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Report to the Honorable
Larry J. Hopkins, U.S. House of
Representatives

July 1989

DOD ACQUISITION

Information on Joint Major Programs

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GAO

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International Affairs Division

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July 17, 1989

The Honorable Larry J. Hopkins
House of Representatives

Dear Mr. Hopkins:

In response to your February 17, 1988, request, and subsequent agreements with your Office, we reviewed the Department of Defense's (DOD) joint major defense acquisition programs. You asked us to provide information regarding the status of the joint major programs, address questions concerning memorandums of agreements (MOAS), and determine the Office of the Secretary of Defense's (OSD) role in joint efforts and whether that role should be strengthened. Our objectives, scope, and methodology are discussed further in appendix I.

Results in Brief

At the end of fiscal year 1988, DOD had 34 programs that were considered joint major programs. OSD has played a role in initiating the greatest number of these programs and in reviewing and identifying major programs for potential joint participation. MOAS are not required in joint programs, but when they are used, they cover a variety of topics, such as funding, staffing, and provisions for technical or engineering support. However, they do not provide disincentives to discourage participating services from abrogating the agreements. We also concluded that there is no need to strengthen OSD's role in joint major programs.

Status of Joint Major Programs

DOD defines joint programs as those having multiservice or multiagency participation during the research and development (R&D) phase and/or during the procurement phase. Major programs are defined by DOD Directive 5000.1 as those having $200 million in R&D funding or $1 billion in total procurement cost. The directive also designates major programs based on the urgency of need, development risk, joint funding, significant congressional interest, or other considerations.

OSD identified 51 programs as joint and major during fiscal years 1979 to 1989. We limited our review to those programs that met the dollar threshold set out in the directive. Consequently, we eliminated 17 programs from our review because they did not meet the dollar threshold, or after a preliminary evaluation, we found that for various reasons, they were no longer categorized as joint major programs. Participants withdrew from three of these programs, but we could not determine the impact these withdrawals had on unit cost. The 34 programs that were still joint and major as of the end of fiscal year 1988 are discussed in detail in appendixes II and III. One of these programs had a participant withdraw but the program remained joint because two services continued to participate.

Appendix II provides a descriptive summary of the programs in terms of types of joint service or agency participation, phases when programs became joint, initiators of joint major programs, and longevity of participation in joint major programs.

We categorized the programs reviewed into three types of joint service or agency participation: (1) multiservice procurement programs, (2) multiservice or multiagency R&D programs, and (3) cooperative development programs. We identified 5 multiservice procurement programs where one service acts as the procuring agent for another; 21 multiservice or agency R&D programs where participants work together to produce a common system or a variant; and 8 cooperative development programs, defined in this report as those programs where each participant is responsible for developing one or more components of an overall system. (See table II.1.)

Joint participation began during various phases of the acquisition process. These phases include the R&D phases of concept exploration, demonstration and validation, and full-scale development. The final acquisition phase involves production and deployment. Of the 34 programs, 21 became joint during concept exploration and demonstration and validation, 5 became joint during full-scale development, and 5 became joint during production and deployment. We were unable to determine the exact R&D phase at which joint participation began for the other three programs. (See table II.2.)

OSD, the military services, the Joint Chiefs of Staff (JCS), the Congress, and the President all have initiated joint programs. However, OSD has played the dominant role in initiating joint major programs. Specifically, 21 of the 34 programs reviewed became joint at OSD's direction, 6 were initiated by the military services, 3 by the Congress, 2 by the President, and 1 by the JCS. (See table II.3.)

Joint programs are not a new concept. Of the 34 programs reviewed, 4 have had multiservice participation for 20 years or more, 9 programs have been joint for 11 to 20 years, 13 programs have been joint for 6 to 10 years, and 8 have been joint for 5 years or less. (See table II.4.)

Table II.5 categorizes the 34 programs by such elements as lead service/agency, other participants, current phase, and total program costs.

MOAs

Interservice or interagency agreements explain the nature and extent of participant involvement in a program. The types of agreements in the joint programs that we reviewed included operational requirements documents, MOAS or memorandums of understandings (MOUS), test plans, program charters, and decision coordinating papers.

There were 27 joint major programs that had a total of 109 MOAS or MOUS. Three programs involved circumstances where service participants failed to comply with terms of the agreements. One of the programs—the V-22 Osprey Aircraft program—had a participating service withdraw, but the program remained joint because other services continued to participate. The V-22 program was the only program of the three that had a unit cost increase related to an abrogation of an MOA.

According to OSD officials, joint program MOAS or MOUS are not required. We found that when MOAS or MOUS are used, they cover a variety of topics and can be used to establish general operating policies and procedures or deal with a very specific aspect of a program, for example, personnel assignments. We also found that there are no disincentives to discourage a participating service from abrogating its agreements. However, we do not believe that it is necessary to standardize documents used in joint major programs, because such documents should be prepared on a case-by-case basis to fit the individual program circumstances.

OSD's Role in Joint Major Programs

OSD plays an important role in initiating joint major programs and reviewing and identifying major programs for potential joint participation. We do not believe that further measures to strengthen that role are needed at this time.

Before 1986, the Under Secretary of Defense for Research and Engineering had responsibility for curbing duplication in weapon systems, supporting standardization, and furthering joint programs. Since 1986, the Under Secretary of Defense for Acquisition, which replaced the position of Under Secretary of Defense for Research and Engineering, has had primary responsibility for reviewing and identifying major programs for potential joint participation. The Under Secretary of Defense for Acquisition, in his capacity as the Defense Acquisition Executive, chairs the

Defense Acquisition Board. This board replaced the Defense Systems Acquisition Review Council in 1987, and assesses the potential of major programs for joint service participation.

Joint major programs have also been affected by the Goldwater-Nichols DOD Reorganization Act of 1986. The act changed the JCS structure, consequently changing its role in reviewing joint programs. Specifically, the act created the Vice Chairman of JCS, who is responsible for improving the way joint system requirements are identified and the way joint programs are managed. The Vice Chairman chairs the Joint Requirements Oversight Council. In September 1986, the council formally implemented the joint potential review and designation of programs and requirements process. The purpose of the process is to facilitate interservice communication on the opportunities for joint participation in new programs and previously designated programs undergoing milestone reviews.

DOD Comments

We provided a draft of this report to DOD for its review and comment. DOD, in its oral comments, concurred with the report and suggested minor changes for technical accuracy. We considered each of DOD's suggested changes and, where appropriate, incorporated them in the report.

We are sending copies of this report to the Chairmen, House and Senate Committees on Armed Services and Appropriations, the Senate Committee on Governmental Affairs, the House Committee on Government Operations and the Secretaries of Defense, Army, Navy, and Air Force. Copies will be made available to other interested parties upon request. If we can be of further assistance, please call me on 275-8400.

Staff members who made major contributions to this report are listed in appendix IV.

Sincerely yours,

Paul F. Math
Director, Research, Development, Acquisition,
and Procurement Issues

Contents

Appendix IV Major Contributors to This Report

Tables

Figures

Abbreviations

AAWS-M	Advanced Antitank Weapon System-Medium
ADI	Air Defense Initiative
ALCM	Air Launched Cruise Missile
AMRAAM	Advanced Medium Range Air-to-Air Missile
ASAS	All-Source Analysis System
ASPJ	Airborne Self-Projection Jammer
ATA	Advanced Tactical Aircraft
ATF	Advanced Tactical Fighter
ATARS	Advanced Tactical Air Reconnaissance System
C3I	Command, Control, Communications, and Intelligence
CIS	Combat Identification System
DARPA	Defense Advanced Research Projects Agency
DASA	Defense Satellite Communications System Automated Spectrum Analyzer
DCA	Defense Communications Agency
DMSP	Defense Meteorological Satellite Program
DOCS	Defense Satellite Communications System Operations Control Segment
DOD	Department of Defense
DOSS	Defense Satellite Communications System Operations Support System
DSCS	Defense Satellite Communications System

ENSCE	Enemy Situation Correlation Element
EPLRS	Enhanced Position Location Reporting System
GAO	General Accounting Office
GPS	Global Positioning System
HARM	High Speed Anti-Radiation Missile
HMMWV	High Mobility Multipurpose Wheeled Vehicle
ICNIA	Integrated Communications, Navigation, Identification Avionics
IFF	identification friend or foe
IOC	initial operational capability
INEWS	Integrated Electronic Warfare System
JCS	Joint Chiefs of Staff
Joint STARS	Joint Surveillance Target Attack Radar System
JTFP	Joint Tactical Fusion Program
JTIDS	Joint Tactical Information Distribution System
LHX	Light Helicopter Experimental
Milstar	Military Strategic and Tactical Relay Satellite
MOA	memorandum of agreement
MOU	memorandum of understanding
NASP	National Aero-Space Plane
NATO	North Atlantic Treaty Organization
NASA	National Aeronautics and Space Administration
NSA	National Security Agency
OSD	Office of the Secretary of Defense
PLRS	Position Location Reporting System
R&D	research and development
SAR	Selected Acquisition Report
SDI	Strategic Defense Initiative
SDIO	Strategic Defense Initiative Organization
SINCGARS	Single Channel Ground and Airborne Radio System
TAOM/MCE	Tactical Air Operations Module/Modular Control Equipment
TMD	Tactical Missile Defense
TOW	Tube-Launched, Optically Tracked, Wire-Guided Missile
TRI-TAC	Joint Tactical Communications
UARS	Unmanned Air Reconnaissance System
WIS	Worldwide Military Command and Control System Information System
WWMCCS	Worldwide Military Command and Control System

Objectives, Scope, and Methodology

In a letter dated February 17, 1988, Representative Larry J. Hopkins requested us to review DOD's joint major defense acquisition programs. We were asked to provide information regarding the status of joint major programs, address questions concerning MOAS, and determine OSD's role in joint efforts and whether that role should be strengthened.

The objectives of our review were as follows:

1. Collect descriptive data on joint major programs, including:

- how many of the programs initiated since 1978 are still joint major efforts;
- whether participating services dropped out of joint efforts;
- whether unit cost increases may have resulted from participant withdrawals;
- summary data on all the current joint major programs, such as types of participation, phases when programs became joint, initiators of joint efforts, longevity of participation in joint programs, and other aspects of joint involvement; and
- details regarding each of the current joint major efforts.

2. Address specific questions concerning MOAS, including:

- how many MOAS have been initiated since 1978,
- how many MOAS were abrogated and what additional unit costs were incurred as a result,
- what role OSD plays in the MOA process, and
- whether disincentives exist to discourage an individual service from abrogating an MOA commitment.

3. Review OSD's role and the roles of other DOD organizations in joint major programs.

DOD defines joint programs as those having multiservice or multiagency participation during the R&D phase and/or during the procurement phase. Major programs are defined by DOD Directive 5000.1 as those having $200 million in R&D funding or $1 billion in total procurement cost (in fiscal year 1980 constant dollars[1]). The directive also designates major programs based on the urgency of need, development risk, joint funding, significant congressional interest, or other considerations.

[1]Constant dollars are dollars adjusted for changes in prices since the base fiscal year 1980.

OSD identified 51 programs as joint and major programs during fiscal years 1979 to 1989. The scope of our review was limited to those programs having the dollar thresholds to designate them as major programs. We did not review 5 of the 51 programs that OSD originally listed because additional information indicated that these programs did not fall into the joint and major category. The five programs were the DOD High Energy Laser, which was not a major program, but a technology effort that did not materialize; the Microwave/Millimeter Wave Monolithic Integrated Circuits; the Very High Speed Integrated Circuits; the Joint Interoperability Tactical Command and Control Systems; and the Multiple Launch Rocket System.

In addition, we found that 3 of the 51 programs listed were not joint programs—the F-16 is bought separately by the Air Force and the Navy (the Navy's F-16N is an adversary aircraft used for training missions); the Advanced Anti-Armor Weapon System-Heavy is an Army only program, although the Marine Corps is planning to participate at some time in the future; and the Wide Area Mine is an Army concept exploration effort that will evaluate technical approaches that the Air Force previously developed.

We also found that one program, the Microwave Landing System, was not major, and another program, the 5/8" Gun and 8" Artillery Guided Projectile, was neither joint nor major. Of the remaining 41 programs, we determined that the 34 programs listed on pages 13 and 14 were still joint and major programs at the time of our review, and we obtained further descriptive data on each of these programs. For those seven that had been joint and major at some time since 1978, but were no longer joint or major at the time of our review, we examined the reasons for their change in status.

Three of the programs that had been joint and major during the last 10 years subsequently terminated for a variety of reasons: Copperhead, Medium Range Air-to-Surface Missile, and Inter-Service/Agency Automated Message Processing Exchange. Program officials told us that the Army terminated Copperhead for financial considerations. According to a program official, the Congress terminated the Medium Range Air-to-Surface Missile in 1984 due to affordability considerations; however, we found some indication that the services could not agree on requirements. The Air Force terminated the Inter-Service/Agency Automated Message Processing Exchange in January 1988 due to funding constraints and declining confidence that the program could be accomplished within the baseline cost and schedule.

One program, the Bigeye Binary Chemical Bomb, experienced funding reductions and is no longer major.

Three programs that were joint at one time during the last 10 years are no longer joint. They include the Light Armored Vehicle-25, the Army Tactical Missile System, and the Cruise Missiles Project. OSD directed the Army to join the Light Armored Vehicle Program in 1981, but terminated its participation in 1983 after the Congress reduced its funding. Effects on unit cost could not be determined. Program officials told us that the Air Force withdrew from the Army Tactical Missile System in 1984 because the missile did not satisfy service requirements. We could not determine the unit cost effects of the withdrawal since the Air Force was in the program a short time and pulled out in the early R&D phase (concept exploration) without specifying procurement quantities. In 1988, the Air Force withdrew from the Joint Cruise Missiles Project after the missiles it had been developing with the Navy were discontinued. Among the remaining 34 programs listed on pages 13 and 14, only 1 had a participant withdraw. The Army withdrew from the V-22 Osprey Aircraft Program, but the program is still a joint effort because other services have continued to participate. Specifically, the Army withdrew from the V-22 Osprey Aircraft program because of higher priorities and budget constraints. The Air Force continued to participate in the program with the Navy; however, it reduced its planned procurement quantities.

We reviewed joint program documents, MOAs and MOUs, program management plans, program management directives, test plans, and cost data. Unless otherwise noted, all cost data are reported in then-year dollars as of December 1987, the date of the latest Selected Acquisition Report (SAR) available during our April through September 1988 fieldwork. We also interviewed responsible officials in each of the program offices at OSD and DOD agencies. Where documentation was not otherwise available, we relied upon the information supplied in interviews with program officials.

We have issued reports on at least 25 of the programs reviewed, and we used this information as appropriate. These reports are listed in appendix III with a discussion of each program.

Our work was conducted at DOD, the Departments of the Army, Navy, and Air Force, and Defense Advanced Research Projects Agency (DARPA) in Arlington, Virginia; Army Materiel Command, Alexandria, Virginia; Defense Systems Management College, Fort Belvoir, Virginia; Air Force Systems Command, Andrews Air Force Base, Maryland; Army Missile Command, Huntsville, Alabama; Armament Division, Air Force Systems Command, and Naval Air Systems Command, Eglin Air Force Base, Florida; Aeronautical Systems Division, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio; Space Division, Air Force Systems Command, Los Angeles, California; Army-Tank Automotive Command, Warren, Michigan; Electronic Systems Division, Hanscom Air Force Base, Massachusetts; Army Communications-Electronics Command, Fort Monmouth, New Jersey; and Army Aviation Systems Command, St. Louis, Missouri.

We performed our work from April 1988 to August 1989 in accordance with generally accepted government auditing standards.

Joint Major Defense Programs Reviewed

1. Advanced Antitank Weapon System-Medium (AAWS-M)

2. Advanced Medium Range Air-to-Air Missile (AMRAAM)

3. Advanced Tactical Air Reconnaissance System (ATARS)/ Unmanned Air Reconnaissance System (UARS)

4. Air Defense Initiative (ADI)

5. Airborne Self-Protection Jammer (ASPJ)

6. Combat Identification System (CIS)

7. Defense Meteorological Satellite Program (DMSP)

8. Defense Satellite Communications System (DSCS)

9. Hellfire Missile System

10. High Mobility Multipurpose Wheeled Vehicle (HMMWV)

11. High Speed Anti-Radiation Missile (HARM)

12. Integrated Communications, Navigation, Identification Avionics (ICNIA)/Integrated Electronic Warfare System (INEWS)

13. Joint Surveillance Target Attack Radar System (Joint STARS)

14. Joint Tactical Communications (TRI-TAC)

15. Joint Tactical Fusion Program (JTFP)

16. Joint Tactical Information Distribution System (JTIDS)

17. M1/M1A1 Abrams Tank

18. Maverick Missile

19. Military Strategic and Tactical Relay Satellite (Milstar)

20. National Aero-Space Plane (NASP)

21. Navstar Global Positioning System (GPS) User Equipment

22. Position Location Reporting System (PLRS)

23. Sidewinder Missile

24. Single Channel Ground and Airborne Radio System (SINCGARS)

25. Sparrow Missile

26. Stinger Missile

27. Strategic Defense Initiative (SDI)

28. Tacit Rainbow Missile

29. Tactical Air Operations Module (TAOM)/Modular Control Equipment (MCE)

30. Tactical Missile Defense (TMD)

31. Tube-Launched, Optically Tracked, Wire-Guided (TOW 2) Missile

32. UH-60A Black Hawk Helicopter

33. V-22 Osprey Aircraft

34. Worldwide Military Command and Control System (WWMCCS) Information System (WIS)

DOD Joint Major Programs

This appendix provides descriptive information on the 34 joint major programs in terms of types of joint service/agency participation, phases when programs became joint, initiators of joint major programs, and longevity of participation. It also presents information on such elements as lead service/agency, other participants, current phase, and total program costs.

Types of Joint Service/Agency Participation

As shown on table II.1, we categorized the programs as (1) multiservice procurement programs, (2) multiservice and/or multiagency development programs, or (3) cooperative development programs.

- Multiservice procurement programs are those in which one service acts as the procuring agent for another to purchase a specified quantity of a product. Under these arrangements, the participation of services/agencies—other than the "lead" agency—was limited. We identified five multiservice procurement programs. The TOW program is an example of such an arrangement where the Army procures the TOW missile for the Marine Corps.
- Multiservice and/or multiagency R&D programs, as we have defined them in this report, are those in which participants work together beginning at one of the development phases to produce common systems or variants for specific needs. We identified 21 multiservice/agency R&D programs: 18 were joint efforts of DOD services and/or agencies, and 3 involved non-DOD agencies or organizations. DOD programs with non-DOD participants include: NASP Program with participation by the National Aeronautics and Space Administration (NASA); CIS with participation by the North Atlantic Treaty Organization (NATO); and Navstar GPS with participation by NATO, the Coast Guard, and the Federal Aviation Administration.
- Cooperative development programs, as we have defined them in this report, are those in which each participant is responsible for developing one or more components of a system. We identified eight cooperative development programs. For example, the Defense Communications Agency (DCA) manages the DSCS and coordinates the services' efforts to meet their responsibilities as defined in the DSCS program charter and the management engineering plan. Each service, however, is responsible for procuring and deploying specific components of the system. The Air Force is responsible for the satellites and airborne terminals, and the Army is responsible for the ground and operations control equipment.

Table II.1: Types of Joint Service/Agency Participation

Multiservice procurement programs	Multiservice/multiagency R&D programs	Cooperative development programs
Abrams	AAWS-M	ADI
SINCGARS	AMRAAM	ATARS/UARS
Stinger	ASPJ	DMSP
TOW 2	CIS	DSCS
UH-60A	HARM	Joint STARS
	Hellfire	Milstar
	HMMWV	SDI
	ICNIA/INEWS	TRI-TAC
	JTFP	
	JTIDS	
	Maverick	
	NASP	
	Navstar GPS	
	PLRS	
	Sidewinder	
	Sparrow	
	Tacit Rainbow	
	TAOM/MCE	
	TMD	
	V-22	
	WIS	
5	**21**	**8**

Phases When Programs Became Joint

As shown in table II.2, the 34 programs became joint during various phases of the acquisition process. The acquisition process includes the R&D phases of concept exploration, demonstration and validation, and full-scale development. The last phase of the acquisition process is production and deployment. The majority of the programs (29) became joint during the various phases of R&D. Specifically, 21 of them became joint during concept exploration and demonstration and validation and 5 became joint during full-scale development. For three of the programs, we were unable to determine the exact R&D phase at which the participants joined. Only five programs became joint during the production and deployment phase.

Table II.2: Phases When Programs Became Joint

R&D[a]			
Concept exploration	**Demonstration and validation**	**Full-scale development**	**Production and Deployment**
ADI	AAWS-M	Hellfire	Abrams
AMRAAM	ASPJ	Sparrow	DMSP
CIS	ATARS/UARS	Sidewinder	SINCGARS[b]
DSCS	HARM	TAOM/MCE	Stinger
ICNIA/INEWS[c]	HMMWV	TOW 2	UH-60A
Joint STARS	NASP		
JTFP	Navstar GPS		
JTIDS	PLRS		
Maverick			
SDI			
TMD			
V-22			
WIS			
13	**8**	**5**	**5**

[a]We could not determine the exact R&D phase at which participants joined three programs. Specifically, documentation did not indicate at which R&D phase participants joined the Milstar Program. A TRI-TAC program official told us that an overall phase at which participants joined could not be provided since the program was a cooperative development effort and the various TRI-TAC items were started at different times. Officials in the Tacit Rainbow program office could only say that the Navy and the Army joined the program prior to full-scale development.

[b]The Navy first provided the Army with advance funding in 1985 during R&D for procurement of SINCGARS radios. SINCGARS is a multiservice procurement program, however, and the Navy, as well as the Air Force and the Marine Corps, will only be involved in the production and deployment phase of the program.

[c]The Navy and the Air Force signed an MOA for joint INEWS development in 1983 in the concept exploration phase. The Air Force and the Army signed an MOA for joint ICNIA development in 1983 during the demonstration and validation phase.

Initiators of Joint Major Programs

Several organizations can influence the initiation of joint major programs. Table II.3 shows the organizations that initiated jointness in the 34 programs. These organizations include OSD, the military services, the JCS, the Congress, and the President. The majority of the programs became joint at the direction of OSD.

Table II.3: Initiators of Joint Major Programs[a]

OSD	Services	JCS	Congress	President
AMRAAM	Abrams	SINCGARS	JTFP	ADI
ASPJ	ATARS/UARS		TAOM/MCE	SDI
AAWS-M	HARM		V-22	
CIS	Stinger			
DMSP	TOW 2			
DSCS	UH-60A			
HMMWV				
ICNIA/ INEWS				
Joint STARS				
JTIDS				
Maverick				
Milstar				
NASP				
Navstar GPS				
PLRS				
Sidewinder				
Sparrow				
Tacit Rainbow				
TMD				
TRI-TAC				
WIS				
21	**6**	**1**	**3**	**2**

[a]Data at the Hellfire program office does not show what organization initiated the joint effort.

Longevity of Participation in Joint Major Programs

As an acquisition strategy, joint programs are not a new concept. Table II.4 shows, for example, of the 34 programs, 4 have had multiservice participation for 20 or more years. Nine programs were joint from 11 to 20 years, 13 programs were joint from 6 to 10 years, and 8 became joint programs within the last 5 years.

Table II.4: Longevity of Participation in Joint Major Programs

Last 5 years	6-10 years	11-20 years	Over 20 years
ADI (1988)	ICNIA/INEWS (1983)	Hellfire (1977)	DMSP (1969)
Abrams (1987)	Milstar (1983)	AMRAAM (1976)	Sparrow (1968)
AAWS-M (1986)	TAOM/MCE (1982)	HARM (1975)	TOW 2 (1965)
TMD (1986)	JTFP (1982)	JTIDS (1975)	DSCS (1963)
ATARS/UARS (1985)	Joint STARS (1982)	Navstar GPS (1975)	
NASP (1985)	Tacit Rainbow (1982)	PLRS (1973)	
SINCGARS (1985)	UH-60A (1982)	Sidewinder (1971)	
SDI (1984)	V-22 (1981)	TRI-TAC (1970)	
	WIS (1981)	Maverick (1970)	
	HMMWV (1980)		
	CIS (1980)		
	ASPJ (1979)		
	Stinger (1979)		
8	**13**	**9**	**4**

Status of 34 DOD Joint Major Programs

Table II.5 presents summary status data on the 34 programs in terms of

- lead service/agency,
- other participants,
- current phase,
- program charter date,
- percent commonality, and
- total program costs.

Abbreviations and acronyms used in table II.5 are explained in table II.6.

Table II.5: Status of 34 DOD Joint Major Programs

System	Lead svc./ agency	Other partic.	Current phase	Charter	Commonality[a] (%)	Total program costs[b]
AAWS-M	A	MC	D&V	None	100	$5,469.0
Abrams	A	MC	P&D	Yes[c]	100	21,999.5[d]
ADI	AF	N DARPA	CE	Class.	N/A[e]	1,900.0[f]
AMRAAM	AF	N	FSD/ P&D[g]	1979	100	11,199.2
ASPJ	N	AF	FSD/ P&D[h]	1981	100	5,478.0
ATARS/ UARS	AF/N[i]	MC	FSD	None	N/A[j]	1,556.4
CIS	AF	A N NATO	FSD	1980	95	N/D[k]
DMSP	AF	N MC A[l] NSA	P&D	None	100	1,872.4
DSCS	DCA	N AF A	P&D	1985	N/A[m]	807.3[n]
HARM	N	AF	P&D	1983	100	4,983.5
Hellfire	A	N MC	P&D	1986	95	2,420.7
HMMWV	A	MC AF	P&D	None	95	2,279.9
ICNIA[o]	AF	A N NSA	FSD	1983	N/D[p]	N/D[q]
INEWS[o]	AF	N A	D&V	1983	N/D[p]	N/D[q]
Joint STARS	AF	A OSD	FSD	1982	N/D[r]	4,058.8
JTFP	A	AF N MC	FSD	1982	80[s]	Class.
JTIDS	AF	A N MC OSD	FSD	1975	65	1,323.7
Maverick	AF	N MC	P&D	None	N/D[t]	7,620.8
Milstar	AF	A N	Class.	Class.	N/A[u]	Class.
NASP	AF	NASA DARPA N SDIO	D&V	None	100	3,331.0

(continued)

System	Lead svc./ agency	Other partic.	Current phase	Charter	Commonality[a] (%)	Total program costs[b]
Navstar GPS	AF	A N MC DMA NATO CG FAA[v]	P&D	1975	80	4,108.6
PLRS	A	MC	P&D	None	60	613.1[w]
Sidewinder	N	AF	P&D	1971	95	1,216.6[x]
SDI	SDIO	A N AF NSA DARPA DNA NASA DOE CIA USUHS DLA ACDA	D&V	1984	N/A[y]	Class.
SINCGARS	A	MC[z] AF[z] N	P&D	1976	100	5,698.4
Sparrow	N	AF	P&D	1976	100	2,758.6[aa]
Stinger	A	N MC AF	P&D	1984	100	3,279.2
Tacit Rainbow	AF	N A	FSD	None	N/D[bb]	3,725.1
TAOM/MCE	MC	AF	P&D	None	80	1,578.0
TMD	A	MC AF	CE	None	N/D[cc]	2,900.0
TOW 2	A	MC	P&D	1982	95	2,394.2
TRI-TAC	A[dd]	N MC AF OSD JCS NSA	N/D[ee]	1971	N/A[ff]	3,744.0[gg]
UH-60A	A	AF	P&D	None	100	6,547.2
V-22	N	A MC AF	FSD	1985	80	23,000.4
WIS	AF	A N DCA DNA DLA DMA DIA NSA	FSD	1982	100	1,980.7

[a]DOD defines commonality as the quality that applies to materiel or systems: possessing like and interchangeable characteristics enabling each to be utilized or operated and maintained by personnel trained on the others without additional specialized training; having interchangeable repair parts and/or components; and applying to consumable items interchangeably equivalent without adjustment. We found that 23 of the 34 programs included in our review had a high degree of commonity. Specifically, 12 programs had 100 percent commonality, 9 had 80 percent to 95 percent commonality, and 2 had 60 percent to 65 percent commonality. For the remainder of the programs, commonality was either undetermined or not applicable (i.e., as with cooperative endeavors such as ADI or DSCS). A high degree of commonality may imply cost savings; however, the cost data necessary to make that determination is not available.

[b]Total program costs are in then-year millions of dollars as of December 1987.

[c]According to program officials, a charter of the M1 Tank Program was signed, but program officials were unable to provide a copy of the charter or a date.

[d]This cost data includes M1, which is out of production as well as M1A1 program costs for the Army. Separate cost data for M1A1 was not available.

[e]Commonality is not applicable to ADI, which is a cooperative development program in which each participant is responsible for developing one or more components of the overall system that all participants will use. The Air Force and the Navy are responsible for a collection of surveillance and engagement technologies to provide strategic air defense against low observable threats to North America. DARPA conducted R&D on generic, advanced technologies related to strategic air defense.

[f]These are R&D costs only. No procurement estimates were available.

[g]The AMRAAM Program is concurrently conducting full-scale development and low-rate production of 180 missiles in fiscal year 1987, 400 in fiscal year 1988, and 900 in fiscal year 1989.

[h]At the time of our review, ASPJ had nearly completed full-scale development and production was beginning.

[i]ATARS/UARS is a cooperative development program in which the Air Force is the lead service for development of the ATARS sensor suites, and the Navy is the lead for the development of the UARS vehicle into which the sensor suites will be integrated.

[j]Since ATARS/UARS is a cooperative development program, commonality is not applicable. However, each service will procure and use both the components it developed and those developed by the other services.

[k]As of December 1987, the R&D estimate for CIS was $1,252 million. Total CIS program costs were not available at the time of our review.

[l]A 1976 MOA on the joint service management and operation of the DMSP provided a framework for Army participation in the program. The Army is not currently active in the program, but may join under block 6, the next generation DMSP system.

[m]Commonality is not applicable to DSCS, which is a cooperative endeavor. According to a program official, the Army buys ground terminals and the related operations control equipment for the three services; the Air Force procures satellites and its own airborne terminals; and the Navy buys its own shipborne terminals.

[n]This is the total cost for the current acquisition of ground terminals, satellites, and control equipment under DSCS III only. The overall DSCS program, including DSCS I and II, has been in existence since about 1963-64.

[o]ICNIA and INEWS are two elements of an Air Force-led advanced technology development/demonstration. They are not a single program and will be integrated through weapon system applications of the resulting technologies.

[p]According to an ICNIA/INEWS program official, commonality will only be meaningful when the common avionics baseline specifications are available in late 1989.

[q]According to ICNIA/INEWS program officials, development cost estimates were $110 million for ICNIA,

and $245 million for INEWS as of November 1988. Procurement and total cost estimates are not yet available.

[r]The Army uses a surveillance and control data link to transfer data between the ground and airborne segments. The Air Force uses JTIDS for this purpose.

[s]The components of JTFP are the Army's All-Source Analysis System (ASAS) and the Air Force's Enemy Situation Correlation Element (ENSCE). According to a 1982 Army memorandum, the JTFP objective was to develop these systems with the greatest possible degree of hardware and software commonality and interoperability consistent with service requirements. The Army expects the software to be 90 percent common and the hardware to be 80 percent common.

[t]According to Maverick program officials, the versions of the Maverick are very similar. Several variants, AGM-65A through AGM-65G, have been produced incorporating changes in component parts. For example, the 65D and 65G versions are 100% common except for the warhead and fuze, and the 65F and 65G versions are 100% common except for the rocket motor and safe arm device required by the Navy on the 65F version.

[u]A July 1986 Milstar Terminal commonality analysis demonstrated that the Line Replacement Unit commonality was very limited across the services because of divergent requirements driven by platform constraints. All hardware items were given a low rating for commonality potential across the services due to major design differences between terminals.

[v]Australia is also a participant in the Navstar GPS Program.

[w]The cost for Enhanced PLRS (EPLRS), the pre-planned product improvement for PLRS, could not be separately determined because it is included in the Army Data Distribution System.

[x]Cost data is for the AIM-9M version of the Sidewinder only.

[y]Commonality is not applicable to SDI, which is a cooperative development program. Most of the technology and research efforts that are now part of the SDI Program were part of the service/agency programs when SDI was presidentially mandated in 1983. Each of these efforts was transferred from the service/agency budgets to the SDI Program with the submission of the fiscal year 1985 budget to the Congress.

[z]According to program officials, the Marine Corps is expected to fund the SINCGARS Program in fiscal year 1989. The Air Force plans to participate but has not submitted a formal request.

[aa]Cost data is for the AIM-7M version of the Sparrow only.

[bb]According to program officials, the December 1987 Air Force program management directive only requires that the services maximize commonality between the air- and ground-launched versions of the Tacit Rainbow Missile. It does not specify that a percent commonality be achieved.

[cc]According to program officials, TMD is currently in the concept exploration phase, therefore, the baseline program has yet to be defined and percent commonality cannot yet be determined.

[dd]TRI-TAC is a cooperative development endeavor. The Army is the lead service for the overall program. The different participants lead various parts of the TRI-TAC Program. For example, the Army is the lead service for the circuit switch and the Air Force is the lead for the radio.

[ee]According to a program official, each of the various TRI-TAC items is in a different state of development and has its own initial operational capability (IOC). Therefore, no one current phase can be specified for the overall program.

[ff]Since TRI-TAC is a cooperative endeavor, commonality is not applicable.

[gg]This is the program cost for the Army only. Marine Corps, Air Force, and Navy costs are not included because funding is not centrally managed, and all of the services fund their portions of the program in separate budget lines.

Table II.6:Abbreviations and Acronyms Used in Table II.5 That Are Not Listed in the Contents

A	Army
ACDA	Arms Control and Disarmament Agency
AF	Air Force
CE	concept exploration
CG	Coast Guard
CIA	Central Intelligence Agency
Class.	Classified
DCA	Defense Communications Agency
DIA	Defense Intelligence Agency
DLA	Defense Logistics Agency
DMA	Defense Mapping Agency
DNA	Defense Nuclear Agency
DOE	Department of Energy
DOT	Department of Transportation
D&V	demonstration and validation
FAA	Federal Aviation Administration
FSD	full-scale development
MC	Marine Corps
N	Navy
N/A	not applicable
N/D	no data available
NSA	National Security Agency
P&D	production and deployment
USUHS	Uniformed Services University of Health Sciences

MOAs

Interservice/interagency agreements explain the nature and extent of participant involvement in a program. The types of agreements we found in joint programs include operational requirements documents, MOAs or MOUs, test plans, program charters, and decision coordinating papers.

We found that of the 34 joint major programs that we reviewed, 27 had a total of 109 MOAs or MOUs. We found 3 programs with instances of failure to comply with the terms of MOAs: Maverick, DMSP, and the V-22 Osprey Program. However, the only program that we identified as having a cost increase related to an abrogation of an MOA was the V-22 Program. The Army withdrew from the V-22 Osprey Program in 1988 due to budget constraints. In addition, the Air Force, although remaining in the program, reduced its planned procurement quantities of the V-22 from 80 to 55 in 1987. Subsequently, unit costs increased from $29.4 to $30.7 million, due primarily to the Army's withdrawal.

OSD officials told us that OSD is not involved in joint program MOAS or MOUS and that they are not always required. Any of the types of agreements mentioned above, or others, may be used for joint programs. We also found that the number and types of agreements varied considerably. In some programs, such as the M1/M1A1 Abrams Tank Program in which the Army acts as the procuring agent for the Marine Corps, there are no joint agreements. The document used to accomplish the procurement for the Marine Corps is a military interdepartmental purchase request.

We also found that MOAS, when they are used, cover a variety of topics and can be used to establish general operating policies and procedures or deal with a very specific aspect of a program, such as personnel assigned from a participating organization. We found that there are no disincentives to discourage a participating service from abrogating an agreement, but since a program's needs may change depending on a variety of circumstances, we do not believe that it is necessary to standardize the documentation used in joint programs or otherwise enforce agreements that may no longer be applicable.

OSD's Role in Joint Major Programs

As seen in table II.3 and the following discussion, OSD has had a dominant role in initiating joint major programs, and we do not believe that further measures to strengthen that role are needed at this time. A July 1984 Joint Logistics Commanders' study also reported that OSD organizations were the dominant source in joint program initiation.

Prior to 1986, the Under Secretary of Defense for Research and Engineering had responsibility for curbing duplication in weapon systems, supporting standardization, and furthering joint programs. Since 1986, the Under Secretary of Defense for Acquisition, a position created by the Congress under the 1986 Military Retirement Reform Act (Public Law 99-348), has replaced the position of Under Secretary of Defense for Research and Engineering and has become one of the primary positions for reviewing and identifying major programs for potential jointness. This individual also serves as the principal advisor to the Secretary of Defense on all matters relating to the acquisition system; research and development; production; logistics; command, control and communications and intelligence (C3I) activities related to acquisition;

military construction; and procurement. In addition, the Under Secretary of Defense for Acquisition, acting as the Defense Acquisition Executive, chairs the Defense Acquisition Board,[1] which assesses major programs for joint service participation.

Public Law 99-433, the Goldwater-Nichols DOD Reorganization Act of 1986, changed the structure of JCS and consequently, affected its role in reviewing joint programs. Specifically, the act created the position of the Vice Chairman of JCS, who is responsible for improving the way joint system requirements are identified and the way joint programs are managed.

The Vice Chairman chairs the Joint Requirements Oversight Council, which was formerly called the Joint Requirements and Management Board. The Council's charter includes responsibility for reviewing military requirements for potential joint application and assessing and identifying programs for jointness at the beginning of the acquisition process. The charter also stipulates that the Council will examine individual service and interoperability issues that arise during joint program development or operation. We previously reported the need for an organization within DOD to resolve interservice disputes and that the JCS should have a stronger role in joint programs.[2] A JCS official told us that the Council has been reviewing such cross-service issues and that a number of classified requirements disputes have been resolved.

In September 1986, the Joint Requirements Oversight Council formally implemented the joint potential review and designation of programs and requirements process to facilitate interservice communication on the possibilities for jointness in new programs and previously designated programs facing review at milestones I and II.

The Defense Acquisition Board conducts milestone reviews to determine whether a program should proceed to the next acquisition phase. A "milestone 0" decision indicates whether a system should proceed into the concept exploration phase, during which alternative system concepts are identified and evaluated. Following a "milestone I" decision, a system proceeds into the demonstration and validation phase, during which a few test articles are fabricated to see if they can perform generally as expected. A "milestone II" decision determines whether one or

[1] This board replaced the Defense System Acquisition Review Council in 1987.

[2] Joint Major System Acquisition By the Military Services: An Elusive Strategy (GAO/NSIAD-84-22, Dec. 23, 1983).

more systems should proceed into full-scale development. A "milestone III" decision determines whether a system should be produced and fielded.

Although the scope of our work was limited to joint major programs, we found that joint service acquisitions of less-than-major-programs are also being encouraged by the Joint Logistics Commanders. In 1984, the Under Secretary of Defense for Research and Engineering directed these commanders to identify and select programs with opportunities for joint efforts at the less-than-major-program level. Subsequently, subordinate commanders responsible for aeronautical, ordnance, and communications-electronics fields identified joint opportunities at the component and less-than-major-program levels. Some less-than-major items procured jointly include transceivers and aircraft engines.

DOD Joint Major Program Summaries

This appendix discusses each of the 34 programs in greater detail, including background information that describes the program, participating services and agencies, program schedules and applicable tests, deliveries, interservice/interagency agreements, costs, and a listing of recent reports issued by our Office. The details discussed under each heading vary because of the complexity of some programs, the range of joint involvement, the maturity of the programs, and issues that we believe should be discussed to provide an overview of each program.

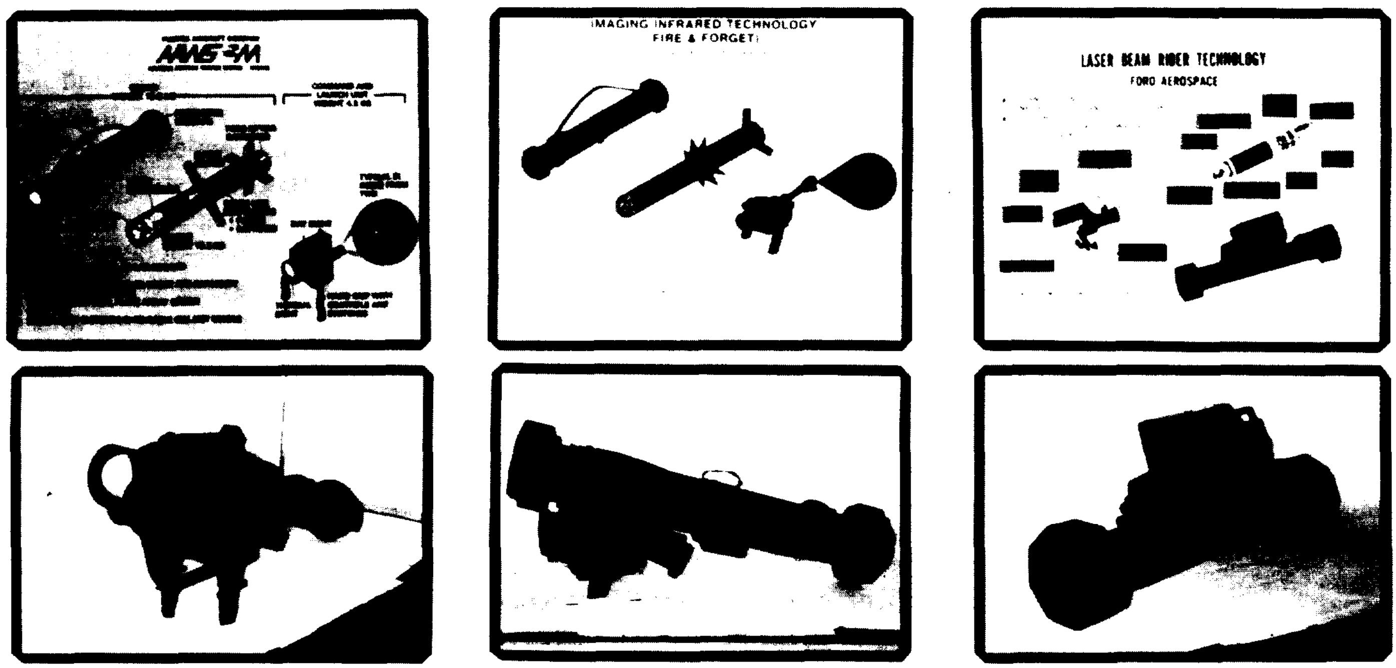
AAWS-M

The AAWS-M is a medium-range, portable antiarmor weapon for use in rough terrain, rapid deployment, and air assault operations. (Fig. III.1 shows the three AAWS-M concepts.) It is intended to defeat tanks and other targets expected on the battlefield of the 1990s, and it will replace and offer significant improvements over the Dragon weapon system in the Army and Marine Corps inventories. The system consists of a container/launcher, a missile, and a reusable command/launch unit. The system was to employ one of three possible technologies—a laser beam rider, a fiber optic guidance missile, or an infrared imaging system. DOD officials informed us that, since the time of our review, the Army and Marine Corps have selected the imaging infrared fire and forget technology for AAWS-M development.

In July 1985, the Army approved the required operational capability document for the program. According to program officials, the program became joint with the Marine Corps in April 1986 at the direction of OSD. Subsequently, the Army and Marine Corps approved the program's joint services' operational requirement based on a threat analysis. Officials from the program office anticipate the Marine Corps and Army systems will have 100 percent commonality.

Figure III.1: The Three AAWS-M Concepts

Advanced Antitank Weapon System Medium
(DRAGON REPLACEMENT)



Source: AAWS-M Program Office.
[a]Imaging Infrared Technology was selected for AAWS-M Development.

Service Participants

AAWS-M is a multiservice research and development program. The Army is the lead service and the Marine Corps is the participating service.

The Marine Corps joined the program in April 1986, during the technology demonstration phase. In January 1987, a Marine Corps Deputy Project Officer was assigned to the AAWS-M project office. However, because of a reorganization of the Marine Corps acquisition system in April 1988, the deputy told us that he was reassigned as the Marine Corps Liaison Officer to the Missile Command. In this position, the officer acts as a liaison and oversees the Marine Corps' participation in several Missile Command programs, including the AAWS-M Program.

Schedule

At the time of our review, AAWS-M was in the technology demonstration phase. Specifically, it was in a 27-month technology demonstration phase to investigate the three possible technologies for the system. The program office planned to complete technology demonstration by December 1988 and to begin full-scale development in April 1989.

In April 1988, the AAWS-M contractors began tests that included warhead lethality assessments and force-on-force evaluations to estimate system effectiveness in an operational environment. The test program included 18 missile flights for each contractor to demonstrate performance in degraded environmental conditions. According to a program official, government testing included the force-on-force test, completed in June 1988; the portability tests, completed in April 1988; warhead testing, completed in August 1988; dirty battlefield testing (degraded environment), completed in February 1988; and the flight tests, completed in November 1988.

A program official told us that, of the tests completed, all contractors demonstrated the capability to fire from enclosures and that levels of noise, recoil, toxicity and debris were acceptable. The official also told us that (1) the portability test revealed little difference among the candidates, and all results were acceptable; (2) lethality tests revealed that two contractors met requirements, and the third would propose changes to meet requirements; and (3) countermeasures and dirty battlefield test results were positive. According to the official, all contractors were generally able to hit and kill the target in the presence of obscurant and suppression measures.

Deliveries

None of the contractors have delivered complete systems, but all have delivered R&D hardware items for testing and analysis. These deliveries include prototype command launch units, system mockups, prototype warheads, flight motors, launch motors, propellant samples, and motor strain evaluation cylinders. The R&D deliveries were scheduled between November 1987 and June 1988 and took place on schedule. No production deliveries have occurred to date.

Agreements

The joint services' operational requirement is the only signed joint agreement. The Army signed an MOA on March 20, 1988, and sent it to the Marine Corps for staffing. This MOA was intended to establish the relationships between the Army Program Executive Office and the Marine Corps Research and Development Command. On October 3, 1988, the Marine Corps requested some changes and furnished three options to the document. The Army revised the document and returned it to the Marine Corps. A project official expects the Marine Corps to finalize the document.

In June 1986, the Army and Marine Corps approved a joint test and evaluation master plan for the technology demonstration and validation phase. The test plan specified portability tests, force development test and evaluation (force-on-force), dirty battlefield tests, and system flight tests. The Army and the Marine Corps jointly planned the testing, and the Marine Corps was involved in every aspect of planning and executing the testing on a day-to-day basis, including providing a number of gunners for testing.

Costs

According to a program official, the estimated cost of specific contractor concepts and the actual range of estimated cost are competition sensitive. Therefore, only the highest cost concept is discussed here. The Army currently estimates the AAWS-M to cost about $5.5 billion—$535 million in R&D and $4.9 billion in procurement. Estimated acquisition cost has not changed significantly since April 1986 when DOD approved the technology demonstration. The current procurement unit cost estimate is $38.7 thousand for the missile and $38.5 thousand for the command and launch unit.

Recent Reports

Army Budget: Potential Reductions to the Research, Development, Test and Evaluation Budget (GAO/NSIAD-88-214, Sept. 1, 1988).

DOD Acquisition Programs: Status of Selected Systems (GAO/NSIAD-88-160, June 1988).

Antitank Weapons: Current and Future Capabilities (GAO/PEMD-87-22, Sept. 1987).

AMRAAM

The AMRAAM was designed to meet the Air Force's and Navy's medium range air-to-air missile requirements for the 1989-2005 timeframe. Congress approved the development of a new medium range air-to-air missile in the July 1976 DOD Appropriation Authorization Act of 1977. Subsequent to that, the Under Secretary of Defense for Research and Engineering directed the establishment of a joint Air Force/Navy program office to develop the missile.

The program's objective is to produce a missile that will provide a pilot with the capability to simultaneously engage several targets under all weather conditions and the maneuverability to avoid counterattack. (AMRAAM is shown in fig. III.2.)

Figure III.2: AMRAAM

Source: AMRAAM Program Office.

AMRAAM is to be a replacement for the services' medium range air-to-air missile, the Sparrow. It is expected to have better performance than the Sparrow and therefore, improve the combat effectiveness of the services' latest aircraft, such as the Air Force's F-15, F-16, and the Advanced Tactical Fighter (ATF), and the Navy's F-14 and F/A-18. It also is to have launch and maneuver capability, multiple target capability, higher speed, greater range, and better resistance to electronic countermeasures than the Sparrow. The missile is to be more reliable and maintainable than the Sparrow.

The program's joint services' operational requirements document, dated September 1976, was revised in April 1978 and subsequently approved by both services in September 1978. A joint tactical working group composed primarily of combat experienced Air Force, Navy, and Marine Corps air crew members under the direction of the Under Secretary of Defense for Research and Engineering, determined the operational requirements for the missile. An official from the program office told us that the Air Force and Navy missiles would have 100 percent commonality.

Service Participants

AMRAAM is a multiservice R&D program. The Air Force is the lead service, and the Navy is the participating service. Both have participated in the program since concept exploration.

Schedule

At the time of our review, AMRAAM was nearing the end of its full-scale development phase and initial production had begun. The program experienced substantial schedule slippages and cost growth during its development, and as a result, the Secretary of Defense approved a restructured program in 1985. The restructured program extended the missile development schedule from 54 to 79 months and delayed the IOC date from 1986 to 1989.

We reported in July 1988 (GAO/NSIAD-88-186) that, as a result of test delays and schedule changes, a number of uncertainties existed about AMRAAM's combat performance. Through April 1988, only 59 of the planned 89 live-fire missiles, about 66 percent, had been launched. Only 3 of the 59 test missiles had the full-capability configuration, and there had been no operational tests with the full-capability missiles. Although the tests had demonstrated many of the missile's critical performance requirements, many other technically difficult and operationally realistic tests had not been completed.

Before the May 1988 Defense Acquisition Board review, the Air Force Operational Test and Evaluation Center (the Air Force's independent test activity) described AMRAAM's combat effectiveness as "undetermined" because none of the planned operational tests with full-capability missiles had been conducted. The test activity also described the missile's reliability as "undetermined" because of delays in completing reliability tests and because of some recent reliability failures in the flight test program. We reported in July 1988 that if flight testing continued at the current rate, such tests would not be completed until May 1989.

In March 1989, a program official reported that the full-scale development flight test program was completed in January 1989 and that all previously identified reliability failures had been resolved with the exception of the ongoing wing redesign. DOD officials advised us that initial operational test and evaluation is scheduled to be completed by August 1989.

Despite test delays, OSD approved initial low-rate production of 180 interim design missiles in June 1987. In May 1988, the Defense Acquisition Board recommended that OSD approve the low-rate production of 400 full-capability missiles. In September 1988, the OSD Conventional Systems Committee agreed that AMRAAM be procured at the low-rate production quantity of 900 missiles in fiscal year 1989. The Defense Acquisition Board expects to consider a request for authority to begin full-rate production later in 1989.

Deliveries

Hughes Aircraft Company is the AMRAAM development contractor. However, Raytheon Company is also under contract to monitor Hughes' design effort and produce 15 missiles to qualify as an AMRAAM second-source producer. According to program officials, Hughes completed deliveries of developmental missiles in January 1989. DOD officials advised us that all of Raytheon's qualification missiles have been delivered and Raytheon was qualified as the second-source producer in February 1989.

Both contractors were awarded production quantities beginning in fiscal year 1987. Hughes is manufacturing 105 of the 180 missiles while Raytheon is manufacturing 75. The initial delivery of the missiles under the first production contracts with Hughes Aircraft Company began in September 1988. Raytheon began deliveries in February 1989. Deliveries of missiles from the second year's production contracts are scheduled to begin August 1989 from Hughes and October 1989 from Raytheon.

In total, the services plan to procure more than 24,000 missiles over an 11-year period, 3 years of low-rate and 8 years of full-rate production.

Agreements

The joint services' operational requirements document, which the Air Force and Navy approved, defined the operational need of the missile in terms of threat, problem, concept, and capability. Within these categories, 33 requirements were defined. They included higher speed, increased maneuverability, all aspect look-down shoot-down capability, and better resistance to electronic countermeasures.

The program management directive dated October 1976 directed the initiation of a joint Air Force/Navy development program for the AMRAAM. The joint program management charter, which has been updated periodically since November 1979, describes the responsibilities and authority of the Air Force program director.

The April 1988 program management plan, which the Air Force and Navy program managers signed, stipulates joint personnel levels, program funding estimates, and general management plans for the program. The test and evaluation master plan describes the test management relationships. The AMRAAM test plan outlines a large number of flight tests that increase in difficulty as the missile design matures.

Costs

As previously mentioned, the AMRAAM Program has experienced significant cost growth since its inception. In 1987, we reported (GAO/NSIAD-87-168) that the missiles estimated acquisition costs (both development and production) had increased in 1984 constant dollars from $3.4 billion for 20,000 missiles to $8.2 billion for 24,335 missiles. Our 1988 report (GAO/NSIAD-88-160) stated that program acquisition costs were $8.7 billion in 1984 dollars ($11.2 billion when inflation is considered) which included $1.2 billion for R&D and $7.5 billion for procurement of 24,320 missiles.

The December 1987 SAR, showed a decrease of about $400 million from the original $11.6 billion development cost estimate[1] to the $11.2 billion current estimate for total program acquisition costs. According to the SAR, this reduction was the net effect of a number of cost changes that included quantity and schedule changes.

[1] A development estimate reflects the estimates of operational/technical characteristics, schedule and program acquisition cost (by appropriation) developed at the time full-scale engineering development is initiated (milestone II).

Recent Reports

Missile Development: AMRAAM's Combat Effectiveness at Production Not Fully Tested (GAO/NSIAD-88-186, July 7, 1988).

DOD Acquisition Programs: Status of Selected Systems (GAO/NSIAD-88-160, June 30, 1988).

Missile Development: Development Status of the Advanced Medium Range Air-to-Air Missile (GAO/NSIAD-87-168, Aug. 14, 1987).

Missile Procurement: Advanced Medium Range Air-to-Air Missile Preproduction Test Results (GAO/NSIAD-87-165FS, June 2, 1987).

Aircraft Procurement: Status and Cost of Air Force Fighter Procurement (GAO/NSIAD-87-121, Apr. 14, 1987).

DOD Acquisitions Programs: Status of Selected Systems (GAO/NSIAD-87-128, Apr. 2, 1987).

Missile Procurement: AMRAAM Cost Growth and Schedule Delays (GAO/NSIAD-87-78, Mar. 10, 1987).

Aircraft Procurement: Air Force Air Defense Fighter Competition (GAO/NSIAD-86-170BR, July 22, 1986).

Missile Development: Advanced Medium Range Air-to-Air Missile (AMRAAM) Certification Issues (GAO/NSIAD-86-124BR, July 9, 1986).

Technical Risk Assessment: The Status of Current DOD Efforts (GAO/PEMD-86-5, Apr. 3, 1986).

Missile Development: Advanced Medium Range Air-to-Air Missile Legal Views and Program Status (GAO/NSIAD-86-88BR, Mar. 28, 1986).

Missile Development: Status of Advanced Medium Range Air-to-Air Missile (AMRAAM) Certification (GAO/NSIAD-86-66BR, Feb. 18, 1986).

ATARS/UARS

The ATARS/UARS is an umbrella program that will enable advanced electro-optical sensor suite to be carried on both manned aircraft and unmanned air systems.

The ATARS portion of the program is designed to meet the needs of tactical commanders for detection, location, and classification of tactical targets with sufficient accuracy to permit the timely delivery of air or ground launched weapons. ATARS focuses on full-scale development of a common family of electro-optical/infrared sensor suites (replacements for existing film based reconnaissance systems) data-linked sets, recorders, and reconnaissance management systems for upgrade of Air Force and Navy manned and unmanned reconnaissance systems. The sensor suites will be integrated into a mix of tactical reconnaissance platforms.

The UARS portion of the program consists of an electro-optical sensor, either a visible light sensor or an infrared sensor suite, integrated by the Air Force into an unmanned air reconnaissance vehicle. The vehicle is being developed by the Navy under the mid-range remotely piloted vehicle program.

The services entered into the cooperative program to jointly manage nonlethal unmanned aerial vehicle activities under the control of OSD. These cooperative activities include requirements reconciliation, acquisition strategy, and a management structure that will maximize the commonality of equipment. The services plan to produce a joint statement of requirements by mid-fiscal year 1989.

In conjunction with ATARS/UARS, the ground stations developed under the joint services imagery processing system will have commonality to the Air Force, Navy, and Marine Corps manned and unmanned systems.

Service participants' requirements were incorporated into the request for proposal/contracts for the ATARS/UARS Program. Each service will procure ATARS sensors and UARS vehicles through the other service's program.

Service Participants

ATARS/UARS is a cooperative development program with the Air Force as the lead service for developing the ATARS electro-optical sensors and ground stations. The Navy is the lead service for the medium-range unmanned air reconnaissance vehicle development. Commonality is not applicable since this is a cooperative development. The Navy and the Marine Corps joined the program during the demonstration and validation phase in 1985.

Schedule

ATARS/UARS is currently in full-scale development. The program is on schedule. Development test and evaluation is scheduled to begin by

October 1990, and initial operational test and evaluation is scheduled to begin in 1991. The system's IOC date is classified.

Deliveries

According to DOD officials, although procurement funds are contained in the joint Unmanned Aerial Vehicle Program, specific delivery dates and quantities have not yet been determined.

Agreements

MOAS for this program include a Naval Air Systems Command and Air Force Systems Command agreement, dated August 1987, outlining the ATARS/UARS cooperative developments and a March 1985 agreement between the Navy and the Air Force on tactical reconnaissance development activity.

Costs

Air Force R&D costs are $167.7 million for ATARS and $24.5 million for UARS. Procurement costs are $684.2 million for ATARS and $680 million for UARS. The total program cost for ATARS/UARS is $1.6 billion.

ADI

ADI, the North American Strategic Air Defense System, complements SDI and is intended to serve two purposes. It will address future low observable air breathing threats and quiet cruise-missile capable submarine threats to North America by providing assured surveillance and tactical warfare antiaircraft capabilities. It also will provide options for increased air defense if the strategic ballistic missile threat is reduced either by treaty or by deployment of some form of strategic missile defense.

In serving these purposes, ADI includes the development of undersea, space-based, airborne and ground-based surveillance systems, and battle management/command, control, communications, and engagement technologies for an advanced air defense system.

The ADI concept began in a 1981 Air Defense Master Plan. The ADI Program was first funded in 1987 in response to a 1985 presidential directive for a separate technological program to address the growing strategic air threat. According to a program official, OSD subsequently established ADI as a multiservice program because of broad operational requirements and mission areas encompassed by strategic air defenses versus advanced air breathing threats, including sea-launched cruise missiles. An additional objective is to leverage ADI technology investment within the entire spectrum of service, DARPA, and SDI Organization (SDIO) Programs. The ADI Program will achieve this leverage by augmenting technology programs that contribute to air defense needs and by avoiding duplicate efforts through close service and agency coordination.

ADI is a cooperative R&D program currently in the concept exploration phase. Because this is a cooperative technology development program, commonality is not applicable. According to a program official, joint operational requirements for the program are currently being developed.

Service Participants

The Air Force is the coordinating service for the ADI Program. The Navy and DARPA joined this program at the concept exploration phase. The Office of the Under Secretary of Defense for Acquisition, primarily the Deputy Director, Defense Research and Engineering for Strategic and Theater Nuclear Forces, is the cognizant OSD office for ADI. The Strategic Defense Panel within the Strategic Systems Committee provides OSD oversight and guidance of ADI activities planned and executed by the services and agencies. The Inter-Agency ADI Steering Committee was replaced by a working group of the Strategic Defense Panel. The working group meets quarterly, is chaired by OSD, and has membership similar to the Steering Committee. JCS may be called upon to review/validate ADI operational requirements that cannot be handled under service practices and procedures.

DARPA is conducting R&D on advanced technologies related to strategic air defense. The Navy, which joined ADI in fiscal year 1988, has research efforts that focus on active and passive acoustics for undersea surveillance.

Schedule

ADI is conducting technology development, including overall concepts, architectures, and requirements for strategic air defense. According to DOD officials, no formal milestone decision has been made; however, the decision to enter demonstration and validation is scheduled to be made in early 1990 with a "system of systems" milestone decision. Selected demonstration and validation is expected to be conducted between 1991 and 1994. Full-scale development is scheduled between fiscal years 1993 and 1995; at that time, the initial systems and technologies selected for full-scale development will be shifted to service management.

Deliveries

According to program officials, planned or actual deliveries are not yet applicable.

Agreements

The Inter-Agency ADI Steering Committee charter, dated August 1987, defines committee roles, responsibilities, and procedures for coordinating and integrating the ADI technology. The ADI Program charter is classified. The United States also has signed an air defense modernization MOA with Canada, which mentions the ADI Program. The ADI management plan, dated September 1987, outlines program objectives, interagency cooperation, and management and budget structure.

Costs

There are no projects within ADI that are jointly funded or developed. Each service is allocated funds from an OSD program element and is responsible for managing assigned portions of the total ADI effort. For example, the Air Force is conducting research in system integration, surveillance, C3I, and engagement projects, while the Navy is researching system integration, undersea surveillance, and anti-air warfare/engagement.

According to a program official, as of December 1987, the R&D development estimate was $2.8 billion. However, due to refinement of the technologies to be developed and fiscal constraints, the current estimate was $1.9 billion.

Recent Reports

Air Defense Initiative: Program Cost and Schedule Not Yet Determined (GAO/NSIAD-89-2FS, Oct. 28, 1988).

ASPJ

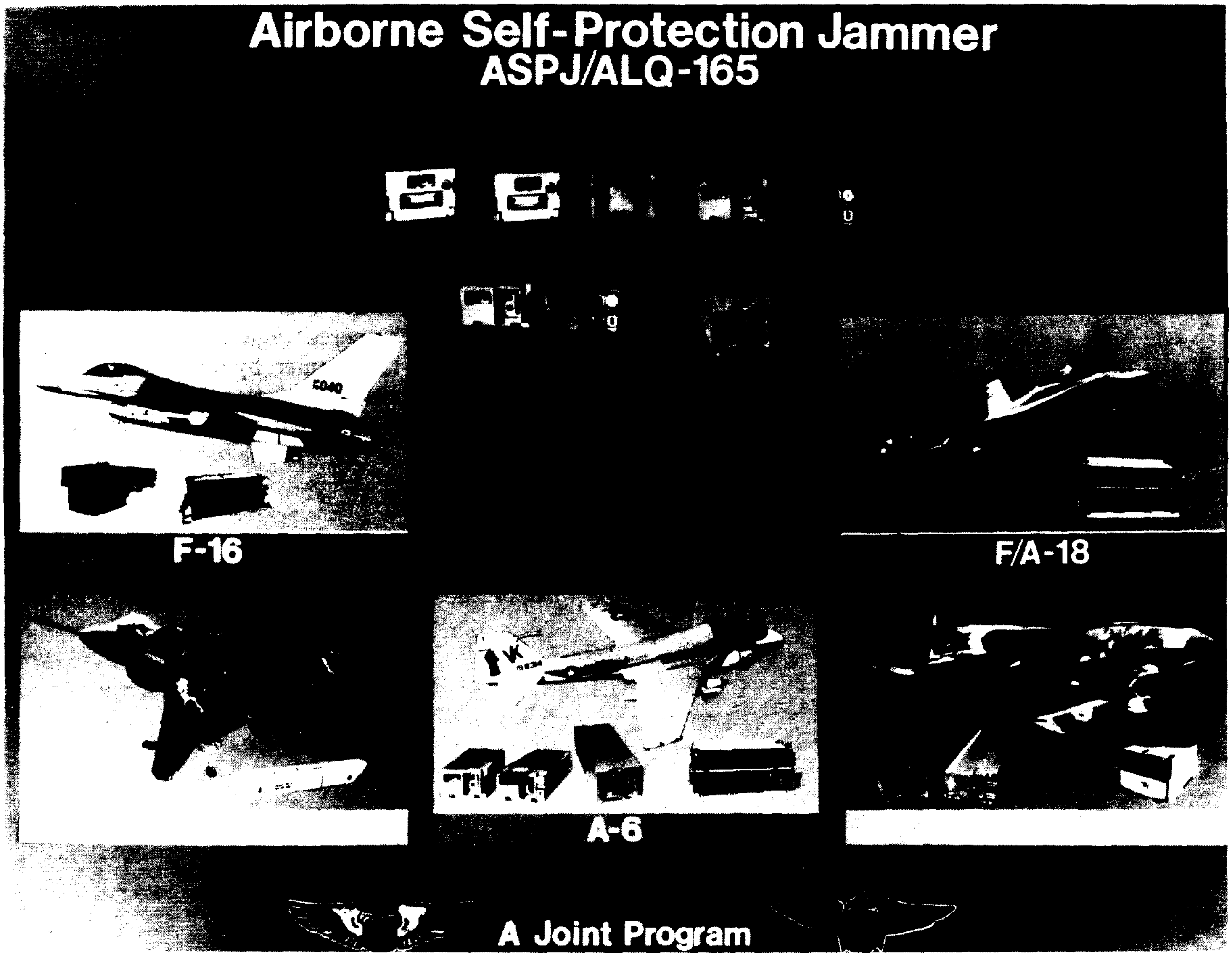
Under the ASPJ Program, electronic countermeasures systems will be developed to provide tactical aircraft self-protection against terminal threat weapons through the remainder of the century. The ASPJ system incorporates jamming, radar warning receiving, with both the Navy ALR-67A and the Air Force ALR-56M and other electronic warfare functions, and consists of two receivers, a data processor, and low and high band transmitter units. ASPJ will be integrated with other electronic warfare systems.

The program was started in 1969 as a traveling wave tube component that amplifies and transmits radio frequencies. In 1976, DOD's Director of Defense Research and Engineering directed that this effort be combined with the Air Force's lightweight, low-cost countermeasure program to form what is currently known as the ASPJ Program.

Joint operational requirements and threshold parameters for the program are reflected in the December 1979 joint decision coordinating paper. The decision coordinating paper for ASPJ is revised approximately every year.

The system, which has 100 percent commonality for Navy and Air Force aircraft, will be installed in the F/A-18, F-14, F-16, and possibly the A-6 aircraft, and in a pod on the AV-8B aircraft. (Fig. III.3 shows the ASPJ electronic countermeasures device.) The percentages of Navy and Air Force aircraft that will be fitted with the jammer, by informal agreement, are 66 percent of the Navy's frontline operational aircraft (i.e. carriers and readiness squadrons) and 90 percent of the Air Force's F-16 quantity buy.

Figure III.3: The ASPJ Electronic Countermeasures Device



Source: ASPJ Program Office.

Service Participants

ASPJ is a multiservice R&D program. The Navy is the lead service, and the Air Force joined the program in 1979 during the demonstration and validation phase, at the direction of OSD.

Schedule

Production of the ASPJ system was supposed to start in 1985 but fell 3-1/2 years behind schedule. The slippage was due to technical problems involving miniaturization, thermal redesign, modifications for increased capability, hybrid circuit redesign, hardware and software integration, and reliability of power supplies.

At the time of our review, the ASPJ Program had nearly completed full-scale development and production verification was beginning. In December 1986, OSD approved the ASPJ acquisition to include a production verification phase. This phase provided for the acquisition of 6 units with an option for 14 additional units contingent upon test results and a joint service review. The units procured under the production verification and full-scale development phases will support a program of joint testing and evaluation.

Environmental qualification testing, consisting of temperature, altitude, vibration, shock, and thermal overload testing, was completed and ASPJ performance in a dense environment was validated in October 1987. Development testing was completed in June 1988, and operational testing began at that time. Limited production is scheduled to begin in May 1989 pending successful test results. The IOC date is classified.

Deliveries

Sixteen system deliveries were originally planned under R&D; however, only 12 were delivered and fielded. Twenty deliveries have been planned for the production verification phase and are scheduled to begin in fiscal year 1989. No quantities have been ordered yet under the procurement phase, but current estimates are for 1,834 units. ASPJ procurements will be tied to aircraft procurements and, therefore, will fluctuate from year to year.

Agreements

In 1981 the Navy and the Air Force signed a joint program charter that discusses program organization and direction, service responsibilities, and shared development funding commitments. Joint operational requirements are reflected in the decision coordinating paper, which shows mission requirements and threshold parameters.

The Air Force and the Navy signed an engineering development MOA in 1978 which outlined joint responsibilities, billets, and funding agreements during phase one of the ASPJ engineering development phase. This MOA provides for joint Navy and Air Force funding of engineering development phase one and joint provisioning of assets. The Navy and the Air

Force signed a full-scale development MOA in 1982 that defines program responsibilities and management relationships. At the time of our review, a similar production agreement was in draft.

Costs

The Navy and the Air Force have funded R&D costs for the system. As of the December 1987 SAR, the development estimate for R&D was $236.4 million while the current R&D estimates had increased to $571.7 million due to revised escalation rates, re-assessment of program improvement requirements, addition of Air Force R&D funds and changes directed by the Joint Requirements and Management Board. No development estimates for procurement were available, but according to program officials, the total current estimate for ASPJ was about $5.5 billion.

Recent Reports

DOD Acquisition Programs: Status of Selected Systems (GAO/NSIAD-88-160, June 30, 1988).

Technical Risk Assessment: The Status of Current DOD Efforts (PEMD-86-5, Apr. 3, 1986).

CIS

The CIS program office is responsible for managing development of aircraft identification friend or foe (IFF) systems. The CIS program office is primarily responsible for developing the MARK XV IFF, the United States version of a NATO interoperable replacement for the outdated MARK X/XII IFF systems. OSD initiated the MARK XV system to improve combat identification capability by providing high confidence, line-of-sight friendly identification of aircraft and ships. The MARK XV is also intended to improve battle management and allow best use of weapons at maximum range.

OSD established the CIS program office in 1980 to direct, coordinate, and oversee the tri-service efforts and to develop improved combat identification capabilities. The joint operational requirements dated July 1984, when the program was in the demonstration and validation phase, specified form, fit, and function to be compatible with MARK XII; and interoperability with NATO and other allies. The requirements also specified the size, power, cooling and weight of airborne equipment. Current requirements call for 95 percent commonality at shop replacement unit level.

Service Participants

The Air Force is the lead service for this multiservice R&D program. The Army and the Navy joined the program in 1980 in the concept exploration phase. Two agreements regarding the program were signed among NATO countries in 1987 in the demonstration and validation phase.

In August 1986, we reported (GAO/NSIAD-86-181) that the services had not supported the joint program office, thereby limiting the scope of its efforts. We recommended that OSD elevate the CIS Program to a higher level of authority to ensure that friendly identification requirements are adequately considered in major weapon system acquisition programs and to ensure that the program office has the authority to obtain the personnel needed to accomplish the program objective. DOD agreed with the need to reexamine the CIS program office's organization placement and also agreed that service support had been inadequate. In response to our recommendations, DOD formed a high-level joint management team with a March 1987 MOA. A steering committee was also formed and set out to review overlap. An April 1987 OSD letter stated that these actions were completed.

Schedule

The MARK XV IFF Program began in June 1980. Demonstration and validation flight testing occurred in 1988. At the time of our review, the program was making the transition to the full-scale development phase. Full-scale development slipped 6 months from June to December 1988 because of late delivery of demonstration and validation hardware. In addition, the Air Force restricted the request for proposal release until the program funding issue was resolved and the requirements review was accomplished. Full-scale development is scheduled to continue through fiscal year 1994, at which time production is scheduled to begin.

Deliveries

No deliveries have been scheduled to date.

Agreements

A tri-service charter dated September 1980 established the mission, authority, and responsibility for management and administration of resources and projects, such as the MARK XV identification subsystem which constitutes the overall United States Question and Answer Identification System program. MOAs for this program include (1) an agreement between the CIS program office and the National Security Agency (NSA), dated November 1984, which outlined the responsibilities and interfaces required to complete MARK XV development and production and (2) an agreement between the CIS program office and the Air Force program office responsible for the MARK XII dated December 1983, which defined the roles of the program offices and identified areas where reciprocal actions are required. In addition, the Air Force, Army, and Navy signed an MOA in February 1985 documenting responsibilities and establishing policies for management and administration of CIS programs.

The Air Force, Army, and Navy approved the MARK XV IFF system program management plan in June 1986. This plan provides the program's objectives, acquisition and development strategies, schedule, and technical performance specifications. The Air Force issued the program management directive in April 1987. This directive reflects the approved program funding levels. The Air Force, Army, and Navy signed a joint test and evaluation master plan that describes the required operational and technical characteristics for the system.

Costs

Only R&D cost data were available at the time of our review. Production values will be determined after the December 1988 Defense Acquisition Board review. The development cost estimate for R&D has decreased from $1.7 billion to $1.3 billion as a result of revised economic escalation indexes and the schedule being extended 2 years, to fiscal year 1995.

Recent Reports

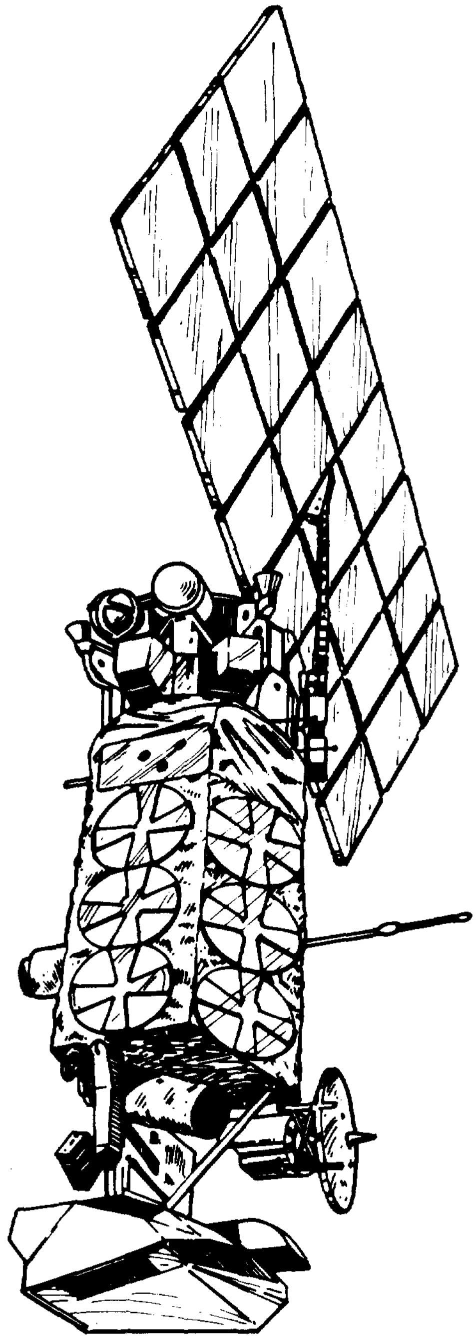
Aircraft Identification: Improved Aircraft Identification Capabilities: A Critical Need (GAO/NSIAD-86-181, Aug. 11, 1986).

DMSP

DMSP provides visible and infrared cloud cover data and other meteorological, oceanographic, and solar-geophysical information to support DOD's strategic and tactical missions worldwide. (The satellite is shown in fig. III.4.) DMSP's mission is to collect and disseminate such data through all levels of conflict consistent with the survivability of the supported forces. Data also are provided to the civilian community through the National Oceanic and Atmospheric Administration.

Joint services' operational requirements for DMSP are included in a memorandum the JCS issued in August 1986 concerning military requirements for defense environmental satellites. The DMSP satellites are 100 percent common to service participants.

Figure III.4: DMSP



Source: DMSP office.

Service Participants

The Air Force is the lead service for DMSP. OSD initiated the joint program in March 1969 when it approved joint development of a data receiving terminal that could be installed on Navy ships. According to program officials, all service participants joined the program in the production phase. A 1976 MOA contains provisions for Army participation but, according to program officials, the Army is not currently active in the program; however, the Army may join under development of the next generation of DMSP systems. NSA is also participating in the program, but data is not available to show the exact date that NSA joined.

DMSP is a cooperative development program comprised of Air Force, Army, and Navy segments. The Air Force segment is made up of spacecraft, sensors, boosters, launch and command and control facilities, and data receiving, handling, processing, relay and display facilities. The Army segment, if required to fulfill Army responsibilities as defined in the joint Army-Air Force meteorological support regulation, would consist of ground data receiving, processing, and display facilities. The Navy segment, including the Marine Corps, consists of shipboard and land-based direct data handling, relay, and display facilities. Each service is to manage the acquisition, operation, training, and support of its segment and provide focal points for coordinating program matters within its own service.

Schedule

DMSP satellites were developed in blocks that are generations or evolutionary groupings of satellites. Block 5D satellites have been in the production phase since 1972. Block 5A through 5D-2 systems have been completed. The program is currently producing satellites under the block 5D-2 Improved/5D-3 system. Block 6 satellites are currently in the concept exploration phase and are planned to go into full-scale development in 1994.

Deliveries

According to Navy officials, all block 5A through 5D-2 satellites have been delivered. The first 5D-2 improved satellite has been delivered and the next three are scheduled for delivery in fiscal years 1989-90. The prototype 5D-3 satellite is planned for delivery in fiscal year 1990 and the five production 5D-3 satellites are planned for delivery in fiscal years 1994-98. A block 6 prototype is planned for delivery in fiscal year 2002.

Agreements

In July 1965, DMSP was an Air Force operational program. In March 1969, DOD approved a joint service development effort for this program. An April 1973 MOA established management policies and responsibilities for the Army, Navy, and Air Force. DOD's Director, Defense Research and Engineering, updated and approved this MOA in December 1976.

According to program officials, the Navy and the Air Force signed an MOA in 1979 concerning joint development and procurement of a passive multifrequency microwave imager to be launched on DMSP satellites. While core portions of DMSP are funded through the Air Force, the lead service, funding for the imager is provided by both the Air Force and the Navy.

In 1985, the Navy, Air Force, NASA, and the National Oceanic and Atmospheric Administration signed an MOA to develop and launch a Navy remote ocean sensing system via DMSP.[2] According to program officials, the Secretary of the Navy canceled plans for the Navy remote ocean sensing system in 1987 due to budget constraints, but not before the Navy had already bought one microwave imager to be launched on the Navy remote ocean sensing system satellite. This imager has been transferred to the Air Force for use on DMSP.

Costs

As of December 1987, the R&D estimate was $523 million, and the total program cost was about $1.9 billion for current blocks 5D-2 improved/5D-3, under which satellites 11 to 20 will be developed and produced. Cost information for older DMSP satellites is not available.

Recent Reports

Procurement: Assessment of DOD's Multiyear Contract Candidates (GAO/NSIAD-88-233BR, Sept. 1, 1988).

Procurement: Assessment of DOD's Multiyear Contract Candidates (GAO/NSIAD-87-202BR, Aug. 31, 1987).

Weather Satellites: Economies Available by Converging Government Meteorological Satellites (GAO/NSIAD-87-107, Apr. 23, 1987).

Weather Satellites: User Views on the Consequences of Eliminating a Civilian Polar Orbiter (GAO/RCED-86-111, Mar. 7, 1986).

[2]The purpose of the Navy remote ocean sensing system was to acquire global ocean data for military and civilian operations and research.

DSCS

DSCS provides DOD and other users with unique and vital communications service over long distances not supportable by other communications means. (See a typical DSCS operation in fig. III.5.) The DSCS Program started in 1963-64. DSCS is a cooperative development program comprised of space, ground, and control segments.

The space segment is a constellation of satellites that receive signals from earth terminals and rebroadcast them back to earth stations at a different frequency. Under this segment, the first terminal was deployed, and the first satellite was launched in 1965-66. Since then, DSCS has gone through three evolutionary phases or generations. Satellites under DSCS I were low altitude, non-geostationary, and had low capacity. Satellites under DSCS II were high altitude, geostationary, and had medium capacity. Satellites under the current DSCS III phase are geostationary and have the largest capacity ever achieved.

The ground segment is comprised of earth terminals that send signals to and receive them from the satellites. The latest version of such terminals is the AN/GSC-52, which has a computer display that leads the operator through a series of diagnostic functions to determine where terminal problems are occurring. This display minimizes operator training, improves efficiency and reduces terminal down time. The terminal will eventually be capable of operating in a remote or unmanned state, but this has not yet been achieved.

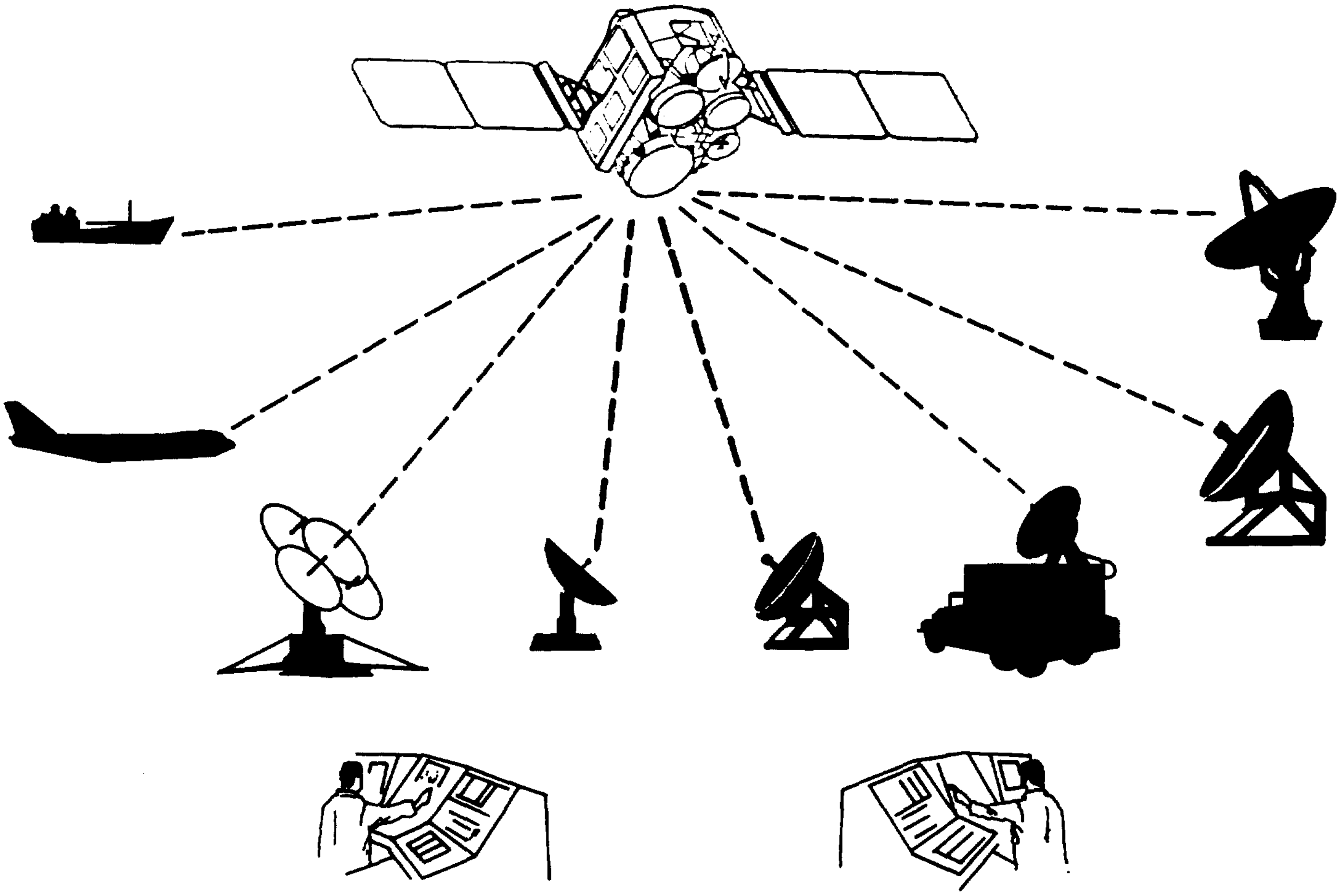
The DSCS Operations Control Segment (DOCS) maximizes the utility of communications resources under all operating conditions, and minimizes the adverse effects of equipment failure, weather, and hostile threats. It is comprised of several subsystems.

- The DSCS Operations Support System (DOSS) provides network planning and performance predictions.
- The DSCS Automatic Spectrum Analyzer (DASA) monitors the satellite downlink spectrum and compares the results with DOSS predictions.
- The DSCS Frequency Division Multiple Access Control System automates control of a large communications network.
- The DSCS Electronic Counter-Countermeasure Control System automates control of the smaller but more critical jamming protected communications network.
- The Smart Multi-Circuit Terminal handles all coordinating communications between the control centers and the earth terminals.

- The Satellite Configuration Control Element receives satellite telemetry, issues satellite payload control commands, and performs jammer locating calculations.

The DOSS/DASA subsystems are necessary to remove the satellite communications networks from manual control to a semi-automated system that will support the growing communications requirements. According to program officials, upgrades have been developed to allow DOSS/DASA to interface with more DOCS subsystems and act as the DOCS central computer.

Figure III.5: Typical DSCS Operation



Space and Missile Systems Organization Satellite Control Facility[a]

Defense Communications Agency Satellite Configuration Control Element[b]

[a]Ground control complex at Sunnyvale, Cal., monitors and controls the housekeeping of the DSCS III spacecraft via its Remote Tracking Station Network. It also provides backup Communication Configuration Control functions.

[b]Satellite control element provides in-band command and control of the payload configurations to meet worldwide user requirements. They also display selected payload and telemetry data.

Source: DCA.

Service Participants

DSCS has been a joint program since it began concept exploration in 1963-64. OSD mandated the joint participation. JCS determines the use, location, and application of all assets and validates system requirements.

DCA is the DSCS program manager, providing systems engineering, technical support, and operational management. The Army, Air Force, and Navy operate and maintain strategic terminals assigned by JCS.

All three services use DSCS communication services and execute parts of the program. In accordance with an OSD mandate issued in 1975 in the DSCS II phase, the Air Force is executive agent for the space subsystem. The Army is executive agent for the ground subsystem to include tri-service operation and maintenance training, and life-cycle logistics support. The Navy develops and purchases unique shipborne terminals. Each service provides military construction and operations and maintenance support for assigned terminals.

The overall DSCS Program is a joint program, although each individual acquisition is done by a single service. Commonality among service participants is not applicable to DSCS.

Schedule

The current acquisition of satellites under the space segment began in 1984, and they achieved IOC in 1985. This segment is currently in the production and deployment phase and is expected to end in 1996 with the launch of the last DSCS III B satellite on a new multiple launch vehicle.

Acquisition of the AN/GSC-52 ground terminals under the DSCS ground segment began in 1982. The AN/GSC-52 was a non-developmental item. Production of the AN/GSC-52 was 12 months behind schedule due to the longer than expected lead times for terminal components. IOC had slipped by 16 months and deployments were delayed as a result of the slippages in the production schedule, problems with the availability of spare parts and technical manuals, construction funding, and host nation approvals. However, in March 1989 DOD officials advised us that AN/GSC-52 production had been completed.

Purchases of DOSS/DASA systems under the control segment began in 1979. The control systems achieved IOC in 1982. The control segment is now in the production and deployment phase, with deployment expected to end in 1992. Operations under this segment are expected to continue into the late 1990s and potentially into the 21st century along with DSCS III and follow-on satellites.

The latest procurement action for the control segment was threatened with cancellation due to lack of Army funding; and as a result, the DOSS production effort was reduced. Six DOSSes, 14 DASAS, and 5 DOSS remote terminals are still required for 2 active DSCS operations centers and the support locations. The number of DOSSes has already been reduced to three, with six DASAS and two DOSS remotes.

According to the program office, all DSCS testing has been on schedule. Joint operational testing is conducted each time that a satellite or ground terminal is ready for deployment. Testing on the design of the DOSS/DASA under the control segment is complete.

Deliveries

The space segment is currently procuring the last 7 of 14 satellites. A total of 39 AN/GSC-52 ground terminals have been procured and delivered to the government. Plans have been made to procure 12 DOSS/DASA units under the control segment, but only the first 6 have been bought and fielded due to reduced levels of Army funding.

Agreements

The current DSCS program charter, dated 1985, identifies DCA as the program manager. The DSCS management engineering plan, dated April 1986, established DSCS management relationships and provided guidelines for program functions essential to system acquisition and implementation. The DSCS Program plan provides an annual update of DSCS communications and control requirements. A joint transfer agreement lays out responsibilities for equipment transfer between services. These documents form the basis of agreements between the services and DCA for the DSCS Program.

The Air Force Space Division governs testing of satellites under the space segment with the DSCS III orbit test plan. There are two plans for testing ground terminals under the ground segment: (1) procedures for testing at the contractor's facility dated June 1985 and (2) the medium satellite communications terminal AN/GSC-52 acceptance test plan dated October 1986 and revised June 1988. According to program officials, testing on the design of DOSS/DASA systems under the control segment is complete.

Costs

Development estimates for the space, ground, and control segments are not available. For the last seven DSCS III satellites under the space segment, the cost is $528.6 million using fiscal years 1984 through 1988 funds. The 39 AN/GSC-52 ground terminals procured under the DSCS III ground segment were non-developmental items requiring no R&D funds.

Their current acquisition cost is estimated at $254 million. For DOSS/DASA systems under the DSCS III control segment, the total cost is $24.7 million: $8.4 million for the development and procurement of two systems, and $16.3 million for the procurement of the remaining four. Based on these figures, the total expenditures for the purchase of DSCS III equipment under the current acquisition is $807.3 million.

Hellfire Missile System

Hellfire is a laser guided, air-to-ground missile system designed to defeat heavy armored vehicles and minimize exposure of delivery vehicles to enemy fire. Hellfire can be employed in a variety of modes, including autonomous, ground or airborne remote, or direct or indirect fire. It is also a candidate for a surface-to-surface role to satisfy the close combat anti-armor mission need.

According to program officials, the modified Navy/Marine Corps version of the Hellfire includes a safe arm device for shipboard operations. With the exception of the safe arm device, the commonality between the Army and Navy/Marine Corps versions is about 95 percent. (The Hellfire is shown being fired in fig. III.6.) The Hellfire Missile is to be employed with the Army's AH-64 Apache attack helicopter and the Navy/Marine Corps' AH-1 helicopter.

Figure III.6: The Hellfire Missile Being Fired

Source: Hellfire Program Office.

The Army, Navy, and Marine Corps approved a June 1977 joint services' operational requirements document during full-scale development. The Air Force also approved the document in January 1978. This document specifies common performance requirements, including providing accurate fire on acquired targets, which have been designated by ground or aerial observers and launch aircraft crew members. In 1978, the Air Force agreed to monitor the program.

Service Participants

Hellfire began as a multiservice R&D effort in 1977 when it was in full-scale development. Data at the Hellfire program office does not show what organization initiated the joint effort. The Army is the lead service for the Hellfire with the Navy and the Marine Corps as participants. The Air Force monitored the development of the missile for use on the A-10, but—according to the project office— the Air Force subsequently determined that the missile did not meet its needs. The Army is responsible for developing and producing the missile, launcher, and container; providing depot logistics support for the missile and launcher; and procuring common spare parts.

The Navy has primary responsibility for Navy/Marine Corps applications of the Hellfire. The Navy has responsibility for development, production, and deployment of the necessary electronic controls and displays required to launch the missile from Marine Corps helicopters; conducting Marine Corps system testing and deployment; providing all logistics support not provided by the Army; and participating in periodic program progress and design reviews. The Navy is also responsible for funding all Navy/Marine Corps service-unique requirements and support by furnishing a military interdepartmental purchase request to the Hellfire project office.

Schedule

Operational testing was completed, and DOD approved the Hellfire for production in November 1981. Production began in 1982 and the system achieved IOC for the Apache helicopter in 1986.

Deliveries

As of December 1987, the total estimated procurement quantity was 48,925 missiles. All 229 missiles scheduled for delivery under R&D and 8,587 of the 9,534 missiles scheduled for delivery under procurement had been delivered.

Agreements

In late 1985, the Army and the Navy signed an MOA which specified planned efforts to satisfy joint service operational requirements, and provided a coordination plan between the Army and the Navy. The January 1986 Project Manager Charter for Hellfire, which superceded the 1984 charter, specified that the Army project manager would provide centralized life-cycle management for all Hellfire Missile subsystems related to guidance, control, and effectiveness.

Costs

As of December 1987, the development cost estimate for the total Hellfire Program was $0.7 billion. The current estimate for the program was about $2.4 billion. Of this, $0.3 billion was for R&D and $2.1 billion was for procurement. The Army attributed the cost increases to an addition of 24,096 missiles; revised escalation indexes; schedule slippages; revised production cost estimates; program improvements; and engineering changes. These engineering changes included incorporating a minimum smoke motor and changes to the warhead and seeker. Program acquisition unit costs increased from a development estimate of $0.03 million to a current estimate of $0.05 million.

Recent Reports

Defense Budget: Potential Reductions to Missile Procurement Budgets (GAO/NSIAD-87-206BR, Sept. 10, 1987).

Potential Dollar Reductions to DOD's FY 1986 Missile and the Lightweight Multipurpose Weapon Procurement Programs (GAO/NSIAD-85-138, Sept. 9, 1985).

Assessing Production Capabilities and Constraints in the Defense Industrial Base (GAO/PEMD-85-3, Apr. 4, 1985).

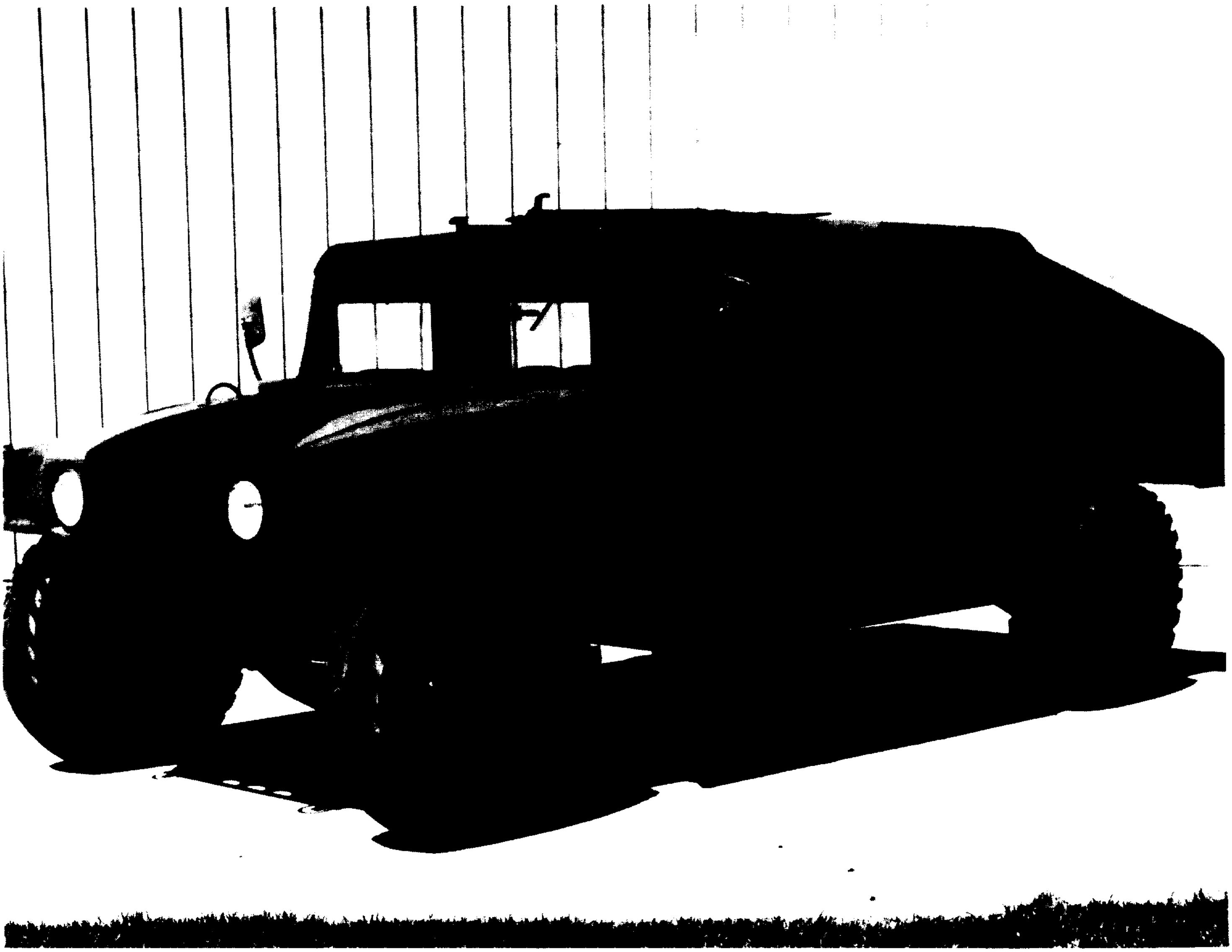
HMMWV

HMMWV is a 1-1/4 ton diesel powered light vehicle that can be configured for a variety of roles ranging from a general purpose utility vehicle to a weapons carrier or ambulance. (The HMMWV is shown in fig. III.7.) It will replace a portion of the family of tactical vehicles used by the Army, Air Force, and Marine Corps. The vehicles being replaced range in size from 1/4 to 1-1/4 tons and include the M151 and M247 utility trucks, the M880 and M561 cargo trucks, and the M792 ambulance.

The joint service program evolved from a 1969-76 Army effort to develop a high mobility weapon carrier and a 1976-79 Marine Corps program to develop a common-chassis vehicle for use in a variety of roles. According to a program official, the vehicle has 95 percent commonality based on parts.

The March 1987 acquisition plan for HMMWV reflects a competitive multiyear acquisition for fiscal years 1988 through 1992. The basic models included in the plan are categorized as either group I vehicles (utility cargo, armament, and TOW missile carriers), or group II vehicles (shelter carriers and ambulances).

Figure III.7: The HMMWV



Source: HMMWV Program Office.

Service Participants

The HMMWV joint program began as a multiservice R&D program with the Army as lead service and the Marine Corps, Air Force, and Navy participating. A program official told us that participants joined this OSD mandated program in 1980. This was during the demonstration and validation phase.

A weapons system manager is assigned to the program to ensure that the operational and support requirements of the participating services are met. For example, according to program officials, the Marine Corps needs vehicles that contain ballistic armor protection and have deep water fording capability that are not included on the other services' vehicles.

Schedule

According to an Army official, HMMWV is currently in the production and deployment phase, and was expected to continue in this phase through the year 2000; however, they now estimate that this phase will continue only through 1994.

In December 1984, initial production testing of group I vehicles was completed. In April 1986, we reported that the vehicle tests showed improvements over prototype tests but that important performance and reliability problems persisted (GAO/NSIAD-86-79). In August 1987 (GAO/NSIAD-87-202BR), we reported that Army officials indicated that most of the problems previously mentioned were corrected. At that time, over 27,000 group I vehicles had been accepted and fielded under a conditional release (full release pending resolution of the remaining problems). As of February 28, 1989, about 3,700 group II vehicles had been fielded.

Deliveries

According to a program official, planned and actual deliveries for R&D were 33 HMMWVs, and as of December 1987, planned procurement quantities under contract totaled 63,531, of which 46,453 vehicles had been delivered. As of January 31, 1989, quantities delivered to all services totaled 57,143.

Agreements

An MOA approved by the Army in November 1981 and the Air Force and the Marine Corps in January 1982 formalized the program structure and outlined certain staff procedures necessary for execution of the HMMWV development program. It also provided that joint service participation be integrated into the Army management and review structure.

Costs

Development estimates for R&D were $11.3 million. A program official told us that, as of December 1987, the R&D estimate, including testing costs, was $19.8 million. Unit production cost estimates were $20 thousand to $27 thousand depending on the model. A program official stated that the unit cost estimate for the ambulance has increased by over $13 thousand, from $27 thousand to $40 thousand, due to the complexity of the vehicle. According to the same official, program costs, as of December 1987, are about $2.3 billion through fiscal year 1993.

Recent Reports

Procurement: Assessment of DOD's Multiyear Contract Candidates (GAO/NSIAD-87-202BR, Aug. 31, 1987).

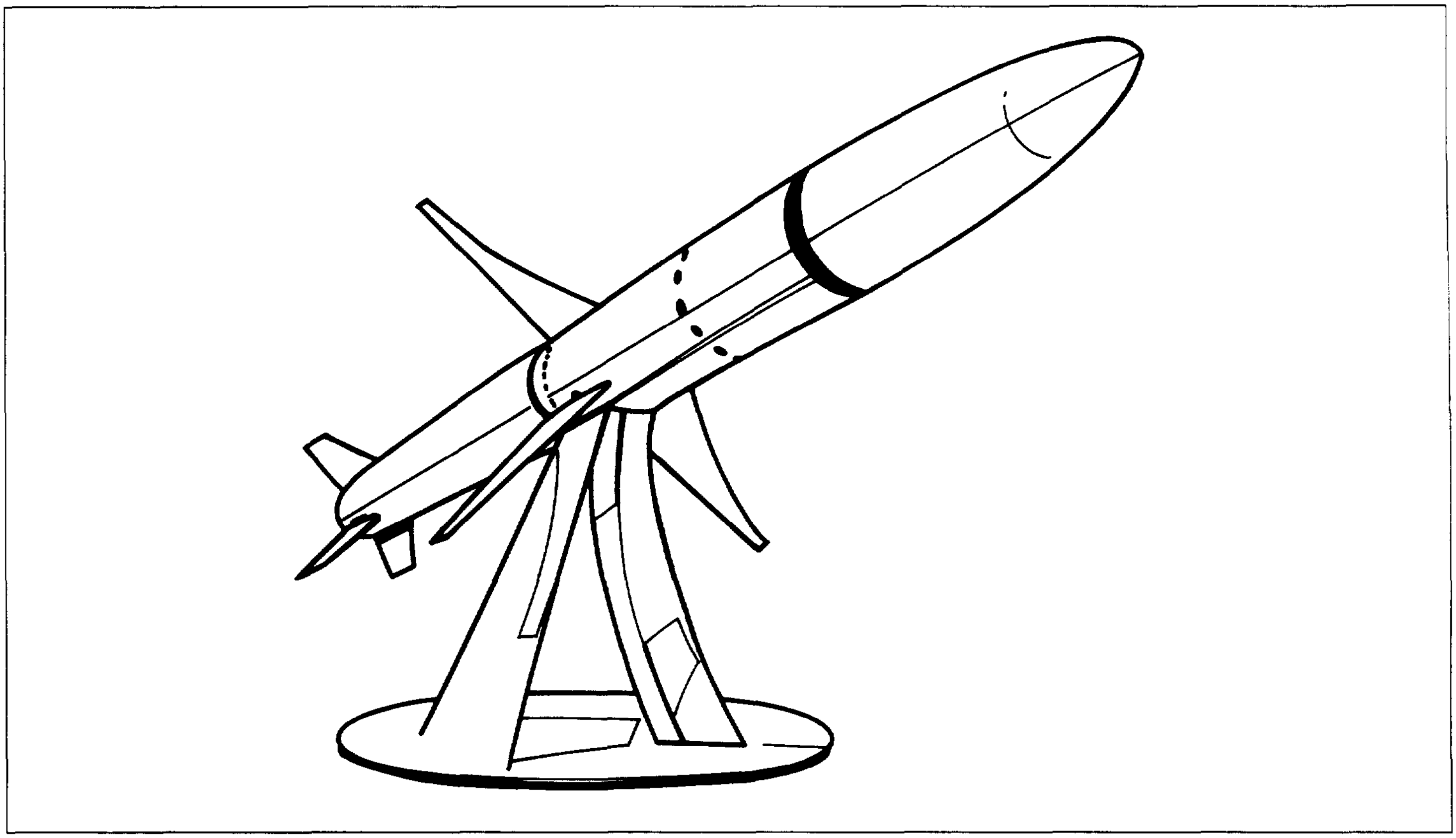
Problems With Army's High Mobility Multipurpose Wheeled Vehicle Continue (GAO/NSIAD-86-79, Apr. 4, 1986).

Major Defense Issues Being Addressed By The General Accounting Office (GAO/NSIAD-85-42, Mar. 1, 1985).

HARM

The HARM AGM-88A is an air-launched surface attack missile for use against land-based and sea-based enemy defense radars. Development of the HARM began in 1972 to address deficiencies in the SHRIKE and Standard Arm Missiles. HARM is part of the defense suppression systems program, which includes the Laser Maverick, Imaging Infrared Maverick, Hellfire, and Sidearm weapon systems. According to a program official, HARM was made a multiservice R&D program because both services had the same requirements. This program official told us that program requirements are included in an acquisition plan which is updated annually and that the HARM has achieved 100 percent commonality. (HARM is shown in fig. III.8.)

Figure III.8: HARM



Source: HARM Program Office.

Service Participants

The Navy is the lead service for the HARM multiservice R&D program. The Navy project manager is responsible for management and accomplishment of the objectives stated in the project manager charter. The Air Force joined the program in 1975. According to a program official, this was during the demonstration and validation phase. The Air Force assigned a deputy project manager who, according to the project manager charter, assumes all authorities and responsibilities of the project manager during his absence.

Schedule

The HARM's full-scale production contract was definitized and joint Navy operational evaluation/Air Force initial operational test and evaluation were completed in 1982. The program is currently in the production phase and is scheduled to continue through fiscal year 1996.

The program was lengthened to include the HARM AGM-88C upgrade. The program has also been extended to develop and procure a capability against newer threats now being fielded. Two guidance section variants are in development: a block III variant by Texas Instruments and a low cost seeker variant by Ford Aerospace. The low cost seeker is based on technology developed by the Naval Weapons Center at China Lake.

According to a program official, the expansion of requirements delayed IOC. In addition, production may be delayed because of the May 1988 explosion at the Pacific Engineering Management Plant in Nevada. That plant produced the ammonium perchlorate used for the rocket motor.

We previously reported on problems with HARM. In May 1985, we reported that a sophisticated initial design, coupled with a major increase in performance requirements contributed to production planning being done in late development (GAO/NSIAD-85-34). We felt it was unrealistic to do little production preparation in development and proceed to an ambitious production buildup without expecting major problems. DOD agreed with our findings and believed that it had made progress in this area since it issued directives on production initiatives in 1984.

In June 1985 (GAO/NSIAD-85-68), we reported that in the HARM Program, concurrent development and production was greater than planned, the initial production decision was made before significant operational test and evaluation results were available, and the full-production decision was made before the operational evaluation was complete. DOD partially concurred with this finding but stated that although limited HARM production was authorized before operational testing, the results of development testing warranted the acceptance of some risk to avoid cost increases and satisfy an urgent Navy operational need.

In March 1988, we reported on defective soldering and launch lugs, and transducer problems with HARM (GAO/NSIAD-88-104). DOD acknowledged that a number of problems had been experienced during missile production, and stated that there are established procedures for early identification and correction of such defects and problems. DOD also stated that in no case did the Navy knowingly accept missiles suspected of containing defects that could affect missile performance.

Deliveries

Planned and actual deliveries under R&D total 99. According to the December 1987 SAR, 3,274 units had been delivered although 3,264 had been planned. The total quantity planned through 1991 was 14,537.

Agreements

A July 1975 MOA designates the Navy as the lead service and outlines program management, technical, operational, and fiscal responsibilities. A February 1985 MOU formalizes working relationships between Navy and Air Force personnel. The 1983 version of the HARM project manager charter stipulates the mission, authority, and responsibility of the HARM project manager and describes the project's scope, operating relationships, organization, and resources. A June 1987 program management directive discusses joint development of the upgraded HARM block IV and the lower cost seeker.

Costs

Both R&D and procurement for the HARM Program have been multiservice funded. As of December 1987, the development estimate for R&D was $238.9 million; the current estimate was $627.9 million. The development estimate for procurement was $2.2 billion; the current estimate was $4.4 billion. The total program cost in December 1987 was $5 billion and the program acquisition unit cost had increased from a development estimate of $0.17 million to $0.34 million.

Recent Reports

Quality Assurance: Concerns About Four Navy Missile Systems (NSIAD-88-104, Mar. 24, 1988).

Procurement: Assessment of DOD's Current Multiyear Candidates (NSIAD-86-176BR, Sept. 8, 1986).

Production of Some Major Weapon Systems Began With Only Limited Operational Test and Evaluation Results (NSIAD-85-68, June 19, 1985).

Why Some Weapons Systems Encounter Production Problems While Others Do Not: Six Case Studies (NSIAD-85-34, May 24, 1985).

ICNIA/INEWS

ICNIA/INEWS are two Air Force led technology development programs. ICNIA is a program to design, fabricate, and test technological approaches to an integrated radio frequency subsystem for aircraft. The technology being developed draws upon very high speed integrated circuit data processor technology, and if feasible, in the latter stages the program will integrate a common signal processor. INEWS is a program to develop the next generation airborne self-protection warning and countermeasure technology for next generation tactical aircraft. It will enable host aircraft to perform combat missions in the advanced threat environment of the 1990s by providing aircrews with timely and accurate threat warning with automatic application of optimum countermeasures.

While the purpose and mission of the two systems are different, both expect to incorporate recent innovations in modular avionics, systems architecture, semi-conductor technology, computerization, and computer software to integrate and automate avionics functions. ICNIA/INEWS technology is expected to greatly reduce size and weight, increase reliability, and substantially lower overall operation and support costs.

According to a program official, waveforms needed by each service have been identified to some degree, and they constitute the initial joint operational requirements for ICNIA. Waveforms are the patterns of modulation for transmitting and receiving signals in the radio frequency spectrum. The services plan to coordinate their requirements through the Joint Integrated Avionics Working Group to assess functional requirements for modules which, when integrated on the different aircraft, will meet service unique requirements while having joint applicability.

Service Participants

According to a program official, OSD strongly encouraged joint service involvement in ICNIA/INEWS multiservice R&D programs. The Air Force is the lead service for the ICNIA Program, which began as a joint effort between the Air Force and the Army in 1983 during the demonstration and validation phase.

In a 1985 report (GAO/NSIAD-85-94), we recommended that the Secretary of Defense direct the Secretary of the Navy to join the ICNIA technology demonstration. We felt that this action would give each service participant a voice in advancing avionics technology and in developing a standard communication, navigation, and avionics system at minimum combined cost. DOD concurred with our findings and recommendation. We reported that the Navy had recognized the need for ICNIA technology for its future generation of aircraft, but had not joined the program due to unavailability of funds, a lack of Navy aircraft program requirements for ICNIA technology, and a concern about committing to specific hardware configurations before determining specific requirements.

According to a program official, the Navy subsequently joined the program in February 1986, with the signing of a tri-service MOA. In December 1987, the Navy received funding for design work on Navy unique waveforms. In conjunction with NSA, the three services are to develop an integrated communications and transmission security module and integrate it into ICNIA.

The Air Force also is the lead service for INEWS. INEWS began as a joint R&D effort between the Air Force and the Navy in 1983 at the start of the concept exploration phase. The Army joined the effort by signing a tri-service MOA for the demonstration and validation phase in 1988 for development of common avionics for the ATF, Advanced Tactical Aircraft (ATA), and Light Helicopter Experimental (LHX) aircraft.

A program official told us that while OSD strongly encouraged joint development of the ICNIA/INEWS technologies, the Congress had a role in assuring that the technologies were focused on meeting practical weapon system needs. The fiscal year 1986 DOD Authorization Conference Report includes a requirement for better coordination among the services in electronic warfare requirements and programs such as ICNIA/INEWS. The Congress also requested that the services develop a comprehensive coordinated electronic warfare plan for submission to the Senate and House Armed Services Committees.

The 1987 DOD Appropriations Conference Report further directed the services to include fully integrated digital avionics, communications, sensors, embedded communications security, and other electronics of programs, such as ICNIA/INEWS on the ATF, ATA, and LHX aircraft. According to a program official, the Under Secretary of Defense (C3I) tasked the Air Force to prepare a plan in coordination with the Army and Navy. The result of this effort was the establishment of the Joint Integrated Avionics Working Group, which coordinates activities in all three services to develop avionics specifications and standards. According to a program official, measurement of commonality will only be meaningful when the common avionics baseline specifications are agreed to in fiscal year 1992.

Schedule

ICNIA is currently in an advanced development and demonstration and validation phase, which is designed to transition the advanced technology integrated avionics into full-scale development for the ATF and other aircraft. Advanced full-scale development is scheduled for completion in

1989 when the results of ATF ICNIA development initiation will be analyzed, and specifications for development of ICNIA versions for other aircraft will be prepared.

A tri-service INEWS phase IB MOA, dated June 1988, defines participant responsibilities for the demonstration and validation phase of the INEWS Program. The MOA indicates that the services will jointly conduct technology risk reduction, demonstration and validation, and preliminary full-scale development tasks to support transition into the full-scale development phase. The MOA states that Navy unique requirements will be provided for incorporation into program documentation and specifies Navy and Air Force funding shares for the INEWS contracts. According to program officials, this MOA serves as the current INEWS Program charter.

According to a program official, demonstration tests on ICNIA in August 1987 and on INEWS in December 1988 occurred on schedule and all demonstration objectives were met. ICNIA demonstrated multiple reconfigurable, software programmed waveform capabilities. INEWS demonstrations are classified and competition sensitive.

The IOCs for the products of ICNIA and INEWS are scheduled to correspond with the IOC dates for the ATF and LHX, and for the ATA following its preplanned product improvement program. In accordance with congressional direction, these three aircraft are scheduled to have common avionics on ICNIA/INEWS by fiscal year 1998.

Deliveries

Advanced development models of ICNIA terminals were scheduled for delivery beginning in October 1988. Delivery dates for INEWS are not yet applicable. According to a program official, these programs are experimental in nature and are being pursued to meet the critical technology needs of the ATF, ATA, and LHX. It is expected that full-scale development and production hardware will be procured through the weapon system programs as part of an advanced integrated avionics system.

Agreements

The Army Avionics R&D Activity and the Air Force Wright Aeronautical Laboratories at Wright-Patterson Air Force Base, Ohio, signed an MOA in April 1983, establishing responsibilities for Army participation in the Air Force ICNIA Program. This MOA required the Wright Aeronautical Laboratories to manage the overall ICNIA effort, with the Army funding Army unique requirements and hardware deliverables in the advanced development model. This MOA was superceded by a tri-service MOA in April 1986.

An MOA between the Naval Electronic Systems Command and the Air Force Aeronautical Systems Division dated July 1983 defines participant responsibilities during initial development of the INEWS Program. This MOA provided for the joint development of a schedule and acquisition strategy for the entire INEWS Program. It also specified that the Navy would provide requirements and inputs for incorporation into program documentation and funding to the Air Force for the Air Force managed contracts. According to program officials, these two 1983 MOAS served as charters for the original ICNIA/INEWS technology programs.

Costs

The total program costs for ICNIA/INEWS have not been determined.

Recent Reports

Navy Should Join the Air Force and Army Program to Develop An Advanced Integrated Avionics System (GAO/NSIAD-85-94, June 17, 1985).

Joint STARS

Joint STARS is an Army/Air Force program that is intended to detect, delay, disrupt, and destroy mobile targets day or night in all weather conditions. Joint STARS is unique because it is a closed loop system for real time detection, tracking, and attack of enemy ground moving targets. Using moving target indicators and synthetic aperture radar techniques, Joint STARS can detect and track enemy forces. Joint STARS integrates the accurate attack of those forces by providing position updates and exact enemy locations to direct attack aircraft, artillery, and standoff missiles. The system will consist of a radar and operations and control system integrated on aircraft, ground stations, and weapons interface units installed in direct-attack aircraft and missiles.

Joint STARS is a cooperative development program formed at concept exploration in 1982 to consolidate the technical advances made in earlier Air Force and Army programs. According to program officials, OSD initiated Joint STARS with the May 1982 program charter, which is an Under Secretary of Defense for Research and Engineering memorandum on battlefield reconnaissance, surveillance, and target acquisition. The program plays a key role in OSD's Interdiction Program. A program official also stated that JCS had a major role in defining and achieving Army and Air Force agreement on requirements. The February 1985 Joint STARS joint services' operational requirements document is classified.

According to a program official, the Air Force and the Army use the same platform and radar. The Army uses the surveillance and control data link and the Air Force uses JTIDS to transfer data between the ground and airborne segments. Only the Army plans to use a ground station module.

Service Participants

According to program officials, the Air Force, as the lead service, is responsible for the overall conduct of the program, and in coordination with the Army, functions as the single chain of command for management decisions. Program officials also stated that OSD is a participant in the program since OSD has Joint STARS as part of its interdiction program.

Schedule

Program officials stated that the airborne segment of Joint STARS is in full-scale development until 1994, with a production decision scheduled for early fiscal year 1992. It was also stated that production of long lead items for the airborne segment is scheduled to begin in fiscal year 1991. Further, the airborne segment IOC is planned in fiscal year 1996.

With regard to the Joint STARS ground segment, program officials stated that the ground segment will be in full-scale development until 1990 and in production through 1995. They further stated that the ground segment IOC is classified.

According to these officials, this program started on a schedule that the Air Force viewed as high risk due to the challenge of software development and radar design. In addition, the aircraft and data link have failed to make their schedules. The interaction of all these items has caused an overall schedule slip of about 1 year.

Deliveries

According to program officials, the Air Force plans for three Joint STARS aircraft platforms for the airborne segment for full-scale development. The first aircraft is undergoing flight testing, the second aircraft is behind schedule, and the third aircraft is not yet under contract. Furthermore, the Army has acquired 18 ground station modules and plans to buy 94 additional ground station modules for a total of 112 in the future.

Agreements

In addition to the program charter and joint services' operational requirements, program documentation includes

- an Army/Air Force Chiefs of Staff MOU on the Joint STARS, dated May 1984, which identifies the C-18 aircraft as the single airborne platform for Joint STARS;
- an Army/Air Force Chiefs of Staff MOA on the Army/Air Force Joint Force Development Process, dated May 1984; and
- a classified program acquisition plan.

Costs

As of December 1987, the current total program cost estimate was $4.1 billion. The Air Force program acquisition cost totaled $3,205.9 million, and the Army program acquisition totaled $852.9 million. The program's planning estimate[3] did not include sufficient data to compare the planning estimate to the current estimate. According to a program official, Joint STARS program costs will increase due to an April 1988 Air Force/Army agreement to change the aircraft platform from the E-8A to the E-8B (an E-6 militarized Navy Boeing 707 variant) for the remaining production units and to increase the number of systems from 10 to 22.

TRI-TAC

The TRI-TAC Program is a joint service effort established by OSD to develop and acquire joint communications equipment for the tactical forces. The objectives of the TRI-TAC Program are to eliminate duplication in the development of service communication equipment, and to achieve interoperability among tactical communications systems and other DOD telecommunication systems, as well as with NATO allies.

The program is primarily concerned with design, development, and acquisition of switched tactical communication systems. This includes all trunking, access, and switching equipment for mobile and transportable tactical multichannel systems with associated systems control and technical control facilities; local distribution equipment; voice, record, data, and ancillary terminal devices; and associated communications security equipment. It also includes mobile and transportable tactical

[3]The planning estimate reflects the estimates of program acquisition cost developed at the time the Secretary of Defense approved program initiation, normally at milestone I. The planning estimate will be reflected up to and including the first time the development estimate is reported as the program baseline.

single-channel switched systems that may be operated as an independent system or as part of a tactical multichannel system, and all interface devices for connecting TRI-TAC developed equipment to existing service systems, the Defense Communication System, and NATO systems.

The TRI-TAC acquisition program includes control equipment, radio transmission equipment, digital terminal equipment, switching equipment, and communication security equipment. This program's equipment will replace the current inventory of tactical multichannel switched communications equipment and will support the transition from an analog to an all-digital communications system.

The backbone of the TRI-TAC architecture is the TRI-TAC circuit switches that perform the same type of service as the commercial telephone exchanges. The TRI-TAC circuit switches, however, will automatically receive and route secure and non-secure voice calls and data transmission. The switches are available in large, medium, and small capacity versions which, according to the Army, give commanders the flexibility and capability to get the job done more effectively.

Service Participants

According to a program official, the Army, Air Force, Navy, Marine Corps, OSD, JCS, and NSA participate in the TRI-TAC Program. We were told that the Army is the lead for the TRI-TAC as an overall concept; however, the various participants are assigned as executive agents for the development of specific equipment within TRI-TAC. In 1979, TRI-TAC consisted of 25 systems, with the Army leading the development efforts of 8 systems, the Air Force 6 systems, the Navy 2 systems, the Marine Corps 3 systems, and NSA 6 systems. Since each participant is responsible for developing one or more systems under the program, we categorize TRI-TAC as a cooperative development effort. As a result, commonality is not applicable to the program.

According to Army officials, the TRI-TAC Program was under the jurisdiction of an OSD organization that could mandate equipment specifications and which had budget review authority over all of the services' TRI-TAC Programs. Subsequently, resources of the TRI-TAC Program were assigned to the Joint Tactical Command, Control, and Communications Agency at Fort Monmouth, New Jersey. Program officials told us that this successor office sets standards for interoperability, but does not have the authority to mandate equipment specifications or to review participants' budgets.

Schedule

According to program officials, the TRI-TAC joint program began in 1970. A circuit switch was the first item of the TRI-TAC system, and its development began in the 1970-71 time frame. An official told us that an overall phase at which participants joined the TRI-TAC Program could not be provided because the various items for this cooperative program were started at different times. Army program officials added that the number of items also fluctuated because certain systems were abandoned and others were completed.

According to program officials, most TRI-TAC Programs are meeting performance requirements. However, the single subscriber terminal program is expected to be delayed by 5 months because of problems encountered in converting the computer programming language.

Deliveries

The large circuit and message switches began to be fielded in 1983. Because of a budget reduction, the "D" version of the switch, which uses mobile subscriber equipment technology, will be fielded only to units which are forward deployed in Europe.

Other equipment, such as the tropo-scatter radio and the advanced narrow band digital voice terminal, were over 1 year behind schedule at the time of our review. According to program officials, the single subscriber terminal's projected delivery date is almost 4 years behind schedule, as a result of the program being restructured from a military specification requirement to a non-developmental item effort.

Even though the Army restructured its battlefield communications, TRI-TAC remained the center of the architecture except that mobile subscriber equipment will be used at echelons from corps to brigades. However, the mobile subscriber equipment program is no longer part of the TRI-TAC Program, but a separate Army-managed program.

Agreements

The TRI-TAC Program charter, dated May 1971, established the program and the TRI-TAC Program office. The Deputy Secretary of Defense signed this charter, which set forth the objectives and scope of the program. According to a program official, some joint agreements may have been signed 15 or more years ago, but this official could not locate the documents for our review.

Costs

In 1980, the TRI-TAC Program was estimated to cost about $3.3 billion for all the services. By December 1987, the Army portion alone was estimated to cost about $3.7 billion. The current status of the Army's TRI-TAC Program is in doubt, however, because the Army has reduced the fiscal years 1989 to 1994 program from $1.5 billion to $184 million, deleting over 9,500 pieces of equipment. With no funding currently in fiscal year 1992 and thereafter, the Army is reviewing TRI-TAC requirements to properly reflect them in budgets for 1992 and beyond.

According to Army program officials, the current TRI-TAC Program leaves Army echelons above corps with a basic communications capability far short of the program objectives. As a result, the ability of the TRI-TAC network to interoperate with and access the mobile subscriber equipment network at echelons below the corps will be greatly diminished. For example, 126 radio access units and 3,125 mobile subscriber radio terminals are being deleted, and the number of large extension node switches are being reduced from 51 to 4. Army program officials believe that this will not only degrade the flow of communications between various Army echelons, but also impair survivability.

Recognizing the need for the TRI-TAC Program, the Office of Assistant Secretary of Defense for Command, Control, Communications, and Intelligence, is considering increasing the TRI-TAC Program to $420.8 million for fiscal years 1989 through 1994, about 3 times the current amount but still only 1/3 the amount originally planned. OSD concluded that allowing the Army to reduce the funding below a level necessary to maintain a viable program seriously jeopardizes existing procurement contracts and will certainly result in higher unit costs to the other services.

If the Army reduces the fiscal years 1989-94 program to $184 million, total Army program costs would be about $1.9 billion. Marine Corps, Air Force, Navy, and other participants' costs are not included because funding is not centrally managed and all of the services fund their portions of the program in separate budget lines. Also, the resultant program does not include R&D funds necessary for required configuration changes.

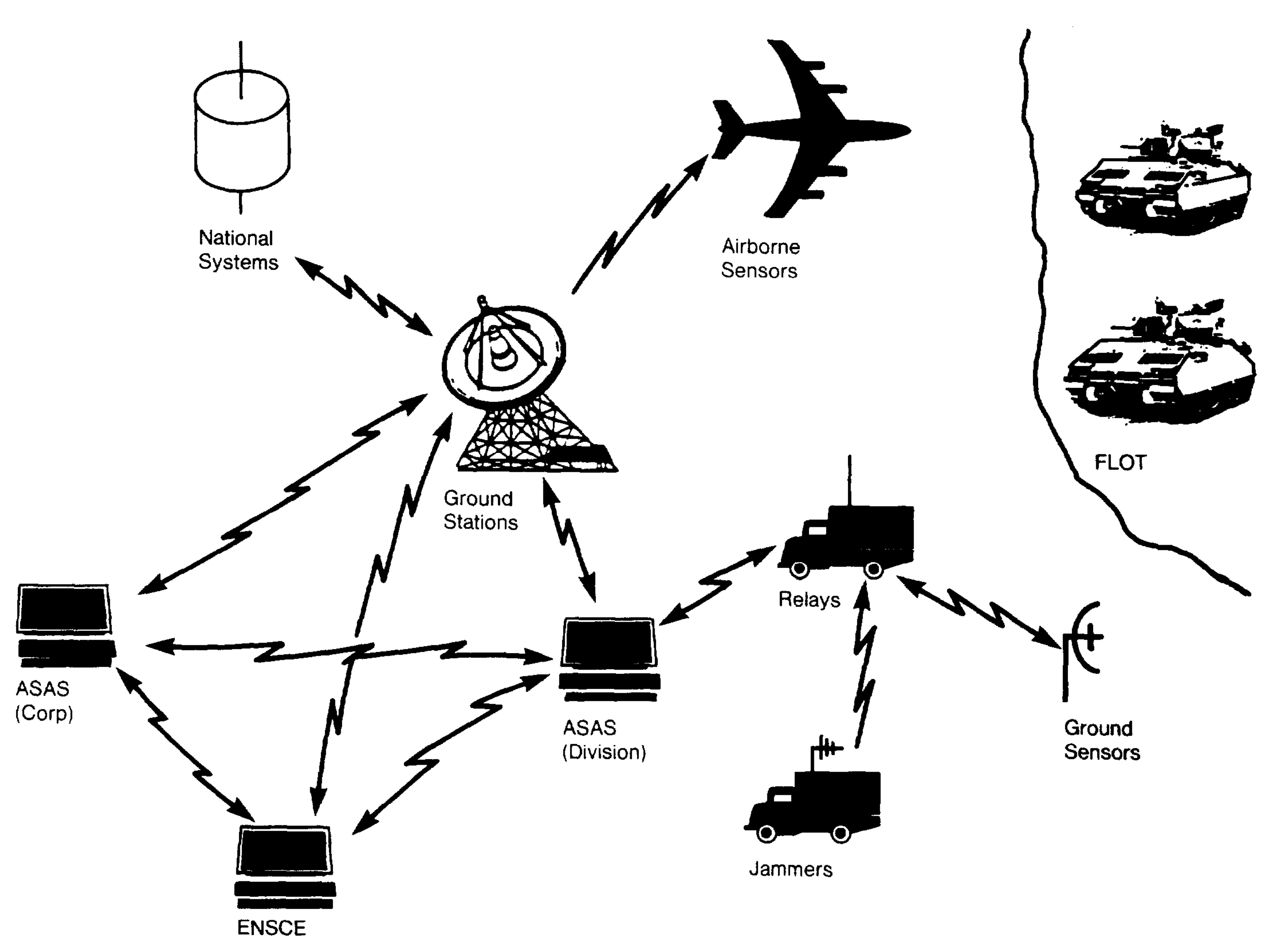
JTFP

JTFP was established as a joint Army and Air Force program to develop a single automated system to correlate, analyze, and disseminate high volumes of time sensitive, multisensor intelligence data. According to a program official, JTFP began as a multiservice R&D program. The Army's element of JTFP is the All-Source Analysis System (ASAS) and the Air Force's equivalent is the Enemy Situation Correlation Element (ENSCE). The objective of the program, according to the Army, was to develop these systems with the greatest possible degree of hardware and software commonality and interoperability consistent with service requirements. The Army expects the software to be 90 percent common and the hardware to be 80 percent common.

The two main efforts in this program are software development and systems integration. The software will be developed in blocks with increasing capability for each succeeding block. The baseline software effort involves about 1.4 million lines of code. The integration effort requires the procurement of current and advanced technology computers, workstations, data communications equipment, and related software.

ASAS will provide automation assistance to intelligence and electronic warfare processing, analysis, and target development and nomination in support of tactical decisionmaking. The ENSCE will provide the Tactical Air Control System with current, dynamic intelligence in the form of immediate target nominations, threat alerts, situation displays, and assessments to support the tactical air operations battle management process. (Fig. III.9 shows the components of the JTFP.) The ASAS requirement was described in the required operational capability document dated September 1983. The Air Force requirement was defined in the Tactical Air Command Statement of Need 59-67.

Figure III.9: Components of JTFP



Source: GAO illustration.

Service Participants

This joint service program was developed at congressional request to acquire ASAS/ENSCE to meet the critically needed requirements for an automated intelligence command and control system. Specifically, the Congress requested in 1980 that DOD submit a plan for joint development of a fusion center for the Army and Air Force. The joint program charter, dated 1982, designated the Army as the lead service of the program and the Air Force as a principal participant. According to a JTFP official, the Navy and Marine Corps are also participants that joined in the concept exploration phase of the program.

Schedule

We reported in 1987 (GAO/NSIAD-87-128) that full-scale engineering development (milestone II) of the ASAS/ENSCE began in March 1983 under an evolutionary approach that was designed to develop and deliver hardware and incrementally developed software. By using this evolutionary approach, program officials expected to achieve increasing levels of performance over time as the technology and software are proven, and as user experience is factored into the designs.

According to a program official, limited quantities of the hardware and software have been produced to date. A partial ASAS was delivered for service field trials in December 1986. The Army considered the test of this partial system successful at performing limited functions. The official also told us that in March 1989, a limited capability configuration system comprised of the ASAS/ENSCE interface and control module, the forward sensor interface and control module, and the portable ASAS/ENSCE workstation, along with the first release of the software will be delivered for force development test and evaluation. We also reported in 1987 that the production decision (milestone III) is expected in 1992 at the completion of initial operational test and evaluation of the prototype system.

Deliveries

A program official told us that limited quantities of hardware and software have been delivered. The official said that the hardware deliveries have been close to schedule but the scheduled software deliveries had been slipped because of specification changes and difficulties in estimating software development efforts.

Agreements

The 1982 joint program management charter designated the Army as lead service, established the joint program office, and defined the authority, responsibility, and major functions of the program manager and the vice program manager. The Secretary of the Army approved the charter in January 1982, and the Secretary of the Air Force approved it in February 1982. A July 1984 letter of instruction, signed by the Air Force and Army Vice Chiefs of Staff, provided for the development, acquisition, and fielding of the Army ASAS and the Air Force ENSCE.

Costs

Cost figures for the ASAS/ENSCE are classified. We previously stated in our 1987 report that the Army contributes about 90 percent of the program funding and the Air Force about 10 percent. We also stated that cost estimates for the ASAS/ENSCE have grown significantly due largely to poor initial cost estimates, changing requirements for software and hardware, capability increases, and schedule stretch-outs.

Recent Reports

DOD Acquisition Programs: Status of Selected Systems (GAO/NSIAD-87-128, Apr. 2, 1987).

JTIDS

JTIDS is an integrated digital information distribution system that provides communication (data and voice), navigation, and identification capabilities for military operations. JTIDS has the potential to interconnect scattered sources of surveillance and intelligence data, weapon controllers, weapon systems, and command elements. It is designed to be used for command and control among all equipped airborne, ground, and naval elements in the tactical theater.

JTIDS' purpose is to provide each force element in the tactical theater with essential, real-time combat information. The system is capable of transmitting cryptologically secured information in a sophisticated jamming environment and is designed to prevent hostile forces from intercepting and using the transmitted signal.

The program involves a family of terminals in different phases of the acquisition cycle and with different dates for IOCs. Class 1 terminals are for use on airborne warning and control system aircraft and in ground command and control systems. Class 2 terminals are being developed in different versions for various platforms and military services. According to program officials, 65 percent commonality has been achieved at the piece part level across JTIDS class 2 terminal programs. The low volume Multifunctional Information Distribution System terminal applies new technology to the existing class 2 design through a cooperative development program between the United States and NATO. The new terminal will be used on space restricted platforms, such as the F-16 fighter aircraft.

The joint operational requirements document, dated January 1981, included requirements for single net connectivity, jamming resistance, unformatted digital data, and electromagnetic compatibility with civil/military systems.

Service Participants

OSD initiated this multiservice R&D program. The Air Force has been the lead service since the program's inception, with the Army, Navy, and Marine Corps participating because of similarities in operating requirements. According to officials, all of the services joined JTIDS in 1975 during the concept exploration phase. In addition, OSD is a participant and has funded part of the program.

Schedule

The class 1 terminal has been integrated directly into the E-3 aircraft. At the time of our review, class 2 terminals were in the full-scale development stage. Development test and evaluation of the class 2 terminals began in October 1985. According to program officials, results of the development test and evaluation indicated that functional performance, including communication, navigation, and anti-jam resistance was satisfactory with minor exceptions. Problems included reliability and built-in test deficiencies.

The Air Force conducted a multiservice operational assessment and initial operational test and evaluation from August 1986 through April 1987. The multiservice assessment found the class 2 terminals unsatisfactory in the areas of network management, identification/correlation, speed, and accuracy. Results also showed that the F-15 JTIDS' class 2 terminal was unsatisfactory in terms of reliability, maintainability, availability, and supportability. Operational suitability was unsatisfactory primarily because of the unreliable built-in test identified during development test and evaluation.

Reliability improvement is underway and significant improvements were observed during a second maintenance demonstration/evaluation following the initial operational test and evaluation. Further evaluation of built-in test and maintainability will be made during flight testing from January 1989 to December 1991.

The JTIDS Program experienced schedule slips as a result of the problems identified during development test and initial operational test and evaluation. For example, low rate initial production has been delayed about 2 years to improve the class 2 terminal's mean time between failures. Functional improvements made in hardware and software will require additional testing. Future testing of the class 2 terminal design improvements and previously untested functions is geared to support a low rate initial production decision in August 1989.

The low volume Multifunctional Information Distribution System terminal completed the project definition stage in September 1988. Full-scale development is scheduled to start in fiscal year 1990.

Deliveries

The December 1987 SAR shows that of the 56 planned class 2 terminal R&D deliveries, 50 have been delivered. Total procurement quantities have been set at 1,871 terminals.

Agreements

A January 1975 joint service charter established the policy for management and administration of the resources and subsystems, which constitute the JTIDS acquisition program. The charter also addressed the roles and responsibilities of the joint program office and the military services in the areas of resource support, planning, management, administration of funds, testing, acquisition, development of subsystems, and computer programs and associated documentation.

Other program documentation includes:

- A program management directive, dated April 1984, that instructed the joint program office to (1) use Time Division Multiple Access architecture, (2) pursue full joint service frequency allocations in such areas as the United States and Europe, and (3) conduct supporting technical analyses and tests.
- A January 1987 joint service test and evaluation master plan that described the required operational and technical characteristics and the integrated schedule for each aspect of the test and evaluation.

Costs

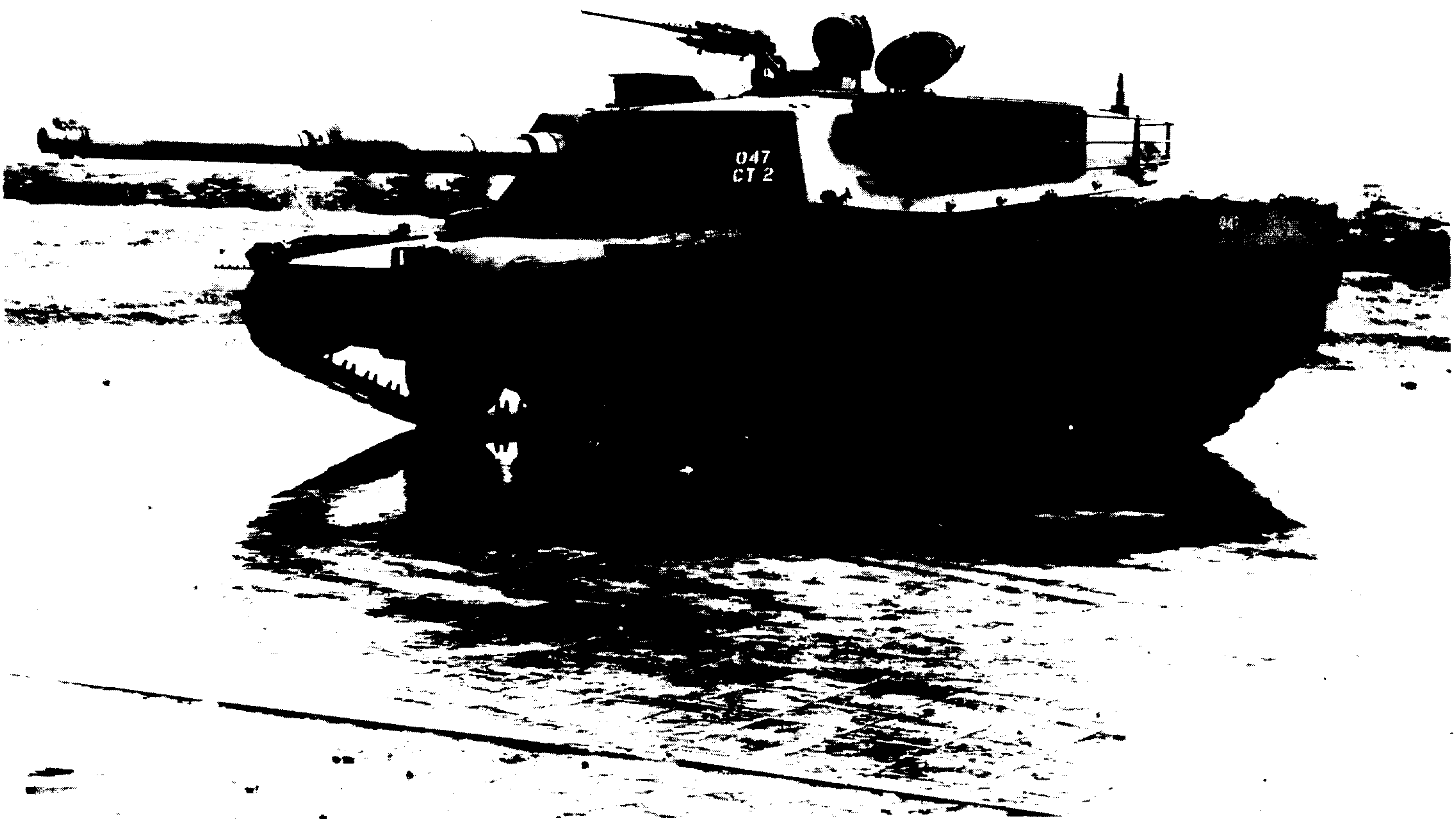
All the services as well as OSD fund the class 2 program. As of December 1987, the development cost estimate for R&D was $382.5 million, and the current estimate was about $1.3 billion. The $941.2 million increase was due to a change in quantities from 55 to 129 systems, the additional cost for full-scale development of the new Multifunctional Information Distribution System terminal, adjustments to cost estimates, and continuation of demonstration and operational testing.

M1/M1A1 Abrams Tank

The M1/M1A1 Tank, or as the Army prefers to call it, the Abrams Tank, is the Army's primary ground combat weapon system for destroying enemy forces. The M1A1 Tank provides a significant improvement to the Army's offensive ground combat power. The tank has a larger main gun (120 mm) than previous M1 tanks. It also has improved fire control and shoot-on-the-move capabilities that increase first round kill probability. Improved ballistic protection allows the M1A1 to withstand hits from more lethal enemy weapons than previous tanks. A new nuclear, biological, and chemical protection system increases crew survivability and endurance. Like other members of the M1 tank series, the M1A1 has twice the engine horsepower of older tank series and has reduced maintenance requirements. The M1A1 will replace earlier M1 series tanks in front-line armor units. (Fig. III.10 shows the Abrams Tank.)

In August 1987, the Marine Corps sent the Army an unfunded, advance military interdepartmental purchase request for the purchase of long lead items required for production of 66 M1A1 tanks. In April 1988, the request was amended to authorize about $24.4 million to purchase the long lead items for 66 tanks. Thus, the Marine Corps initiated joint participation. According to a program official, the M1A1 Tank will have 100 percent commonality among service participants.

Figure III.10: The Abrams Tank



Source: Abrams Program Office

Service Participants

The Army is the lead service for the Abrams Tank, which is a multiservice procurement program. The Marine Corps buys the tanks through the Army, and thus, participates only at the production and deployment phase.

Schedule

Production of the basic M1 Tank began in fiscal year 1979 with first deliveries in 1980, and the last delivery in May 1986. DOD approved the M1A1 for production in December 1984 and the Army awarded the first production contract in April 1985. As of December 1987, 1,482 M1A1 Tanks had been produced.

Deliveries

The first M1A1 Tank was delivered in August 1985 and attained full-rate production in August 1986. At the start of fiscal year 1986, M1A1 Tank production was delayed because of an 8-week labor stoppage at the plant where it was being produced and because of initial start-up problems with the M1A1 Tank. The total M1A1 deliveries from August 1985 to October 1986 were 278.

Agreements

According to a program official, the Army and the Marine Corps have not signed any agreements regarding the interservice procurement.

Costs

The December 1987 SAR data did not provide separate estimates for the M1A1 Tank version; however, the total development estimate for the Army M1/M1A1 Program was about $4.8 billion. The total program estimate for M1/M1A1 as of December 1987 was about $22 billion. The cost increase was due to an increase in procurement quantities from a development estimate of 3,312 to a total of 7,844 tanks through fiscal year 1992; revised escalation indexes; system improvements; increased contractor costs to support testing; a lengthened procurement schedule and increased cost for production facilities; and revised estimates for military construction and support equipment.

Recent Reports

Army Budget: Potential Reductions to Selected Procurement Budgets (GAO/NSIAD-88-212, Aug. 17, 1988).

Army Budget: Potential Reductions to M1 Tank and Bradley Fighting Vehicle Budgets (GAO/NSIAD-87-169BR, Aug. 7, 1987).

Army Budget: Selected Analyses of M1 Tank Budgets for Fiscal Years 1980-1985 (GAO/NSIAD-86-75FS, Feb. 25, 1986).

Maverick Missile

The Maverick AGM-65 Missile Weapon System is a rocket propelled, air-to-surface missile. It is designed for launch from a variety of aircraft. It will use various seekers for homing on designated targets, including hardpoint targets, such as field fortifications, bunkers, tanks, armored personnel carriers, parked aircraft, radar missile sites, and ships. (Fig. III.11 shows a Maverick Missile for each military service.)

Figure III.11: Maverick Missiles

Source: Maverick Program Office.

In July 1964, the Air Force issued specific operational requirements for air-to-ground tactical guided missiles. Subsequently, the Air Force designated the Maverick as the medium size missile to complete optimum coverage of the total tactical target spectrum. Since that time, several versions of the Maverick have been developed. The systems include the television guided AGM-65A and the longer range television guided AGM-65B. These missiles carry an electro-optical seeker in the nose that produces a television image on a cockpit display.

The laser Maverick, AGM-65C, developed for improved guidance for day/night close air support missions, was deleted in 1978. The infrared Maverick, AGM-65D, using thermal detection technology, began initial development in 1970 as an extension of the basic Maverick concept and design. It has a day/night adverse weather attack capability. The Marine Corps' laser AGM-65E close air support version improves the ability to kill some of the current Maverick targets, in addition to destroyer class ships and hard tactical targets, such as bunkers.

The Navy's AGM-65F allows the explosive to penetrate a ship's hull before exploding and has software variations to allow the missile to be more effective against ships. The Air Force's AGM-65G with its alternate 300 pound blast fragmentation warhead for use against hardened targets broadens Maverick's spectrum of tactical targets.

According to a program official, the versions of the Maverick missile are very similar. For example, the AGM-65D version is 100 percent common with the AGM-65G version except for warhead and fuze; and the AGM-65G version is 100 percent common with the AGM-65F version except for the rocket motor and the safe arm device used on the Navy's AGM-65F version. The Marine Corps AGM-65E and Navy AGM-65F use the same center sections, warhead and fuze, rocket motor, and safe/arm device.

Service Participants

The Maverick is a multiservice R&D effort initiated by OSD. The Air Force is the lead for the program, which is now in the production and deployment phase. According to a program official, the Navy joined in 1970 during concept exploration, and the Marine Corps joined in 1978 in an effort to develop the laser Maverick.

Schedule

IOC for the infrared Maverick (AGM-65D) was in 1986. According to the program office, the April 1988 test results from the Air Force's infrared seeker Maverick firings produced 87 hits out of 101 firings, resulting in a hit rate of 86.1 percent. In addition, the AGM-65G flight test program's first launch scored a direct hit on an idling tank in October 1987. The second launch in November 1987, resulted in a direct hit on an aircraft shelter.

According to the program office, infrared and laser Maverick versions are in the production phase. The Marines' laser-guided Maverick procurement ended in 1988. Procurement of infrared Maverick Missiles is scheduled to end in 1992 for both the Navy and the Air Force. No phase of the current Maverick production is behind schedule.

Deliveries

Planned and actual R&D deliveries totaled 33 for the AGM-65D and G versions of the Maverick. Scheduled procurement deliveries were 5,812 as of December 1987, while actual deliveries were 5,999.

Agreements

Joint agreements include

- a September 1974 MOA on guided air-to-ground weapons and air-to-air missiles that established a joint plan for coordinating the two weapons programs;
- a 1980 MOA on joint service development of the AGM-65 Maverick Missile System, which is the framework for the joint Air Force/Navy development and procurement of direct fire, air-to-surface weapons using the basic AGM-65 Maverick Missile System; and
- a February 1981 MOA on the Imaging Infrared Air Force and Navy cooperative program that extended cooperation of the two services throughout the Imaging Infrared Seeker Program to develop a common requirement.

Costs

According to the December 1987 SAR, the development estimate for the AGM-65D and G versions was about $1.6 billion with a current total estimated acquisition cost of about $7.6 billion. The development estimate of program acquisition unit cost was $51 thousand and the 1987 unit cost estimate increased to about $126 thousand. Schedule changes due to procuring different quantities per fiscal year as a result of the incorporation of split competition and congressional budget cuts contributed to the increased unit cost.

Recent Reports

Weapons Testing: Quality of DOD Operational Testing and Reporting (GAO/PEMD-88-32BR, July 26, 1988).

Nonrecurring Costs: Improvements Needed in DOD Cost Recovery Efforts (GAO/NSIAD-86-95, Apr. 18, 1986).

Assessing Production Capabilities and Constraints in the Defense Industrial Base (GAO/PEMD-85-3, Apr. 4, 1985).

Production of Some Major Weapon Systems Began With Only Limited Operational Test and Evaluation Results (GAO/NSIAD-85-68, June 19, 1985).

Milstar

According to a program official, the Military Strategic and Tactical Relay Satellite (now referred to as Milstar) is intended to provide two-way, worldwide, anti-jam, survivable, and enduring satellite communications for command and control of U.S. military forces. Mission control hardware is to be installed on selected survivable platforms required to provide survivable and enduring satellite system control.

A program official told us that in 1981 OSD initiated the requirement to develop extremely high frequency technology. It also designated Milstar to be the main program to meet this requirement. Milstar is taking advantage of the Navy's extremely high frequency package on the Fleet Satellite Communications System. The fleet satellite program is managed and funded by the Navy and provides near global coverage for high priority requirements of the Navy, Air Force, and other DOD users.

Program officials also told us that Milstar is designed to be interoperable with Air Force, Army, and Navy terminals. Commonality is therefore not applicable. The services have conducted terminal testing to ensure that the terminals will be interoperable.

Service Participants

According to the program office, in 1983, OSD mandated that the Air Force be the lead agency for the satellite segment and that the Army and the Navy participate. Milstar is a cooperative development with two joint program offices—the joint Milstar program office, which the Air Force manages, and the joint terminals program office through which the Navy coordinates efforts related to terminals. They are closely connected by mission and requirements but are managed independently. Each of these joint program offices has participants from the other services.

Schedule

The information on Milstar's phases and its IOC date are classified.

Deliveries

According to program officials, delivery information for Milstar is classified.

Agreements

According to the program office, agreements among program participants are classified.

Costs

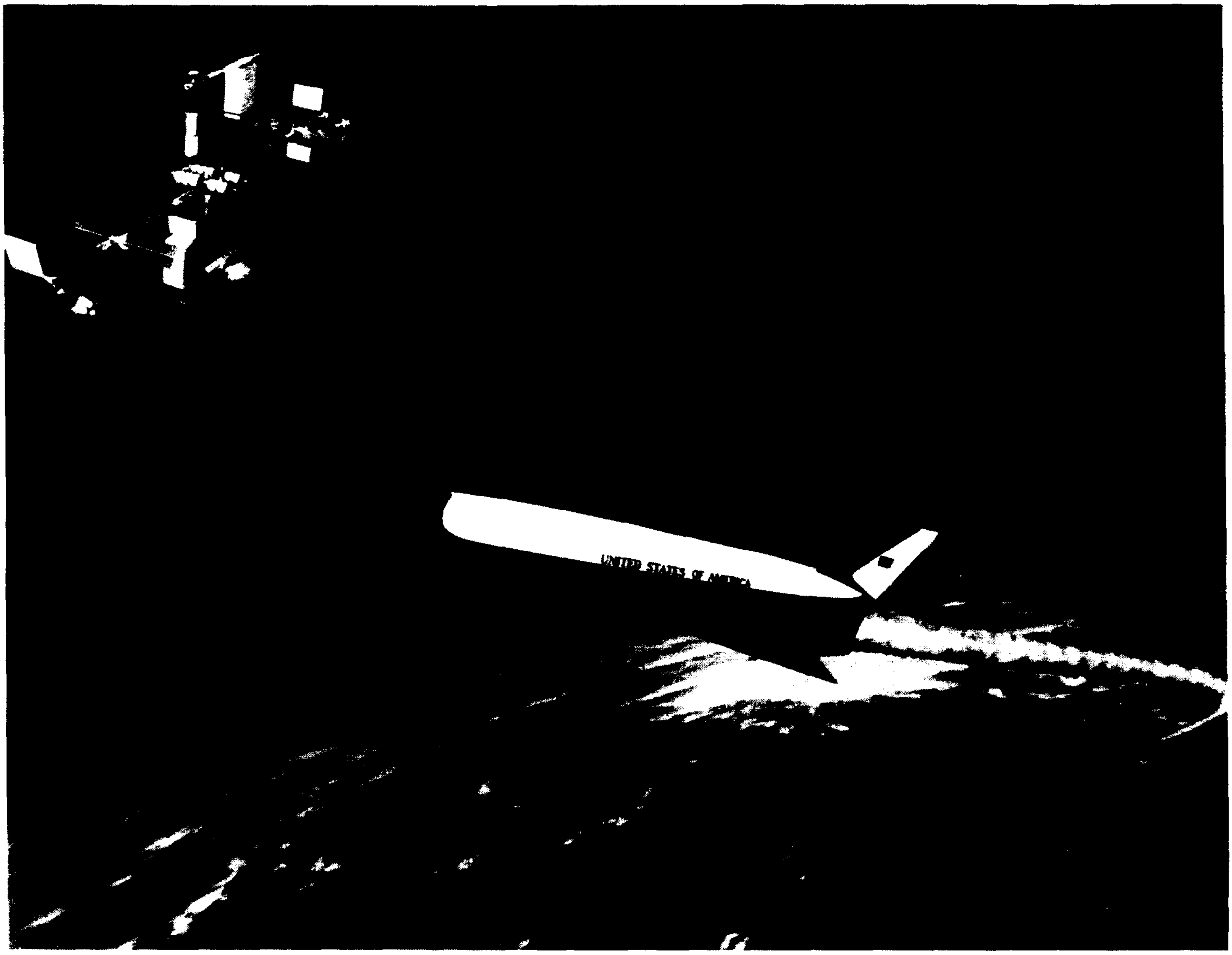
Program officials told us that cost information is classified.

NASP Program

The NASP Program is a joint DOD/NASA technology development and demonstration program to build and test the X-30 experimental flight vehicle. The NASP Program's goal is to provide a technological basis for future hypersonic flight vehicles to include military, commercial, and space applications having technical, cost, and operational advantages over existing commercial and military aircraft and space launch systems. The primary objective of the program is to develop an experimental flight vehicle to demonstrate the technology for single-stage-to-orbit space launch capability using air-breathing propulsion. The X-30 is being designed to take off horizontally from a conventional runway, reach hypersonic speeds of up to Mach 25 (25 times the speed of sound), attain low earth orbit, and return to land on a conventional runway.

As we previously reported in 1988 (GAO/NSIAD-88-122), specific missions and firm operational requirements for future aerospace vehicles probably will not be identified by potential users until the X-30's capabilities have been demonstrated. (Fig. III.12 shows the NASP Program's generic design configuration for the X-30.)

Figure III.12: The NASP Generic Design Configuration



Source: NASA.

The NASP Program is a technologically challenging, high risk program. Significant advances and breakthroughs have occurred in technologies that make developing the X-30 potentially achievable. However, each of the enabling technologies, such as an air-breathing propulsion system using a supersonic combustion ramjet, advanced materials, a fully integrated engine and airframe, and use of computational fluid dynamics and supercomputers must be developed further and fully integrated with the other technologies, since the design of one component can have a large effect on the performance of another component.

As we reported in 1988, adequate ground test capabilities and facilities do not exist to test the X-30 at speeds above Mach 8 for sustained periods. No single facility or group of facilities are capable of creating the combination of velocities, temperatures, and pressures necessary to simulate the X-30's actual flight conditions. Therefore, the X-30 is being developed as a "flying test bed" to validate the requisite technologies at speeds between Mach 8 and 25, orbital escape velocity.

Service Participants

OSD established the NASP Program as a joint DOD (Air Force, DARPA, Navy, and SDIO)/NASA technology development and demonstration program in December 1985. Based on the results of DARPA's "Copper Canyon" Program (1982-85), DOD and NASA concluded that the national interest, as well as their common objectives for developing an aerospace plane, would be best served by a joint program. According to a program official, the vehicle will be 100 percent common to program participants.

The NASP Program is a fully integrated, multiservice/agency R&D program. DOD has responsibility for overall management of the program, and NASA has the major role for technology maturation and lead responsibility for civilian applications. The four service/agency participants were involved in phase I, which was called the Copper Canyon Program, and in the NASP Program from its beginning in phase II. According to a program official, phase II is the equivalent of a demonstration and validation phase. The responsibility for managing the phase II technology development effort was transferred from DARPA to the Air Force in 1988.

Schedule

The NASP Program is in the middle of a 5-year technology maturation phase (phase II) of a three phase program. Phase I (1982-85), the Copper Canyon Program, which preceded the NASP Program, was conducted to define the technical concept for an aerospace plane. Phase II (1985-90) is a concept validation phase. At the end of phase II, a decision will be made, based on the maturity of the technologies, regarding whether to build and test the X-30 experimental vehicle. If the decision is made to proceed, phase III (1991-96) will involve building and testing the X-30. As we previously reported in 1988, flight testing is scheduled to begin in fiscal year 1995.

Deliveries

No deliveries have been made to date because the program is in the demonstration and validation phase. Phase III may involve building and testing three X-30 experimental vehicles: two for transatmospheric flight testing and one for static ground testing. As we previously reported in 1988, if the NASP Program is successful, a prototype military, space, or commercial hypersonic airplane and/or single-stage-to-orbit launch vehicle could possibly be built by the late 1990s.

Agreements

An April 1986 internal DOD MOA defined the responsibilities of the DOD participants—the Air Force, DARPA, Navy, and SDIO. It assigned the Air Force overall DOD responsibility; established the management structure; committed Air Force, DARPA, Navy, and SDIO resources; and established program objectives.

A July 1986 MOU between DOD and NASA formally assigned DOD responsibility for overall management of the NASP Program and NASA the major role for technology maturation and lead responsibility for civilian applications. It established the NASP Steering Group, committed agency resources (funds, personnel, and material), and affirmed overall program objectives. According to DOD officials, this MOU was revised in September 1988.

In fiscal year 1987, the Congress directed that, beginning in fiscal year 1988, all DOD funding for the program be consolidated in the Air Force.

Costs

In our 1988 report, we indicated that the NASP Program is expected to cost more than $3.3 billion between fiscal years 1986 and 1994. Of that $3.3 billion, DOD plans to contribute about $2.7 billion, or approximately 80 percent, while NASA plans to contribute about $675 million, or approximately 20 percent, of total program costs.

The total program cost of $3.3 billion does not include the following:

- $5.5 million for DARPA's Copper Canyon Program between 1982 and 1985;
- $500 million for NASA's cost estimate for personnel, facilities, and utilities between fiscal years 1986 and 1994; and
- $728 million for industry's contribution between fiscal years 1986 and 1990.

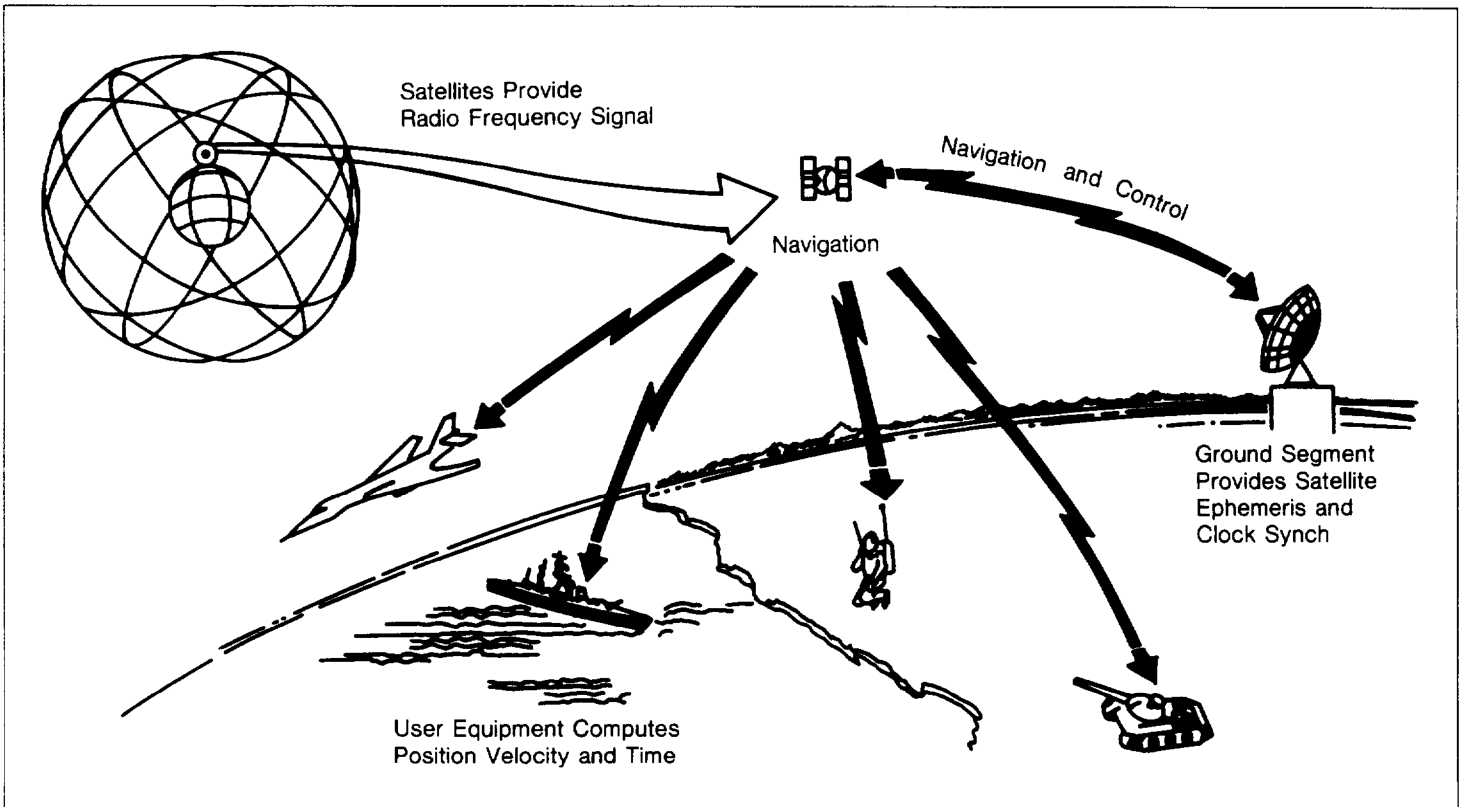
Recent Reports

National Aero-Space Plane: A Technology Development and Demonstration Program to Build the X-30 (GAO/NSIAD-88-122, Apr. 27, 1988).

Navstar GPS User Equipment

The Navstar GPS is a space-based radio positioning, navigation, and time distribution system. GPS will provide precise, continuous, all-weather, common grid worldwide positioning, navigation, and time reference capability to a multiplicity of users. Mission areas supported include navigation and position fixing; air interdiction; close-air support; special operations; strategic attack; counter-air and aerospace defense; theater and tactical C3I; and ground and sea warfare. (See fig. III.13 for an illustration of the Navstar GPS.)

Figure III.13: The Navstar GPS



Source: Navstar GPS Program Office.

This system has three major segments—a space segment, a control segment, and a user equipment segment.

Under the space segment, GPS will deploy 18 block II satellites with three on-orbit spares to provide satellite coverage for continuous, world-wide, three-dimensional positioning and velocity determination.

Under the control segment, widely separated monitor stations passively track all satellites and collect ranging data from their navigation signals. This data is then processed at the Operational Control System/Master Control Station for use in satellite orbit determination and systematic error elimination.

The user segment includes sets for airborne applications, naval applications, and manpack/vehicular applications. Sets in general consist of an antenna array, an antenna controller or radio frequency translator, a receiver processor, and a control display unit.

According to program officials, the Navstar GPS operational requirements were established in 1978 during the demonstration and validation phase. The GPS Army user equipment required operational capability document was signed in April 1979. The receivers under Navstar are 80 percent common among service participants based on parts.

Service Participants

OSD initiated the Navstar GPS Program, and in an April 1973 memorandum, designated the Air Force as lead service for the Navstar GPS user equipment. The program began as a multiservice and multiagency R&D effort and participants joined at various times since 1975. Program participants include the Army, Navy, Marine Corps, Defense Mapping Agency, and under the Department of Transportation, the Federal Aviation Administration and the Coast Guard. Other countries involved include the NATO countries of Belgium, Canada, Denmark, France, Germany, Italy, Netherlands, Norway, and Great Britain, as well as Australia.

Schedule

Phase I, concept validation, was completed in 1979. During phase I, six block I satellites were launched, and an interim control segment was established at Vandenberg Air Force Base, California. Seven configurations of prototype user equipment sets were evaluated. The GPS Program successfully proceeded into full-scale engineering development, phase II, in June 1979.

Phase II involved the launch of four more block I satellites and the development of and transition to the operational control segment.

For the space segment, delivery of the first block II satellite slipped from August 1986 to January 1987 due to production problems. Launch of the first block II satellite slipped from January 1987 to February 1989 due to the halt in the space shuttle flights. The control segment full operational capability slipped from November 1987 to April 1991.

The GPS user equipment is currently in limited rate initial production. The next scheduled phase, milestone IIIB (full-rate production decision), was postponed 15 months, from March 1989 to June 1990, to permit time for completion of testing and reporting.

Deliveries

Thirty-two R&D user equipment units were delivered by January 1988. Production unit deliveries began in the fall of 1988.

Agreements

Since the system's inception, the participants have signed several agreements.

- The Army, Navy, Air Force, and Defense Mapping Agency signed the joint service charter in February 1975 during the demonstration and validation phase. This charter established the policy for managing and administering the resources and subsystems. It also directed the program to establish a primary GPS test range with each participating service funding and supporting its own unique testing requirements.
- The Department of Transportation signed an interagency agreement for the Coast Guard and the Federal Aviation Administration with DOD in 1984. This agreement established Transportation's responsibility for developing, testing, evaluating, installing, operating, and maintaining navigational aids, as specified in the Department of Transportation's statutes.
- The Marine Corps signed an MOU with the Air Force in October 1983. This agreement established the Marine Corps' responsibility for testing service unique requirements.

In addition to these agreements, the multiservice test plan, dated November 1987, established responsibility for the GPS phase III user equipment development, testing, and technical assistance for vehicle integration. Test planning was to be coordinated through the Multiservice Test Plan Working Group, which consisted of representatives from the Air Force, Army, Navy, Marine Corps, Defense Mapping Agency, and NATO.

Costs

According to the December 1987 SAR, the development estimate of total acquisition cost for GPS user equipment was about $4.9 billion. The current estimate for the total acquisition cost was $4.1 billion. The decrease in cost estimates was due to lower economic escalation indexes, decreased aircraft integration efforts, reduced aircraft modification efforts, and value engineering change proposals that reduced aircraft modification efforts.

Recent Reports

Satellite Acquisition: Global Positioning System Acquisition Changes After Challenger's Accident (GAO/NSIAD-87-209BR, Sept. 30, 1987).

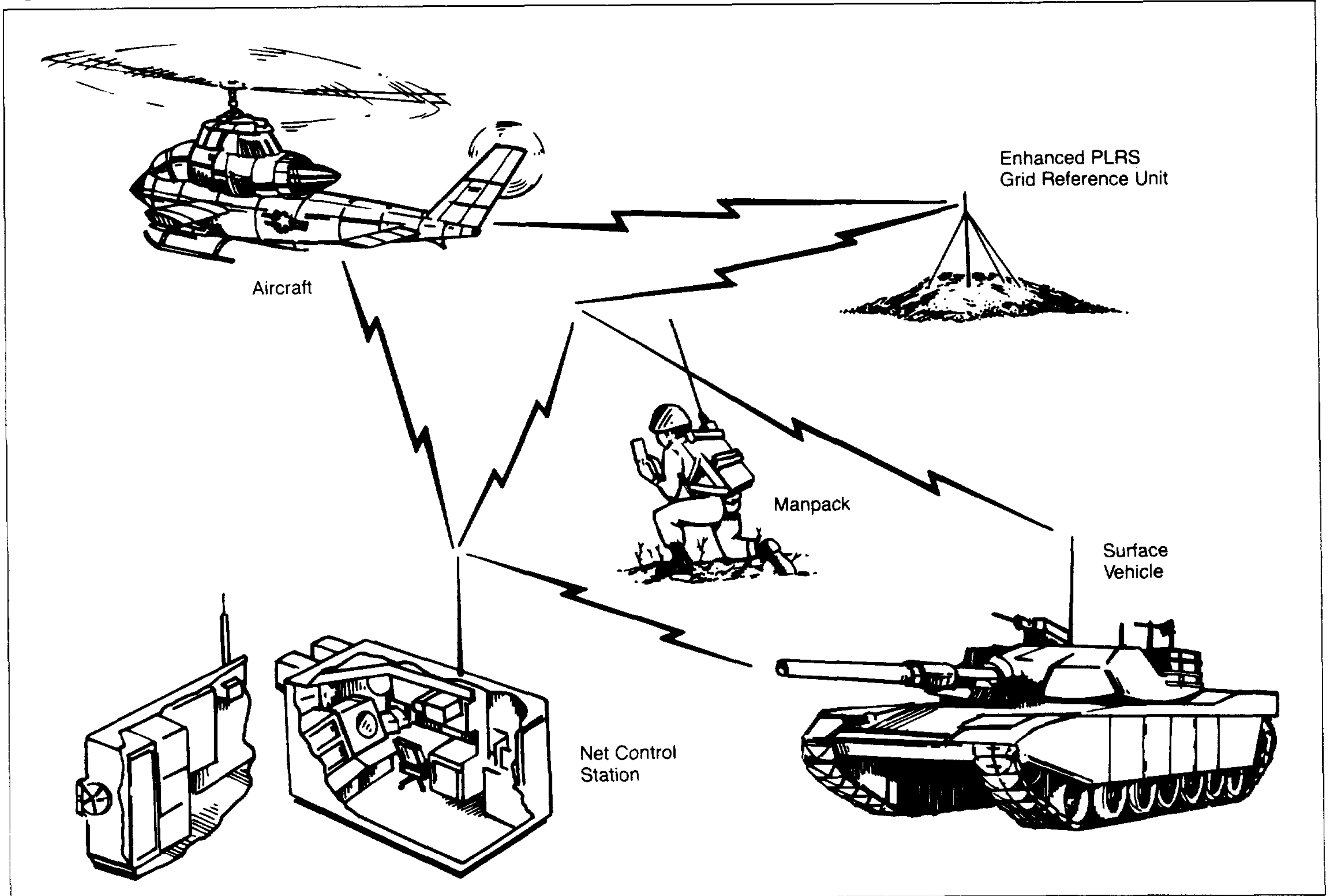
DOD Acquisition Programs: Status of Selected Systems (GAO/NSIAD- 87-128, Apr. 2, 1987).

PLRS

PLRS provides near real-time position location of field forces and coordinates fire and air support. The Marine Corps is procuring PLRS and the Army is procuring the EPLRS, which is a pre-planned product improvement. According to program officials, commonality between service participants is estimated at 60 percent based on parts.

In addition, program officials told us that EPLRS has jam resistant data communications capabilities. (Fig. III.14 depicts the EPLRS components.) In 1979, the Army received approval for EPLRS development. In 1982, the Army System Acquisition Review Council approved PLRS production and endorsed the accelerated, overlapping development strategy for EPLRS. In 1988, the Army council approved EPLRS' low rate initial production and endorsed concurrent development and production efforts.

Figure III.14: EPLRS Components



Source: EPLRS Program Office.

Service Participants

According to program officials, OSD mandated the joint PLRS Program. This multiservice R&D program dates back to 1963 when the Marine Corps issued a general operational requirement for an integrated position and navigation system. Subsequently, in 1973 the Army published a preliminary design study and concept formulation for a similar system and the Marine Corps invited the Army to participate in the system validation phase of PLRS development. A 1975 letter of agreement designated the Army as the lead service for the program.

Schedule

According to program officials, PLRS is currently in the production and deployment phase. This phase is about 18 months behind schedule due to reliability problems, but these problems have been resolved. The first phases of an EPLRS pre-planned, product improvement production contract were scheduled for 1988.

Deliveries

Cumulative deliveries for PLRS were 644 through December 1987. The first unit-equipped milestone was September 1987 for PLRS and is April 1992 for EPLRS.

Agreements

The joint services' operational requirements document for PLRS was approved in 1976 and updated in 1983.

An MOA signed by the Army and the Marine Corps in 1979 gave the Army project management, technical direction and procurement responsibility. The Army and the Marine Corps agreed to fund 60 percent and 40 percent, respectively, of the full-scale engineering development costs, less the costs of service-unique requirements. A 1982 MOA between the Marine Corps and the Army specified that the Marine Corps establish a software support center for PLRS at Camp Pendleton, California.

Costs

The shared contract cost estimates for PLRS in December 1987 were about $613.1 million. EPLRS costs could not be separately determined because they are included in the Army Data Distribution System. In December 1987, that system had a program acquisition cost of about $3.4 billion, including program costs for another component, JTIDS.

Recent Reports

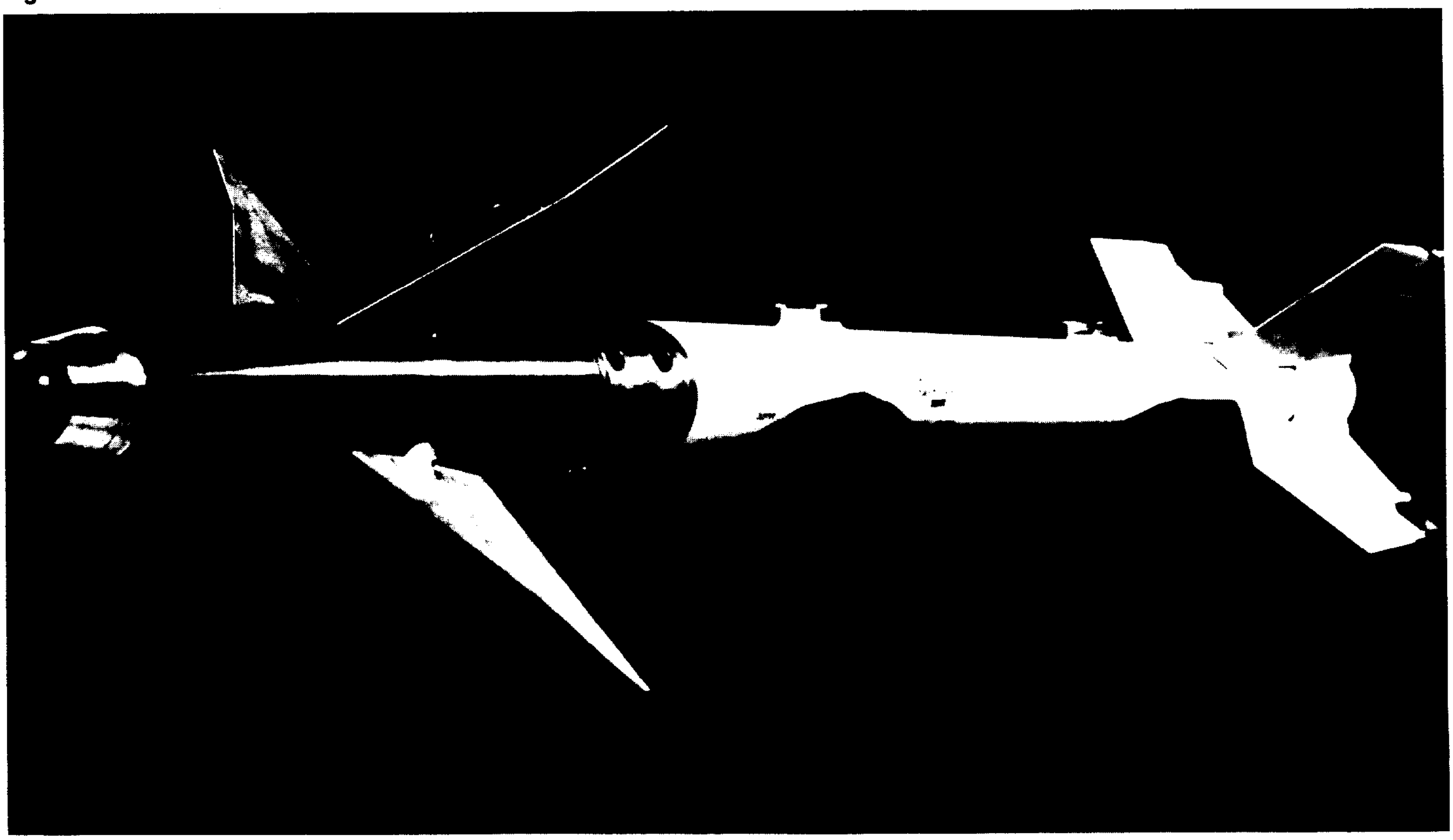
Battlefield Automation: Status of the Army Command and Control System Program (GAO/NSIAD-86-184FS, Aug. 26, 1986).

Sidewinder Missile

Sidewinder is an infrared, short-range air-to-air missile that is carried by Navy and Air Force fighter and attack aircraft. It was designed to improve combat in visual encounters, to be used against infrared countermeasures, and infrared clutter backgrounds, and to enhance close-in combat against advanced threat aircraft.

Because of the Navy and the Air Force interface in the development of the AIM-9L missile, the AIM-9M Program became a joint Navy-Air Force project in 1971. According to a program official, the program was made joint during the full-scale development phase and has achieved 95 percent commonality. (Fig. III.15 shows the Sidewinder Missile.)

Figure III.15: The Sidewinder Missile



Source: Sidewinder Program Office.

Service Participants

OSD mandated this program as a multiservice R&D effort. The Navy is the lead service for this program and the Air Force is the participating service. The Air Force participated with the Navy in early development on a limited basis. Full Air Force participation did not occur until late in the full-scale development phase. There was no demonstration and validation phase of AIM-9M because it was an outgrowth of AIM-9L.

Schedule

At the time of our review, the Sidewinder AIM-9M Program was in the production and deployment stage. Joint operational testing and evaluation were conducted between 1980 and 1981 on the AIM-9M. Specific test results are classified, but the AIM-9M was declared operationally effective based on its demonstrated capability in infrared countermeasures and adverse background environments.

The last year of procurement of the AIM-9M version was fiscal year 1988 for the Navy and is fiscal year 1989 for the Air Force. One program official told us that missile deliveries are expected to continue through 1992 in order to fulfill contract obligations. The Navy and the Air Force plan to begin Advanced Short Range Air-to-Air Missile procurements in 1997 or 1998. In the interim, the Navy is developing a follow-on upgraded missile, the AIM-9R, for Navy use. Operational testing for the AIM-9R is scheduled for 1991.

Deliveries

Deliveries under the approved AIM-9M Program are scheduled to end in fiscal year 1990 for the Navy and in 1992 for the Air Force. DOD officials told us that, in March 1989, the procurement estimates were 5,381 missiles for the Navy and 10,960 for the Air Force.

Agreements

The June 1971 program charter placed the Sidewinder under the direction of the Navy, delineated the project manager's responsibilities, and outlined the program's scope, operating relationships, organization, and resources.

A 1976 Air Force/Navy MOA addressed both the Sparrow and the Sidewinder and dealt with overall program management.

Costs

According to program officials, the Navy funded Sidewinder's R&D costs with the exception of Air Force-specific testing and aircraft integration. R&D unit costs for the Sidewinder Missile Program have increased due to the AIM-9R upgrade.

Procurement is funded by both services. As of December 1987, the total current AIM-9M cost estimate was $1.2 billion.

Fiscal year 1985 and prior estimates of procurement unit costs were about $0.08 million for the Navy and $0.07 million for the Air Force. Procurement unit costs have decreased to about $0.07 million for Navy procurement and to $0.06 million for the Air Force because of competing contractors and an increase in quantities procured.

Recent Reports

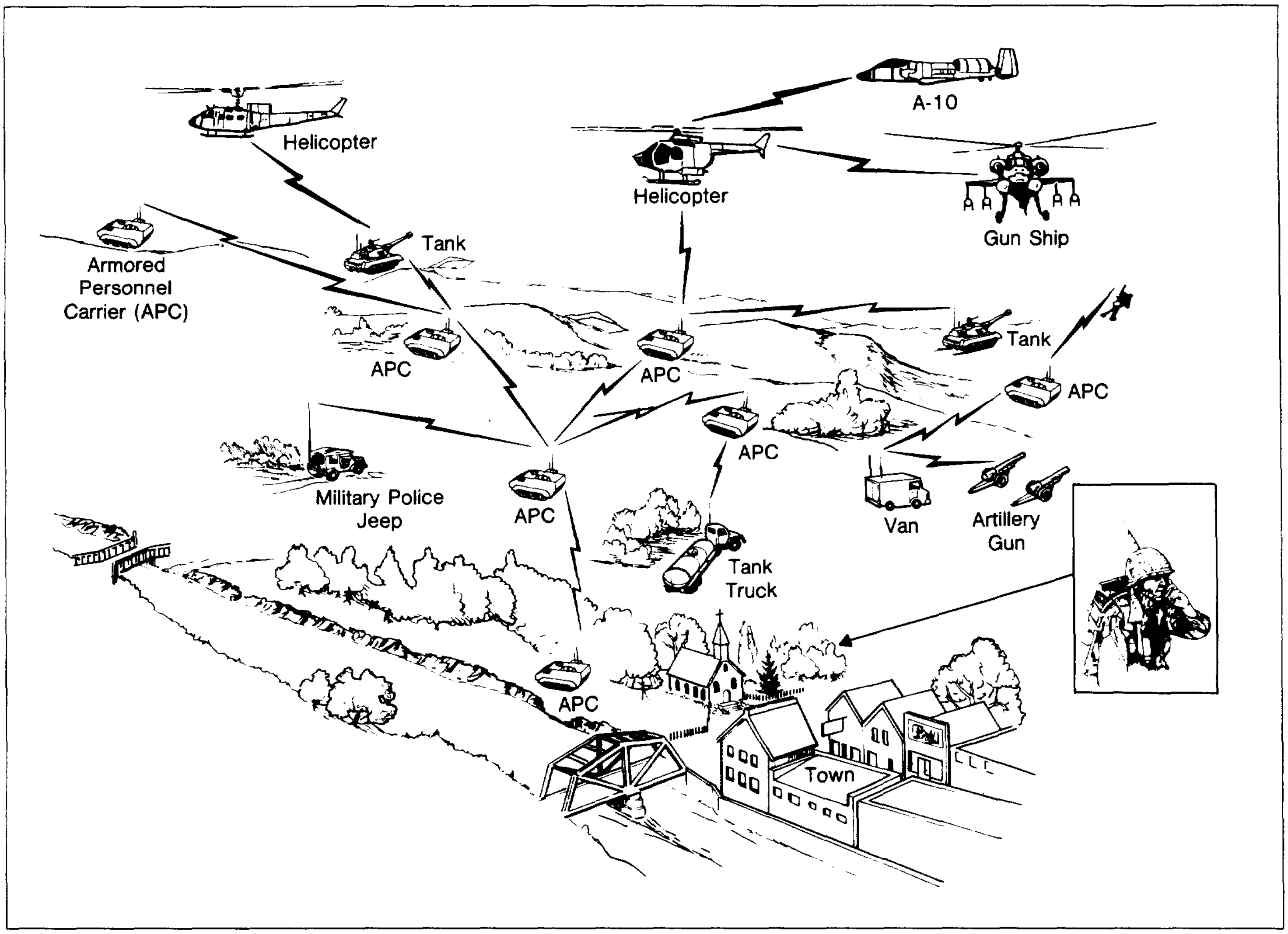
Nonrecurring Costs: Improvements Needed in DOD Cost Recovery Efforts (GAO/NSIAD-86-95, Apr. 18, 1986).

SINCGARS

SINCGARS is a new family of very high frequency anti-jam radios that will be smaller, lighter, and more reliable than the Vietnam-era radios currently in use. (See fig. III.16 for an illustration of the battlefield communication links provided by SINCGARS.) The new radios also have jam resistant capabilities and will be capable of transmitting voice and tactical data. SINCGARS will provide the primary means of command and control for infantry, armor, and artillery units. The radios will be used by troops on the ground, in vehicles, and aboard aircraft. According to a program official, commonality among service participants will be 100 percent.

The Army issued a required operational capability document in 1974 that stated the need to develop a new family of radios to meet the Army's tactical communications requirements in the 1980s. In March 1976, JCS forwarded a memorandum to the Secretary of Defense validating a joint operational requirement for the single channel tactical radios and for the development of communications and security equipment. The joint operational requirements document was updated in 1983. According to program officials, all of the services are involved in the procurement of the ground version of the SINCGARS radios. The Navy is developing a shipboard version for its use, and the Air Force is developing its own airborne radio although in January 1985, we recommended (GAO/NSIAD-85-50) that OSD evaluate the benefits of re-establishing a joint program to develop an airborne very high frequency radio to satisfy both Army and Air Force requirements. Interoperability of the different Navy/Air Force versions of the radios, however, is an essential element of the program.

Figure III.16: Communication Links Provided by SINCGARS



Source: The SINCGARS Program Office.

Service Participants

The Army is the lead service for the SINCGARS multiservice procurement program. The Marine Corps, Air Force, and Navy are program participants and plan to buy SINCGARS radios through the Army. The joint operational requirements document identifies requirements by all services for SINCGARS radios. However, according to program officials, the services did not actively participate in the program until 1985 when the Navy provided funding for the purchase of SINCGARS radios for its special forces.

Schedule

First article testing, which began in August 1985, showed that the ground radio did not meet the reliability requirement for mean time between failures. The program experienced several schedule delays during development due to the reliability problems. We reported in June 1988 (GAO/NSIAD-88-160) that reliability testing was successfully completed in January 1988, at which time the Army began to accept production models. According to program officials, the follow-on operational test and evaluation was completed in May 1988.

SINCGARS is currently in the initial production phase. A contract award to begin full-rate production is scheduled for fiscal year 1989.

Deliveries

As of December 1987, 310 early production model ground radios were delivered to the Army for use in testing and to support the fielding to forces in Korea. Delivery of the airborne radios was scheduled to begin in September 1988.

Agreements

The SINCGARS program charter, which the Army signed in May 1976, identifies the program manager, defines this manager's roles and responsibilities, and identifies the program management office. The only joint document for this program is the joint operational requirements document that was validated by JCS in 1976 and updated in 1983.

Costs

The December 1987 current estimate of program acquisition cost was $5.2 billion for the Army only. The Navy, Marine Corps, and Air Force requirements were $493.5 million, which results in a total program cost of about $5.7 billion. The Army's current estimates have decreased by $400 million from the production estimates because of changes in inflation indexes, a reduction in the quantity of 1,329 radios, and changes in support, including reduced requirements for radio spares and a reclassification of initial spares from procurement to the Army stock fund.

Recent Reports

Combat Radios: Army's Selection of SINCGARS' Second-Source Contractor (GAO/NSIAD-88-200, July 7, 1988).

DOD Acquisition Programs: Status of Selected Systems (GAO/NSIAD-88-160, June 30, 1988).

Battlefield Automation: Army Command and Control Systems Acquisition Cost and Schedule Changes (GAO/NSIAD-88-42FS, Dec. 9, 1987).

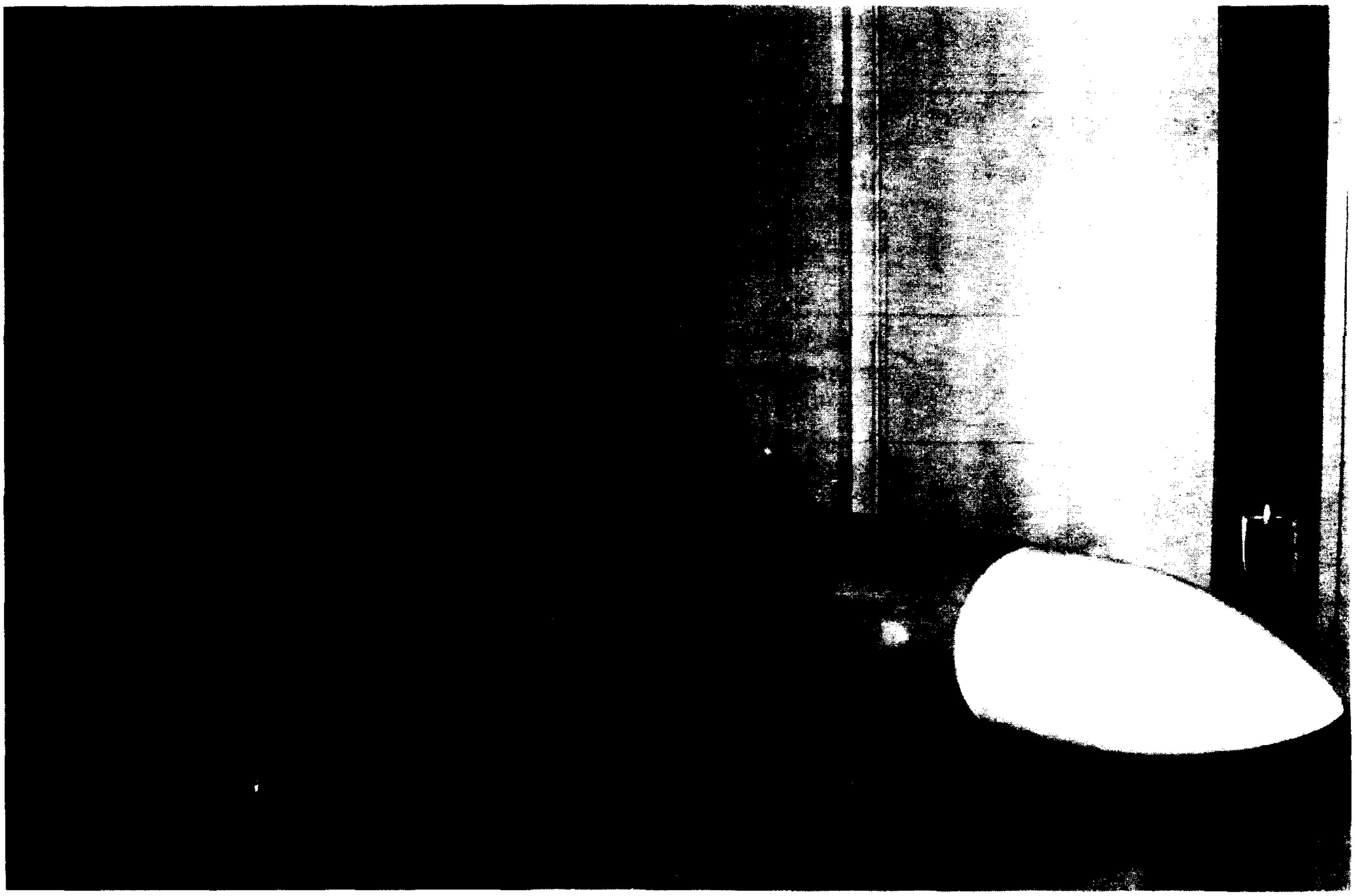
Battlefield Automation: Status of the Army Command and Control System Program (GAO/NSIAD-86-184FS, Aug. 26, 1986).

Separate Army and Air Force Airborne SINCGARS Programs May Be Uneconomical (GAO/NSIAD-85-50, Jan. 31, 1985).

Sparrow Missile

The Sparrow III/IV Air-to-Air/Ship-to-Air Missile, AIM/RIM-7M, is a semiactive, radar-guided missile used in air-to-air and ship-to-air applications in several U.S., allied, and NATO weapon systems. Its mission is to destroy a broad spectrum of airborne targets from all aspects, in all weather conditions, and in a variety of countermeasure environments. Program officials told us that the AIM/RIM-7M is an upgrade and replacement for the AIM-7F, to provide more missile firepower and capability, and to develop a reliable medium range attack missile for combat aircraft. (See fig. III.17 for a photograph of the Sparrow Missile.)

Figure III.17: The Sparrow Missile



Source: Sparrow Program Office.

According to program officials, the joint services' operational requirements for the Sparrow are included in the April 1979 decision coordinating paper.

Air Force procurement of the Sparrow AIM/RIM-7M is projected to end after fiscal year 1989. The Navy is superseding the AIM/RIM-7M with development of a Sea Sparrow AIM/RIM-7P upgrade. In addition, a Radio Development Capability Sparrow Missile Homing Improvement Program was started in fiscal year 1989 to counter a significant emerging threat. Both services are planning to eventually shift from procurement of the Sparrow to the AMRAAM. Meanwhile, production of the AIM/RIM-7M will continue into the 1990s. Officials from the program office told us that the missile has 100 percent commonality for both service participants.

Service Participants

OSD initiated the Sparrow as a multiservice R&D effort in 1968. The Navy is the lead service for the Sparrow. According to program officials, the Air Force joined the Sparrow program in 1968 during the full-scale development phase. As a result, the Air Force had a limited role in the basic design of the AIM/RIM-7M and its predecessor—the AIM-7F.

Schedule

At the time of our review, the AIM/RIM-7M was in the final production and deployment phase.

Deliveries

Planned and actual scheduled deliveries were 44 for R&D. As of March 1989, the total planned procurement quantity was 15,544—8,994 for the Navy and 6,550 for the Air Force.

Agreements

The November 1976 charter specifies the operating relationships between the Navy and the Air Force. A 1976 MOA between the Navy and the Air Force outlines the Sparrow's mission and the services' authority and responsibilities.

Costs

As of December 1987, the development estimate of the total program cost was $1.3 billion, and the current total program estimate was $2.8 billion. This increase is due to changes in escalation rates, milestone slippages, and an increase in procurement quantities of 4,449 missiles.

Recent Reports

Quality Assurance: Concerns About Four Navy Missile Systems (GAO/NSIAD-88-104, Mar. 24, 1988).

Stinger Missile

Stinger is a portable air defense weapon designed to engage low flying aircraft. The system includes the missile, a reusable gripstock, and related ancillary equipment. (See fig. III.18, which shows the Stinger.)

The basic system has undergone two major modifications—the passive optical seeker technique and the reprogrammable microprocessor—to defeat current and future infrared counter-countermeasures.

Figure III.18: The Stinger Missile

Source: Stinger Program Office.

Service Participants

According to program officials, Stinger is a service initiated multiservice procurement effort that began in 1979 during the production and deployment phase. The Army is the designated developer of the Stinger Missile System, and the Navy, Marine Corps, and Air Force procure the Stinger through the Army. The project manager's charter specifies the Army's role in developing and acquiring the Stinger. The 1985 version is currently superseding the 1984 version of the Stinger that used the passive optical seeker technique. A program official told us that the missile configuration bought by the other services is exactly the same as the Army's version, and so commonality is 100 percent among service participants.

Schedule

Engineering development for the basic Stinger began in May 1972, and production began in 1978. To counter a more advanced threat, engineering development for the passive optical seeker technique missile began in May 1977. In 1984, the Army directed the reprogrammable microprocessor improvement. Engineering development began in September 1984. Production of the Stinger that uses the reprogrammable microprocessor began in fiscal year 1985.

At the time of our review, the Stinger Missile System was in the production and deployment phase. The Army was addressing a performance problem with the reprogrammable microprocessor missile, specifically, a software-related problem caused by an electronic component. The program office expected that the correction could be identified and incorporated by January 1989.

Deliveries

All 214 R&D and 9,500 procurement quantities of the basic Stinger and passive seeker missiles have been delivered. A total buy of 63,278 Stingers is planned.

In December 1987, nine reprogrammable microprocessor missiles were planned under the R&D program. According to a program official, production of these missiles was on schedule through March 1989, but missiles will not be accepted until the problems with an electronic component are corrected.

Agreements

According to a program official, there are no joint agreements between the Army and other services for the Stinger Missile System.

Costs

According to the December 1987 SAR, the Stinger total program development estimate was $473.8 million while the current estimate was $3.3 billion. The Army attributes the $2.8 billion increase to a quantity increase of 40,076—almost three times the number originally planned—changes in inflation indexes, revised cost estimating methodology, and engineering changes that included development of major modifications.

Recent Reports

DOD Simulations: Improved Assessment Procedures Would Increase the Credibility of Results (GAO/PEMD-88-3, Dec. 29, 1987).

Army Inventory Management: Inventory and Physical Security Problems Continue (GAO/NSIAD-88-11, Oct. 9, 1987).

Defense Budget: Potential Reductions to Missile Procurement Budgets (GAO/NSIAD-87-206BR, Sept. 10, 1987).

Procurement: Assessment of DOD's Current Multiyear Candidates (GAO/NSIAD-86-176BR, Sept. 8, 1986).

Defense Budget: Potential Reductions to Army and Marine Corps Missile Budgets (GAO/NSIAD-86-158BR, Aug. 6, 1986).

Potential Dollar Reductions to DOD's FY 1986 Missile and the Lightweight Multipurpose Weapon Procurement Programs (GAO/NSIAD-85-138, Sept. 9, 1985).

SDI

The goal of the SDI research and technology program is to provide the basis for an informed decision regarding the feasibility of (1) eliminating the threat posed by nuclear missiles of all ranges and (2) increasing the contribution of defensive systems to U.S. and allied security. Within this goal, the SDI Program is oriented to protect options for near-term deployment of limited ballistic missile defenses as a hedge against Soviet violation of the Anti-Ballistic Missile Treaty. Program emphasis is on non-nuclear technologies capable of engaging ballistic missiles and warheads at all points along their trajectories from launch to near impact.

Former President Reagan initiated the SDI Program in a March 1983 speech. According to program officials, OSD established the SDI Program and the SDIO in an interim charter in April 1984. SDI is a cooperative development program because most of the R&D activities now comprising SDI were in existence under other agencies at the time the program office was established. These activities and the budgets for them were centralized and transferred to SDIO with submission of the fiscal year 1985 budget to the Congress.

In September 1987, the Defense Acquisition Board approved SDI as a major system new start. The participating services and agencies remain responsible for the execution of those portions of the SDI Program for which they had previously been responsible. As a result, commonality is not applicable to the SDI Program.

The JCS developed and approved phase I ballistic missile defense operational requirements in June 1987 as a performance goal for the first increment of deployed capability. The Unified Space Command will provide additional operational requirements based on evolving basic SDI mission needs. The requirements will be changed and updated incrementally as the program matures.

Service Participants

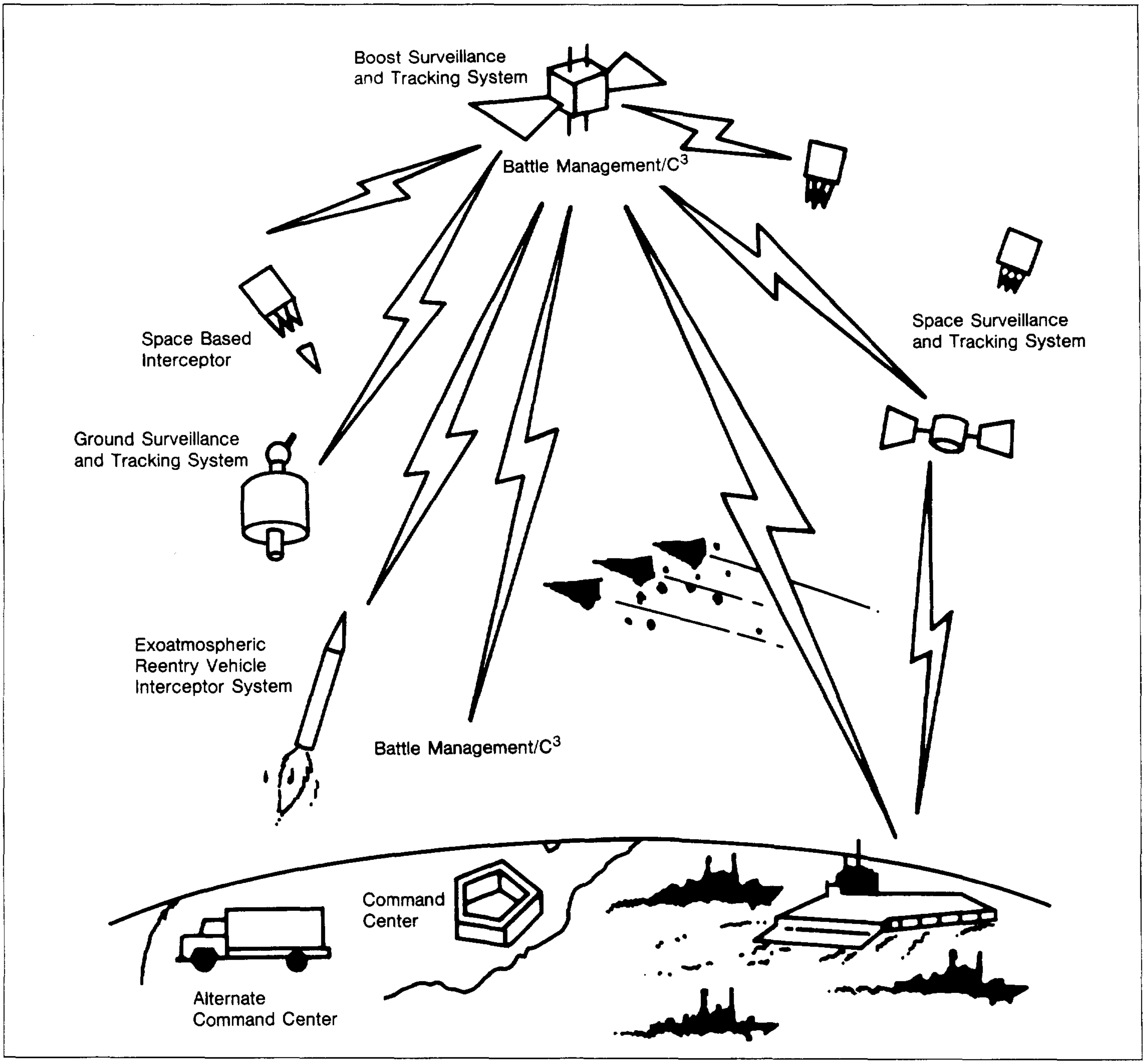
SDIO is the lead agency for the SDI Program. According to program officials, Army, Navy, Air Force, and DARPA joined SDI in 1984 in the concept exploration phase. NASA, the Department of Energy, Defense Nuclear Agency, and Uniformed Services University of Health Sciences joined in 1985. NSA and the Central Intelligence Agency joined in 1986, and the Defense Logistics Agency and the Arms Control and Disarmament Agency joined in 1987. These participating services/agencies all have military and civilian personnel assigned and co-located at SDIO.

Schedule

Concept exploration has been completed for six phase I technologies, which entered the demonstration and validation phase in September 1987. The six technologies include the Boost Surveillance and Tracking System, the Space-Based Surveillance and Tracking System, the Space-Based Interceptor, the Exoatmospheric Reentry Interception System, the Ground-Based Surveillance and Tracking System, and the Battle Management/Command, Control and Communications. (Fig. III.19 shows this concept of the Strategic Defense System.) The Ground-Based Radar technology, with the Army as lead, was expected to be awarded milestone I status in the spring of 1989 and become another phase I element.

Program officials told us that SDI testing to date has been at the component and subcomponent level to validate and evaluate each technological development. Test planning for the demonstration and validation phase is now in progress. Program officials expect the demonstration and validation phase, which is currently ongoing, to continue until the mid-1990s when full-scale development is scheduled to begin. An IOC has not yet been determined.

Figure III.19: One Concept of the Strategic Defense System



Source: SDIO.

Deliveries

Program officials told us that the program is still in early R&D, and deliveries are not applicable.

Agreements

Program officials told us that, in April 1984, OSD signed an interim charter establishing SDIO. Since then, DOD Directive 5141.5 has been issued as the SDI charter. It was updated in June 1987. This directive assigns certain responsibilities (i.e., organizing SDI staff and establishing interagency relationships) to its director.

To date, 20 MOA/MOUs have been signed between SDIO, U.S. allies, services, agencies, and other organizations. In addition, SDIO issues workpackage directives to services/agencies to provide funding and direction for work conducted by these organizations in support of the SDI Program. SDI Program management is implemented through these directives.

Costs

Cost information for the SDI Program, when aggregated over the 5-year defense plan, is classified. Program officials told us that SDI funding is expended by multiple services and agencies. Funding for the SDI Program is in both the DOD and Department of Energy budgets.

Recent Reports

Strategic Defense Initiative Program: Status of Space Surveillance and Tracking System (GAO/NSIAD-88-61, Nov. 10, 1987).

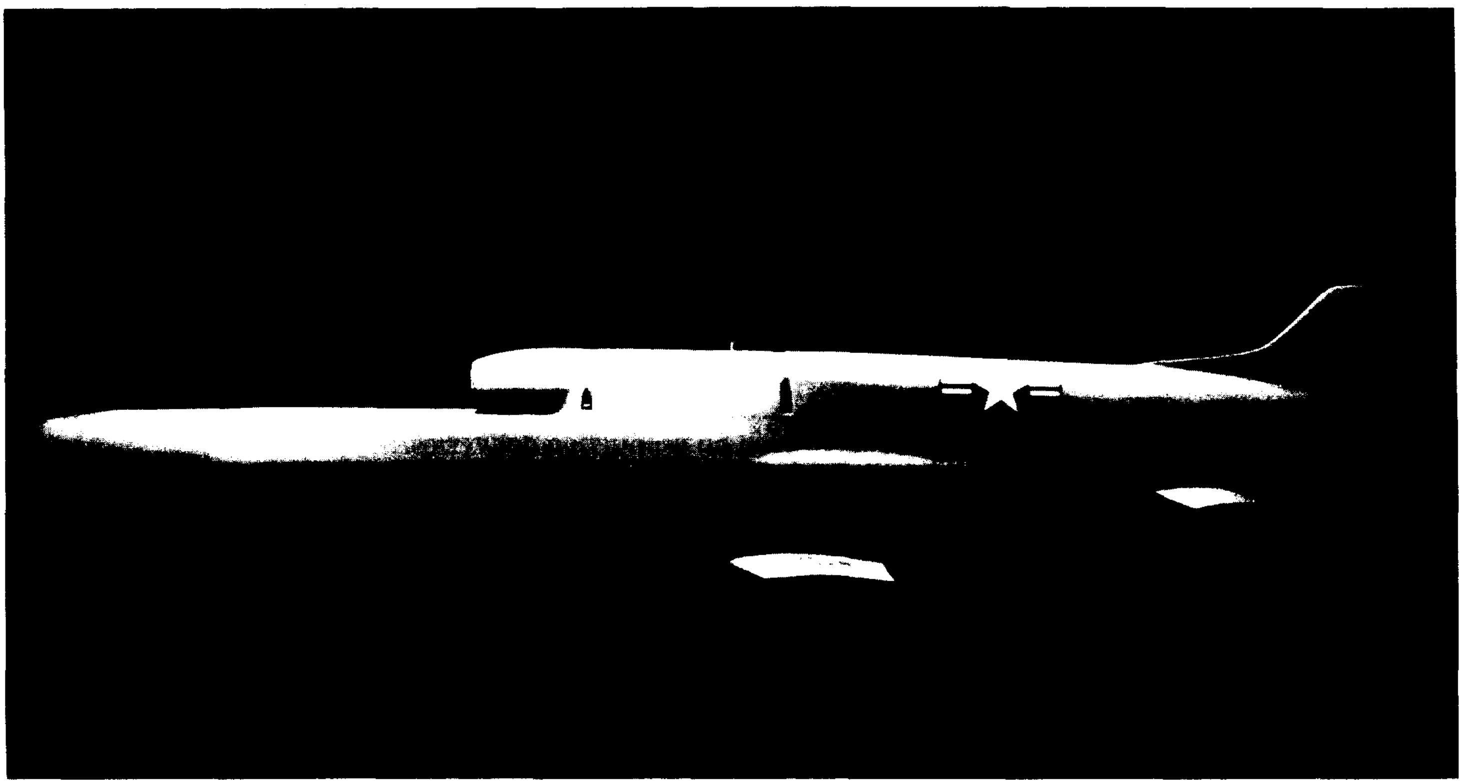
Defense Budget and Program Issues Fiscal Years 1988 and 1989 (T-NSIAD-87-3, Feb. 19, 1987).

DOD Acquisition: Case Study of the Air Force Space Based Space Surveillance System (GAO/NSIAD-86-45S-17, July 31, 1986).

Tacit Rainbow Missile

The Tacit Rainbow Program is intended to provide a low cost, programmable before launch, loitering, attack missile system capable of searching out and attacking enemy radar targets. This system is to be used to support mission areas such as defense suppression, counter air, interdiction, and close air support/battlefield air interdiction. The air-launched Tacit Rainbow Missile will be carried externally on the Navy A-6E and internally on the Air Force B-52G. The ground-launched Tacit Rainbow will be integrated with the Army Multiple Launch Rocket System. (Fig. III.20 shows the Tacit Rainbow Missile.)

Figure III.20: The Tacit Rainbow Missile



Source: Tacit Rainbow Program Office.

Service Participants

According to program officials, OSD directed tri-service participation in this multiservice R&D program. The Air Force is the lead service for both the ground- and air-launched versions of the missile. Program officials told us that the Navy decided to join the program in July 1982 prior to full-scale development and is participating in the air-launched version of the missile. Subsequently, the Army joined in October 1984, also prior to full-scale development, and is a participant in the ground-launched version. The Army, Navy, and Air Force signed a classified joint operational requirements document in May 1985, and updated it in December 1988. According to program officials, the tri-service requirements were passed down after the design requirements for the air-launched Tacit Rainbow had already been determined.

Program officials told us that a December 1987 Air Force program management directive requires that the services maximize commonality between the air- and ground-launched versions of the Tacit Rainbow

Missiles; however, it does not specify that a percent commonality be achieved.

Schedule

According to program officials, the Tacit Rainbow Missile was in full-scale development at the time of our review. Development test and evaluation/initial operational test and evaluation was scheduled for April 1989. The program office indicated that testing was behind schedule because of a lack of quality control at the contractor's plant. Further delays have slipped the milestone IIIA production decision to August 1990.

Deliveries

There have been no production deliveries.

Agreements

According to a program official, the Air Force has signed an MOA with the Navy, but has not yet signed an MOA with the Army. However, a draft MOA is under review. A classified test and evaluation master plan has been prepared for the program.

Costs

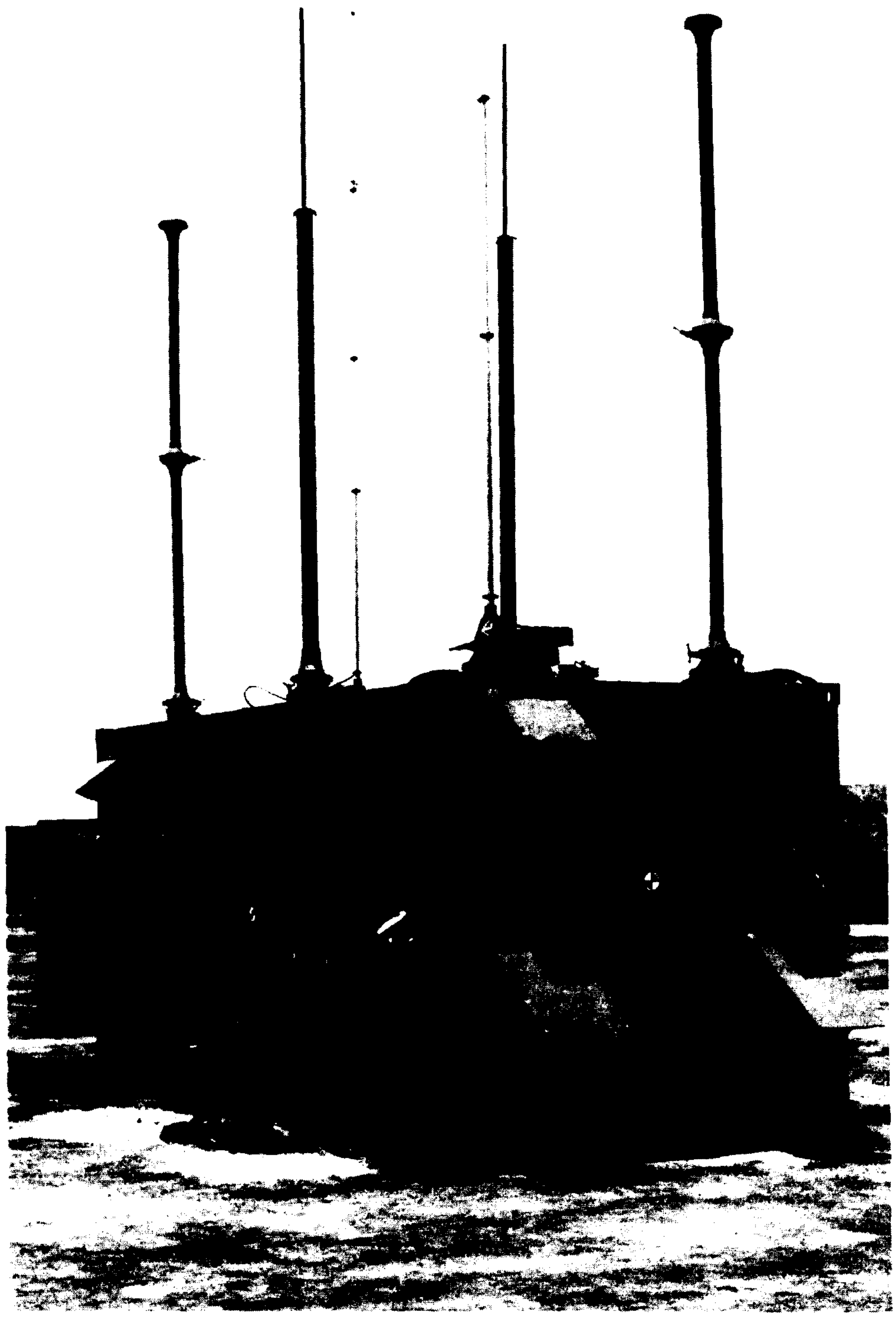
As of December 1987, the total program cost was about $3.7 billion. Of the total, about $149.7 million was for R&D, $3.6 billion was for procurement, and $8.5 million was for construction.

TAOM/MCE

TAOM/MCE is an automated transportable system capable of controlling aircraft in offensive and defensive roles. It is a joint program comprised of the Marine Corps' TAOM Program and the Air Force's MCE Program. MCE was designed to maximize commonality with TAOM, and is intended to replace air surveillance and control operation centers of the Tactical Air Control System. According to a program official, the TAOM and MCE portions of the joint program are almost the same; and as a result, descriptions of the individual programs may be applied to the joint TAOM/MCE system. Key system functions of TAOM/MCE include weapons control, surveillance/identification, air space management, electronic warfare, and communications. Improvements to these surveillance and control elements include: increased automation of the operations and maintenance functions and tactical data links; increased mobility, survivability, flexibility, and information processing capability; redundant communications and computers; and improvements in operator-machine interfaces. (Fig. III.21 shows the modular control equipment.)

A program official told us that there are no joint operational requirements. The Air Force and Marine Corps requirements are identified in two separate system specifications. About 80 percent commonality has been achieved between TAOM and MCE. The percentage of commonality has increased due to the Air Force's adoption of Marine Corps power requirements and the Marine Corps' adoption of certain Air Force software.

Figure III.21: Modular Control Equipment



Source: MCE Program Office.

Service Participants

TAOM/MCE is a multiservice R&D program. According to a program official, in 1980, the Congress directed the Air Force to evaluate existing or ongoing developmental systems against the requirements that the MCE system is intended to meet. The Air Force found that the Marine Corps' TAOM system met approximately 75 percent of their requirements. The Air Force joined the Marine Corps' TAOM full-scale engineering development effort in July 1982. The Marine Corps, in effect, developed a baseline system to which the Air Force would make modifications.

Schedule

The Marine Corps began the development test for TAOM/MCE in 1983 and completed it in May 1986. The Air Force development test program for service unique requirements was completed in May 1986. The Marine Corps operational test was completed in October 1986. The Air Force initial operational test program was completed in January 1987. The Marine Corps and the Air Force shared test data where applicable.

At the time of our review, the MCE system was in a low rate initial production phase, which began in December 1986. TAOM and MCE production contracts were awarded in May 1987. The MCEcontract includes priced options for fiscal years 1988 and 1989. IOC for the MCE and TAOM is scheduled for fiscal year 1990.

Deliveries

Program officials told us that there have been no deliveries to date. The first MCE system is scheduled for delivery in September 1990. Air Force requirements for MCE operations modules have decreased, reducing the number to be procured from 182 to 155.

Agreements

A July 1982 MOA between the Marine Corps and the Air Force and a July 1982 charter on the management of the joint program established the management relations between the two services' program offices. It also identified the respective areas of responsibility for the TAOM/MCE joint full-scale engineering development effort.

Program officials said that a full-scale engineering development MOA between the Air Force and Marine Corps was in effect through May 1987. At the time of our review, a draft MOA on production, dated January 1988 and agreed to by both parties, was at the Space and Warfare Systems Command for coordination.

Costs

The program is funded by both the Air Force and the Marine Corps. According to estimates provided by the program office, the total program cost is $1.6 billion.

TMD

The TMD Program provides for the acquisition and integration of a family of systems for near and longer terms. The program consists of four operational concept elements: (1) active defense, (2) a command and control function, which includes battle management C3I, (3) counterforce measures, and (4) passive defense.

The TMD system is intended to be a mix of existing and developmental systems and technologies; therefore, various systems will be considered as potential components. For example, the Patriot Antitactical Missile capability will comprise the active defense element of TMD for the near term. The concept for tactical missile defense is to counter the Soviet tactical missile capability, to include short-range ballistic missiles, cruise missiles, and air-to-surface missiles.

Service Participants

In January 1982, OSD directed the Army to be the lead service in developing a joint antitactical missile capability. In December 1986, the Army Chief of Staff initiated a tactical missile defense special task force and invited the individual services to provide representatives.

According to a program official, the Army's joint participation with the Air Force and the Marine Corps began in 1986, which was during the concept exploration phase. Thus, the program is a multiservice R&D effort. Since the program is in early R&D, the baseline program has yet to be determined and percent commonality cannot be determined.

In January 1987, OSD assigned lead responsibility to the Army for management of the TMD Program and specified that the TMD would be managed by the Joint Theater Missile Defense Project Manager. The systems included in TMD are managed or programmed to be managed by separate elements of the Army, Air Force, Navy, or other DOD components. The project managers for the TMD systems will continue to report to their respective services.

Schedule

According to a program official, the entire TMD Program is in the concept exploration phase, and as of November 1988, the Army had not scheduled decision milestones for any program element.

Deliveries

Because the program is not fully defined, a program official told us that the types and quantities of equipment to be procured and delivered have not been determined.

Agreements

The JCS approved the tactical missile defense joint operational requirements statement in March 1988. The JCS also approved the joint tactical missile defense operational concept, which describes how the four operational concept elements should function to provide an efficient and effective response to the tactical missile threat.

Cost

As of December 1987, the program office estimated TMD acquisition costs to be $2.9 billion, of which, according to Army estimates, $1.6 billion is for R&D and $1.3 billion is for procurement through 1994. Unit cost estimates have not been developed because the proposed candidate components have not been selected.

TOW

The TOW Missile is a heavy antitank/assault weapon system. The TOW Missile is a crewportable or vehicle-mounted system primarily designed to attack armored vehicles. The Army uses it on the Cobra helicopter, the HMMWV, the M151 jeep, and the Bradley Fighting Vehicle. The Marine Corps also uses the TOW Missile.

Various versions of the TOW Missile have been produced since the Army fielded the basic TOW in September 1970. At the time of our review, the Army was producing and fielding a fourth generation missile, the TOW 2A, and had recently awarded an R&D contract for a more advanced TOW 2B Missile. TOW 2B was initiated as a product improvement program for development of a warhead and sensor system that will allow the missile to overfly and fire down into the target.

Program officials told us that several improvements to the TOW 2A Missile have been proposed. However, the Marine Corps may not choose all improvements and has not made a decision to buy the TOW 2B.

According to program officials, Army and Marine Corps TOW Missiles are about 95 percent common. The only difference between the Army and Marine Corps missile is in the platform. (The TOW 2 Missile Launcher is shown in fig. III.22.)

Figure III.22: The TOW 2 Missile Launcher

Source: TOW Program Office.

Service Participants

The TOW Missile system is a multiservice procurement program in which the Army is the program manager and the Marine Corps is a customer. The project manager's charter explains the Army's role in developing and acquiring TOW. The 1982 charter was superseded in 1985 with the current version.

According to program officials, the Marine Corps decided to buy TOW based on its field requirements for a battle scenario. The Marine Corps was to provide operational requirements and developmental funding for the ground and airborne versions of the TOW Missile. Program officials told us that the Marine Corps first provided R&D funds in fiscal year 1965 during full-scale development and provided procurement funds in fiscal year 1974.

Program officials also stated that the Marine Corps does not have an officer assigned to the program office, but a Marine Corps liaison officer is assigned to the Close Combat Missiles Program Executive Office as the Deputy Program Executive Officer. This officer acts as a liaison and oversees Marine Corps participation in several missile command programs, including the TOW Missile. Other Marine Corps personnel have been involved on a temporary basis for testing.

Schedule

At the time of our review, the TOW 2A Missile was in the production and deployment phase, which began in April 1987. The first lot of TOW 2A production missiles successfully passed fly-to-buy testing in June 1987, and fielding began in September 1987. Production of the TOW 2A will continue until the TOW 2B is ready for production. Administrative delays and funding reductions delayed TOW 2B milestones by 1 year. Demonstration and operational testing of the TOW 2B is scheduled for completion in April 1990. As of March 1988, production of the TOW 2B was scheduled to begin in April 1991.

Deliveries

By December 1987, the Army had received 57,600 of the 74,600 production missiles it scheduled for delivery.

Agreements

The project manager charter, signed in March 1985, outlines the project manager's responsibilities, including developing and acquiring the system, providing integrated logistics support, and managing resources.

The Navy and the Marine Corps are listed as special participating agencies that provide operational requirements and funding for the TOW/TOW 2 Missiles.

Costs

According to the December 1987 SAR, the current R&D estimate for the TOW 2 is $143.2 million. The procurement estimate for fiscal years 1981 through 1992 is $2.3 billion. The total program cost for TOW 2 is $2.4 billion.

Recent Reports

Defense Budget: Potential Reductions to Missile Procurement Budgets (GAO/NSIAD-89-17, Nov. 18, 1988).

DOD Acquisition Programs: Status of Selected Systems (GAO/NSIAD-88-160, June 30, 1988).

Antitank Weapons: Current and Future Capabilities (GAO/PEMD-87-22, Sept. 17, 1987).

Defense Budget: Potential Reductions to Missile Procurement Budgets (GAO/NSIAD-87-206BR, Sept. 10, 1987).

Procurement: Assessment of DOD's Multiyear Contract Candidates (GAO/NSIAD-87-202BR, Aug. 31, 1987).

Iran Arms Sales: DOD's Transfer of Arms to the Central Intelligence Agency (GAO/NSIAD-87-114, Mar. 13, 1987).

Defense Budget: Potential Reductions to Army and Marine Corps Missile Budgets (GAO/NSIAD-86-158BR, Aug. 6, 1986).

Army Budget: Potential Reductions to Aircraft Budgets (GAO/NSIAD-86-143BR, June 20, 1986).

Nonrecurring Costs: Improvements Needed in DOD Cost Recovery Efforts (GAO/NSIAD-86-95, Apr. 18, 1986).

Bradley Vehicle: Concerns About the Army's Vulnerability Testing (GAO/NSIAD-86-67, Feb. 14, 1986).

Potential Dollar Reductions to DOD's FY 1986 Missile and the Lightweight Multipurpose Weapon Procurement Programs (GAO/NSIAD-85-138, Sept. 9, 1985).

UH-60A Black Hawk Helicopter

The UH-60A Black Hawk is a twin engine helicopter used by the Army in the performance of the air assault, air cavalry, and aeromedical evacuation missions. It transports troops and equipment into combat, resupplies the troops while in combat, and performs the associated functions of aeromedical evacuation, repositioning of reserves, and command and control. The Air Force uses the UH-60A for missions such as its search and rescue operations. Commonality between the Army and the Air Force for the UH-60A is 100 percent. The Navy uses the SH-60B Sea Hawk that has an airframe similar to the Army UH-60A. Program officials told us that the Navy procures its airframe directly from the contractor, Sikorsky Aircraft, and procures its version of the General Electric engines through the Army. (See fig. III.23 for a photograph of the UH-60A.)

Figure III.23: The UH-60A Black Hawk Aircraft

Source: Black Hawk Program Office.

Service Participants

The Army is the purchasing agent for the UH-60A aircraft, which the Air Force has bought since about 1982. The Air Force initiated the multiservice procurement when the UH-60A was in the production and deployment phase. Program officials told us that the Air Force procured a total of 11 UH-60As through the Army with deliveries in 1983. The Air Force procured another nine aircraft, which were delivered in December 1987. An additional 16 aircraft (for a total of 36) were scheduled for delivery to the Air Force at the time of our review.

Schedule

The UH-60A Program is in the production and deployment phase. In June 1971, the UH-60A Program was approved for full-scale development. The first production aircraft was delivered to the Army in October 1978, and IOC was November 1979. A program official told us that as a result of the Army aviation modernization plan, the Army increased the Black Hawk Program procurement objective, in February 1989, from the original procurement baseline of 1,107 to 2,253 aircraft. The Army is also working on a 4-year development program to improve the Black Hawk aircraft. This effort is planned as a multistage improvement program.

The Army Aviation Systems Command signed multiyear contracts with:

- Sikorsky Aircraft in January 1988 to provide 252 UH-60A Black Hawk airframes over a 4-year period (fiscal years 1988-91).
- General Electric Company, Aircraft Engines Division in May 1988 to provide 1,156 T700 series engines for H-60 Black Hawk and Sea Hawk helicopters (fiscal years 1989-93).

According to the December 1987 SAR, the Army UH-60A's increased weight, which was due to design revisions and added mission capabilities, has resulted in a degradation of the vertical climb in feet per minute from 450 to 327 and cruise speed in knots from 145 to 137 in the current production configuration. These performance thresholds are expected to be regained in October 1989, with the incorporation of an upgraded engine.

Deliveries

According to program officials, total procurement amounted to 937 aircraft through fiscal year 1988. The 937 aircraft were delivered through calendar year 1988. The Army received most of the 1988 deliveries. The Air Force received 16 aircraft, the Drug Enforcement Agency received 4 aircraft, and the Army National Guard received 2 aircraft. Through February 1989, the Army has procured 1,003 aircraft and the Air Force has procured 45.

Agreements

Program officials told us that there were no joint agreements for development of the aircraft.

Costs

According to the December 1987 SAR, the Army's R&D estimate was about $591 million, and the procurement estimate was about $5.9 billion through fiscal year 1992, for a total program cost of $6.5 billion. The Army program acquisition unit cost is approximately $5.8 million (based on a quantity of 1,121 UH-60As).

Recent Reports

Army Budget: Potential Reductions to Aircraft Procurement Budgets (GAO/NSIAD-87-204BR, Sept. 10, 1987).

Weapon Systems: Effects of Army Decision to Reduce Helicopter Procurement (GAO/NSIAD-87-207BR, Sept. 8, 1987).

Defense Budget and Program Issues Fiscal Years 1988 and 1989 (T-NSIAD-87-3, Feb. 19, 1987).

Procurement: Assessment of DOD's Current Multiyear Candidates (GAO/NSIAD-86-176BR, Sept. 8, 1986).

DOD Acquisition: Case Study of the Army Light Helicopter Program (GAO/NSIAD-86-45S-1, Aug. 25, 1986).

Army Budget: Potential Reductions to Aircraft Budgets (GAO/NSIAD-86-143BR, June 20, 1986).

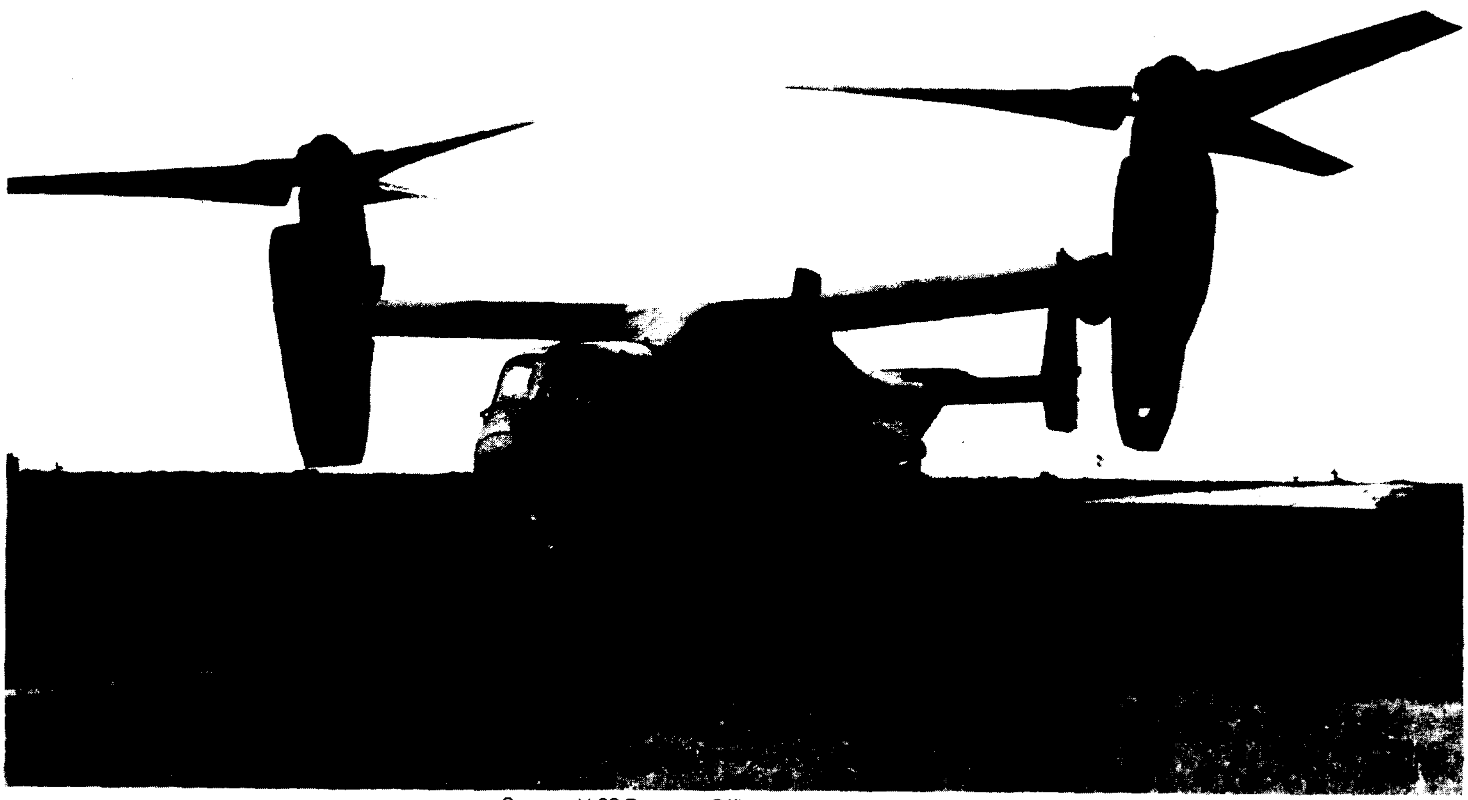
Why Some Weapon Systems Encounter Production Problems While Others Do Not: Six Case Studies (GAO/NSIAD-85-34, May 24, 1985).

Army Contracts Overpriced Due to Misapplication of Spares Formula Pricing Factor (GAO/NSIAD-85-27, Mar. 22, 1985).

V-22 Osprey Aircraft

The V-22 Joint Services Advanced Vertical Lift Aircraft (Osprey), is a tilt rotor, vertical take-off and landing aircraft, designed to fly over 2,000 nautical miles without refueling. It is intended to fill the amphibious/vertical assault needs of the Marine Corps, the combat, search, and rescue needs of the Navy, and the special operations needs of the Air Force. In December 1982, the Air Force, Army, Navy, and Marine Corps signed the joint operational requirements document, which specified the time frame, operational and organizational concepts, and essential characteristics of the vertical lift aircraft. OSD revised the operational requirements in April 1985. Using the Marine Corps and the Army variant (MV-22) as a baseline, program officials approximated that the Navy variant (HV-22) is 95 percent common, and the Air Force variant (CV-22) is 80 percent common. (The V-22 Osprey is shown in fig. III.24.)

Figure III.24: The V-22 Osprey Aircraft



Source: V-22 Program Office.

Service Participants

The V-22 Osprey is a multiservice R&D program. Congressional concern over the Navy's request for authorization to develop a conventional helicopter prompted the Under Secretary of Defense for Research and Engineering to suggest in August 1981 that the mission requirements of the Army, Marine Corps, Air Force, and Navy might best be met with a single advanced technology tilt rotor experimental aircraft. As a result, the

Joint Services Advanced Lift Aircraft development effort began concept exploration in 1981 with the Army as lead service and with Air Force, Navy, and Marine Corps participation. The Navy replaced the Army as lead service in December 1982. In January 1985, the V-22 Osprey Program was designated successor to the Joint Services Aircraft program.

In February 1987, the Air Force reduced its planned procurement quantities from 80 to 55 due to funding cuts. In February 1988, the Army withdrew from the program because of higher priorities and budget constraints. According to a program official, the Army's withdrawal resulted in a further reduction of 231 aircraft from planned procurement quantities. The Army still has personnel assigned to the program to provide flight test support. The first year of the Army's procurement was to have been 1993.

Due to cost considerations, the Secretary of Defense has proposed canceling the V-22 Program, however, the Congress has not yet made a decision.

Schedule

The preliminary design phase for the Joint Services Aircraft began in April 1983. The V-22 is currently in full-scale development, which began in May 1986 and will continue until all flight testing is complete in 1991. According to officials in the program office, ground and ballistic testing of the V-22 aircraft have been accomplished, but first flight testing was delayed until March 1989 due to technical problems. Long lead procurement is projected to begin in early 1989. The IOC date for the Marine Corps is 1992.

Deliveries

Delivery of aircraft for research, development, test and evaluation are scheduled to begin in March 1989. Delivery of production aircraft is scheduled to begin in April 1992.

Agreements

A June 1982 MOU on the Joint Services Advanced Vertical Lift Aircraft Development Program designated the Army as lead. A December 1982 MOA between the program managers of Joint STARS and the Joint Services Advanced Vertical Lift Aircraft established the payload parameters for the Joint STARS hardware package that the aircraft will carry. An October 1984 MOA between the Navy and NASA specified the technical support NASA will provide to the program. The March 1985 program charter established the joint V-22 program under Naval Air Systems Command, delineated service responsibilities, and outlined the program's scope, staffing, organization, and mission. An updated version of this charter was signed in August 1988. In October 1988, the Federal Aviation Administration, NASA, and DOD signed an MOA for a joint study of the civilian aircraft industry implications of the V-22's development.

Cost

The development estimate for procurement was $26.8 billion, but as of December 1987, was down to $20.2 billion due to the decrease of the 231 Army and 25 Air Force aircraft. The current estimate of total program cost was $23 billion. Procurement estimates of unit cost had increased from $29.4 million to $30.7 million due to the Army's reduction in quantity.

Recent Reports

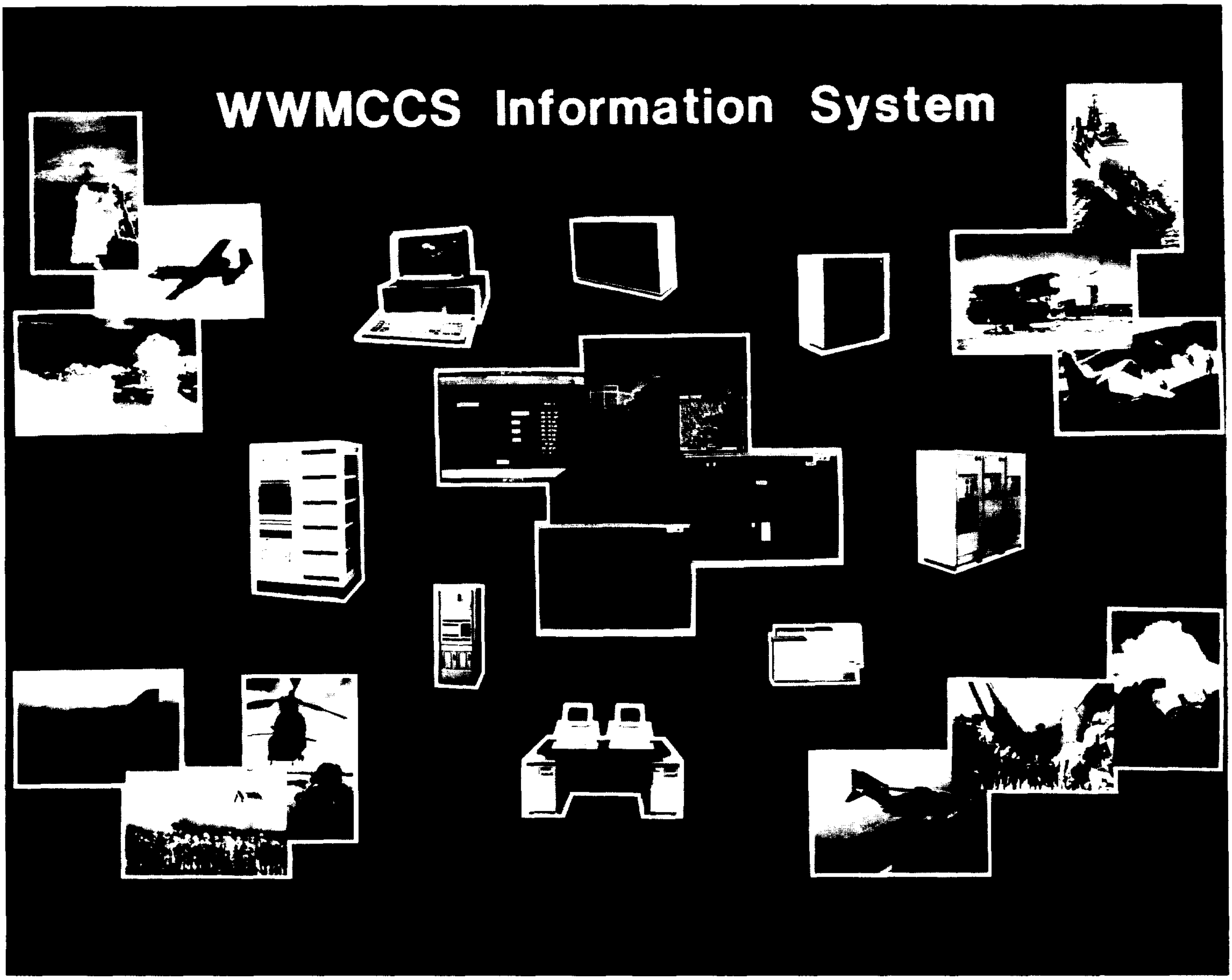
DOD Acquisition Programs: Status of Selected Systems (GAO/NSIAD-88-160, June 30, 1988).

WIS

WIS is the worldwide data collection and information processing system modernization program intended to allow rapid and reliable exchanges of information to support military forces. (Fig. III.25 shows the major components of WIS.) WIS will modernize and replace the existing standard automated data processing system.

WIS capabilities are being developed and fielded in three increments called blocks. Block A capabilities include an automated message handling system, computer workstations to provide data processing in user work areas; a local area network to connect WIS computer systems, automated message handling systems, and workstations. Block B includes competitive procurement of new WIS computer systems to replace existing computer systems, development of new applications software and procurement of a data base management system, and development of improved security controls over access to information. Block C will enhance joint mission planning and execution functions. A program official stated that 100 percent commonality is planned for the joint WIS Program.

Figure III.25: Major Components of WIS



Source: WIS Program Office.

Service Participants

The Air Force has been the lead service for this multiservice/multiagency R&D program since the program's inception in November 1981. According to program officials, OSD directed the Army, Navy, DCA, Defense Intelligence Agency, and NSA to join the program in November 1981 during the concept exploration phase. Other participating agencies include the Defense Nuclear Agency, which joined in April 1982; the Defense Logistics Agency, which joined in September 1986; and the Defense Mapping Agency, which joined in November 1987.

Schedule

In September 1985, the Secretary of Defense approved milestone I (demonstration and validation) for the entire WIS Program, and milestone II (full-scale development) for block A. According to program officials, full-scale development for block A is expected to end in June 1990. Blocks B and C, which are in the demonstration and validation phase will have separate milestone II reviews.

According to program officials, the WIS development test and evaluation schedule has slipped due to technical problems in software development and corrections required in the user interface. As a result, the IOC for block A has slipped from its development estimate of November 1987 to a current estimate of June 1990. Program officials reported that fiscal year 1988 funding reductions resulted in a restructuring of block B. The restructuring will result in a 19-month slip in the block B milestone II Defense Acquisition Board review now scheduled for September 1989. Program officials also told us there would be reductions in requirements and elimination of engineering change proposals. Since the block C program baseline has not been developed, the impact of blocks A and B schedule slips on block C cannot be determined at this time.

Deliveries

According to a program official, deliveries have not yet been planned.

Agreements

The program charter for WIS, dated September 1982, described the roles of the joint program management office and defined the responsibilities of the services and other DOD organizations and agencies in supporting the joint program manager. Program officials told us that JCS approved four required operational capabilities documents as WIS requirements. These documents include (1) the WWMCCS Automated Data Processing Concept of Operations and General Requirements for post-1985, dated February 1981, (2) the Joint Operation Planning and Execution System, dated July 1983, (3) the National Military Command System, and (4) the WIS Automated Message Handling Multicommand required operational capabilities, dated September 1983. According to program officials, the WIS Program has had problems obtaining agreement on requirements among the services and agencies because of the unique user missions and requirements for each. To coordinate issues among services and agencies, the WIS Program established an interface control working group and a configuration control board consisting of service and agency representatives.

A November 1984 MOU between the WIS joint program manager and the Director, DCA, outlines the working relationship between the two organizations and the scope of DCA support. A July 1986 MOU between the WIS joint program manager and the Joint Operation Planning and Execution System project group director discusses fiscal year 1986-88 funding for R&D efforts and formalizes the guidelines that these organizations will use to support one another. A January 1987 draft MOU between the WIS systems program office, which is the procuring agency for WIS, and the Joint Data Systems Support Center, which is the development and maintenance agency for WWMCCS Automated Data Processing, details the responsibilities of both organizations.

The procedures and responsibilities of the Development Oversight Board for providing direction to the WIS block B initiative are outlined in an April 1987 MOU among the WIS system joint program manager; the director of deployment, the Joint Deployment Agency; the deputy commander for strategic systems, Air Force Electronic Systems Division; and the director, Joint Data Systems Support Center.

Procedures for prioritizing automated data processing support activities and resource planning to meet the needs of the WWMCCS automated data processing community are provided in an undated MOU. The organizations included in this MOU are the WIS joint program office; the Joint Data Systems Support Center; and the unified and specified command, control, and communications support organization of JCS.

Costs

According to the December 1987 SAR, the development estimate of total program cost was about $1.9 billion and the current estimate was about $2 billion.

Recent Reports

Command and Control: Upgrades Allow Deferral of $500 Million Computer Acquisition (GAO/IMTEC-88-10, Feb. 23, 1988).

DOD Acquisition Programs: Status of Selected Systems (GAO/NSIAD-87-128, Apr. 2, 1987).

Deployment: Authority Issues Affect Joint System Development (GAO/NSIAD-86-155, July 23, 1986).

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