

(2) Brief on affordability at the Preliminary Review, and at ASARC Reviews as required.

d. Comptroller of the Army.

(1) Provide representation to the IFV/CFV AHWG.

(2) Coordinate preparation and validation of cost estimates.

(3) Prepare Cost Analysis Brief (CAB) and present at Preliminary Review and ASARC review as required.

(4) Provide documentation as indicated at Enclosure 4.

e. Deputy Chief of Staff for Operations and Plans.

(1) Provide representation to the IFV/CFV AHWG.

(2) Validate procurement quantities and supporting requirements documents.

(3) Ensure COEA is updated, as appropriate, and a CTEA is prepared.

(4) Approve BOIP.

(5) Provide necessary interface to ensure individual training, collective training, and new equipment training requirements associated with system fielding are properly addressed during reviews as appropriate.

f. Deputy Chief of Staff for Logistics.

(1) Provide representation to the IFV/CFV AHWG.

(2) Provide ILS Appraisal Paper as specified at Enclosure 4.

(3) Be prepared to present an ILS Appraisal at Preliminary Review and ASARC review as appropriate.

g. Commander, US Army Intelligence and Security Command.

(1) Provide representation to the IFV/CFV AHWG.

(2) Prepare threat documentation.

(3) Monitor the application of the threat within the COEA and DT/OT testing.

(4) Provide threat documentation to OACSI for approval.

h. Deputy Chief of Staff for Research, Development, and Acquisition.

(1) Provide Chairman of IFV/CFV AHWG.

(2) Assemble and distribute IFV/CFV Data Books to ASARC members.

(3) Provide documentation as indicated at Enclosure 4.

i. Deputy Chief of Staff for Personnel.

(1) Provide representation to IFV/CFV AHWG.

(2) Approve QQPRI as specified in reference 1p.

(3) Review Human Factors Engineering Analysis to ensure requirements are satisfactorily met in preparation for reviews. See reference 1o.

(4) Review and update manpower and personnel plans necessary to field the IFV/CFV systems. Compare with current systems including numbers and skill levels.

(5) Prepare to present adequacy of Manpower to support the systems. As part of this assessment present the projected manpower numbers and skill levels that will be available in the early 1980s as compared to today.

(6) Review Manpower Analysis Paper III.

j. Commander, Operational Test and Evaluation Agency.

(1) Provide representation to IFV/CFV AHWG.

(2) Provide Operational Testing results as indicated at Enclosure 4.

k. Chief, Department of Army International Rationalization Office.

(1) Provide representation to IFV/CFV AHWG.

(2) Be prepared to address the adequacy of the RSI plan developed for the Fighting Vehicle Systems (IFV/CFV).

l. Assistant Chief of Staff for Intelligence.

(1) Provide representation to IFV/CFV AHGW.

(2) Obtain Defense Intelligence Agency's evaluation of the threat documentation.

(3) Approve threat documentation.

ATTACHMENT C

IFV/CFV ASARC/DSARC III
REQUIRED DOCUMENTATION

DOCUMENT	AGENCY	DATE	TO	COPIES
QQPRI/BOIP	TRADOC	Mar. 30, 79	DCSPER	5
DCP (to include MENS Annex)				
Outline	DARCOM	Apr. 12, 79	DCSRDA	10
Draft "For Comment"	DARCOM	May. 15, 79	DCSRDA	25
2nd Draft "For Comment"	DARCOM	Aug. 15, 79	DCSRDA	25
"For Comment" Draft	DCSRDA	Sep. 18, 79	DAE	5
"For Coordination" Draft	DARCOM	Nov. 28, 79	DCSRDA	25
"For Coordination"	DCSRDA	Dec. 21, 79	DAE	5
Materiel Need (Updated)	TRADOC	May. 31, 79	DCSOPS	25
MSRS Draft	DARCOM	Jun. 1, 79	DCSRDA	20
MSRS	DCSRDA	Jun. 14, 79	OCA	10
Acquisition Plan (Updated)	DARCOM	Jul. 31, 79	DCSRDA	4
Baseline Cost Estimate	DARCOM	Aug. 15, 79	OCA	4
Human Factors Engineering Analysis Appraisal	DARCOM	Sep. 12, 79	DCSPER	5
Cost Analysis Brief	OCA	Sep. 15, 79	DCSRDA	5
Manpower Analysis Paper	TRADOC	Oct. 20, 79	DCSPER	5
TEMP	DARCOM	Nov. 5, 79	DCSRDA	5
ACAP	OCA	Nov. 5, 79	DCSRDA	5
COEA/CETA (Emerging Results)	TRADOC	Nov. 14, 79	DCSOPS	25 ea
ILS Appraisal	DCSLOG	Oct. 17, 79	DCSRDA	25
ASARC Data Books	DCSRDA	Nov. 8, 79	Distribtn	25
DT II Independent Evaluation	DARCOM	Nov. 17, 79	DCSRDA	5
OT II Emerging Results	OTEA	Nov. 20, 79	DCSRDA	5
COEA/CTEA Final Report	TRADOC	Dec. 5, 79	DCSOPS	25 ea
OT II Final Report, Independent Evaluation	OTEA	Jan. 3, 80	DCSRDA	5
Final DCP	DCSRDA	(Within 30 days of receipt of OSD Decision) Distribution 25		

ATTACHMENT D

IFV/CFV PMO
ASARC/DSARC
MILESTONES/FOOTSTONES

NET

1st Draft NETP (CONUS)	Jan. 15, 79
OT II - Cadre Training	
Driver	Feb. 2, 79
Gunner	Apr. 27, 79
Org Maint	Apr. 27, 79
DS Maint	Jun. 22, 79
Final Draft NETP (CONUS)	Apr. 16, 79
Final Draft NETP (CONUS)	May 7, 79

QQPRI

Program Meeting	Jan. 26, 79
Requirement Message to Involved Agencies	Jan. 30, 79
Receive Input from Involved Agencies	Feb. 15, 79
Coordination Meeting	Feb. 21-23, 79
FVS-PMO Final Input	Feb. 23, 79
MRSA/TSM Coordination	Mar. 2, 79
Final QQPRI Submission	Mar. 30, 79

MSRS

Review DCP and DP	Feb. 26, 79
Initiate MSRS	Mar. 5, 79
MSRS Strawman to PMO Div	Mar. 12, 79
MSRS Planning Meeting w/TSM, DCSRDA, PMO	Mar. 21, 79
Consolidate Comments From PMO Div	Apr. 13, 79
Receive, Review & Enter Input to MSRS	May 4, 79
Staff MSRS w/PMO Div	May 11, 79
AHWG on MSRS	May 15-21, 79
Submit MSRS to DCSRDA	Jun. 1, 79
MSRS Approval Meeting	Jun. 5, 79

DCP

Assign Responsibilities	Apr. 17, 79
Receive Inputs	Apr. 27, 79
Edit, Revise & Compile "Strawman"	Apr. 30-May 2, 79
Staff Strawman w/PMO	May 3-4, 79
Prepare 1st Draft	May 7-8, 79
Review Draft by PM/APM	May 9-10, 79
Revise and Finalize Draft	May 11-14, 79
Submit 1st Draft to DARCOM, DCSRDA, OTEA TRADOC	May 15, 79
Submit 2nd Draft to DARCOM, DCSRDA	Aug. 15, 79
"For Comment" Draft to DARCOM, DSCRDA	Aug. 15, 79
"For Coordination" Draft to DCSRDA	Nov. 28, 79
"For Coordination" to Date (By DCSRDA)	Dec. 21, 79

ACQUISITION

Complete 1st Draft Revision	Apr. 5, 79
Staff Draft Revised Plan W/I PMO	May. 10, 79
Edit, Revise and Staff Final	Jun. 10, 79
Forward to Printer for Publication	Jun. 20, 79
Submit to DCSRDA	Jul. 15, 79

ESTABLISH PRELIMINARY PRODUCT BASELINE

Physical Configuration Audit	Feb. 79
Critical Design Review	May 79
Documentation Validation Audit	Jun. 79
Release of Form 3 Technical Data Package (Establishes Preliminary Product Baseline)	Jul. 15, 79

BCE

Establish system for developing range estimates	Jan. 79
LCCE From Hughes and Ford	Jan. 79
Receipt of Budgetary Estimate from FMC	Feb. 15, 79
Establish Review Team & Criteria for review of contractor estimates to include major subcont.	Mar. 23, 79
Conduct on-site review of contractor estimate to include major subs	Apr. 15-25, 79
Coordinate Update of O&S W/COA & TARCOM	May & Jun. 79
Prepare V.E.S. and C.D.S. for: A. In-House Cost FVS B. In-House Cost Other Commands C. GFE Items Procured by Other Commands Funded PM, FVS Obtain Validation of Above	May 4, 79
Prepare findings of on-site review & incorporate changes to contractor estimates as required	May 3, 79
Prepare V.E.S. and C.D.S. for O& S costs. Obtain validation	Jun. 1-Jul. 1, 79
Prepare V.E.S. and C.D.S. for revised baseline and by displays obtain validation of above	May 1-Jun. 7, 79
Prepare variance analysis between old baseline and new baseline and develop range estimates for all cost elements	Jul. 15, 79
Conduct sensitivity analysis with variations in monthly production rates and total quantities	Jul. 30, 79
Baseline Cost Estimate to DARCOM	Aug. 7, 79

PRR

Initial PRR - Vehicle	Mar. 6, 79
- 25mm Gun	Mar. 13, 79
PRR Functional Reviews	Mar.-Aug. 79
PRR Input to DCP Outline	Apr. 79
PRR Input to DCP Draft	May. 79
PRR Update to DCP 2nd Draft	Aug. 79
PRR Outbrief - Vehicle	Aug. 79
- 25mm Gun	Aug. 79
Production Readiness Review Complete	Aug. 31, 79
PRR Update to DCP "For Comment" Draft	Sep. 79
PRR Report to PM-FVS	Oct. 79

TRANSPORTABILITY APPROVAL

Review Transportability	May 1, 79
Request for C-141 Test Load	May 7, 79
Test Load into C-141	Jun. 4, 79 (approx)
File for Transportability Approval and submit Final Transportability Report	Sep. 1, 79

HFE

Human Factor Validation Review	Feb. 26,- Mar.8, 79
Human Engineering Laboratory (HEL) Report on HF Validation Review to PMO	Mar. 23, 79
PMO & Contractor's Review HEL report and propose corrective action	Apr. 13, 79
HEL validate corrective action	Jun. 4-6, 79
HEL submit preliminary HFE Analysis Appraisal to PMO	Jun. 25, 79
HEL incorporate TECOM PQT-G test data into HF Appaisal	Jun. 25,-Sep. 7, 79
HEL brief PMO on Final HFE Analysis Appraisal	Aug. 15, 79
HFE Analysis Appraisal to HQDA	Sep. 12, 79

TEMP

Start PQT-C	Jan. 22, 79
Start IFV OT II Training	Mar. 7, 79
First Draft - Temp	Jun. 15, 79
Start IFV PQT-G	Jun. 18, 79
End IFV OT II Training	Aug. 27, 79
Start IFV OT II	Sep. 3, 79
Data Cut Off	Oct. 22, 79
Draft Temp	Oct. 29, 79
Approved Temp	Nov. 5, 79

FINAL PRODUCT BASELINE

Critical Design Review	Sep. 79
Physical Configuration Audit	Oct. 79

Functional Configuration Audit	Nov. 79
Documentation Validation Audit	Dec. 79
Update of Form 3 Technical Data Package (Establishes Final Product Baseline)	Jan. 17, 80

ATTACHMENT E

THE SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301
1 FEBRUARY 1980

MEMORANDUM FOR SECRETARY OF THE ARMY

SUBJECT: Secretary of Defense Decision Memorandum on IFV/CFV DSARC III

I have reviewed the DSARC III proceedings on the IFV/CFV program and approve the following actions:

- Full Production - 50/mo ramping to 90/mo in 1985. Continuation of production is subject to findings of a program review to be held before release of FY81 funds.

- Accelerate cost reduction program. The proposed effort including funding at the minimum level of $10M and contractor incentives should be submitted to OSD for approval as soon as possible. The sufficiency of the cost reduction program shall be one of the principal elements required prior to FY81 fund release.

- Re-evaluate the Army survivability test plan. Provide an analysis to OSD NLT 1 March 1980 of the impact on IFV procurement of completing survivability tests prior to the September program review.

- Corrective deficiencies identified in the Integrated Sight Unit (ISU) and validate these corrections during CFV testing. Prepare a testing report with respect to the ISU NLT 1 September 1980.

- The approved DTC (Rollaway) cost goal is $543K (FY80$) and the threshold is $597K based on total procurement of 6,882 vehicles.

- Analyze a program to substitute DU penetrators for the tungsten alloy penetrators in the 25mm APDS round and report your findings to OSD within 90 days.

- Initiate a high priority effort to execute a competitive program including CONUS or foreign participation for the vehicle, its subsystems, ordnance systems, and 25mm ammunition. The program shall be designed to introduce completion in all elements at the earliest practical date to insure the maximum units are acquired through competitive means. The competition strategy shall be submitted NLT 1 September 1980.

- Initiate a high priority effort to establish goals for support related R&M parameters (e.g., mean miles between unscheduled maintenance actions; maintenance manhours per unscheduled maintenance action; and durability). These goals will be submitted to OSD (MRA&L) within 45 days. An integrated test and evaluation master plan covering all phases of testing through IPT and FOE will be provided for approval within 90 days. The test results, a program to fix any R&M or support deficiencies, and support assessment will be briefed as part of the September 1980 review and at the conclusion of IPT and FOE. Also, as part of the briefing, the planned manpower and spares should be assessed in relationship to availability objectives and the R&M parameters measured in test.

- Negotiate with initial sole source contractor to procure as many vehicles as possible the first year by minimizing the follow-on costs, but assuring adequate system technical support.

- Assign and implement the appropriate priority rating authorized under the Defense Production Act, so that lead times, such as for armor plate, can be held to minimum.

- A DOD program review on IFV/CFV will be held during September 1980. At this review the Army will report its plan for competition, logistic support, maintainability, results of DTII, updated O&S cost analysis, survivability testing, R&M funding and cost reduction efforts.

/s/ W. Graham Clayton, Jr.