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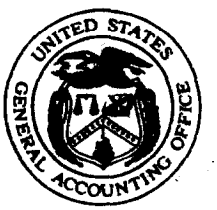
Briefing Report to
the Honorable Dan Quayle,
United States Senate

September 1986

FIRE SUPPORT SYSTEM

Army's Plans to Improve Its Fire Support Capabilities



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United States
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September 19, 1986

The Honorable Dan Quayle
United States Senate

Dear Senator Quayle:

As requested in your January 24, 1986, letter, we evaluated the Army's plan to provide interim automated fire support capabilities for the light and heavy divisions. This letter summarizes our observations. Appendix I discusses the issues in this letter in more detail.

In the early 1980s, the Army provided most heavy divisions and one light division an automated artillery fire command and control (C2) system called the Tactical Fire Direction System (TACFIRE). Because it was large and heavy, and becoming technically obsolete, the Army stopped buying it and began to develop a new system with improved mobility and capability called Advanced Field Artillery Tactical Data System (AFATDS).

Since most light divisions do not have an automated fire support C2 capability and AFATDS is not scheduled to be fielded before 1990, some congressional committees expressed concern about the absence of this capability for light divisions. In fiscal year 1985, the House and Senate Appropriations Committees directed the Army to prepare a plan for providing an interim capability to light divisions and increased capabilities to the total force.

The Army's plan, dated September 1985, identified two interim options for light divisions.

—The first was to provide two light divisions with increased quantities of Fire Support Team/Digital Message Devices (FIST/DMDs). The Army's plan now is to provide them to division, brigade, and battalion fire direction centers, which is an expansion of its original use.

—The second was to provide light divisions with a Tactical Computer Processor (TCP). The Army has subsequently abandoned plans to field the TCP because of cost and weight concerns.

The Army's September 1985 plan to provide automated fire support C2 is an implementation plan, and therefore, it did not present an evaluation of alternative systems such as the Light Field Artillery Tactical Data System (LFATDS). LFATDS was designed as a light division fire support C2 system. The Army had planned to provide LFATDS to light divisions but in June 1985 the Army abandoned this plan because it concluded that funding two different fire support C2 systems (LFATDS and AFATDS) was not justified.

According to the commanders of two light divisions, the FIST/DMD option, which would be a relatively low cost upgrade, does not meet their division and brigade fire planning and direction needs. These same commanders have requested LFATDS. They believe LFATDS has sufficient capability to meet light division C2 needs. They also believe that FIST/DMD is needed at lower echelons to provide a digital communications link which they do not now have. However, in determining the interim solution for light divisions, the Army must decide between low cost and risk equipment (FIST/DMD) that provides limited increased C2 capability for divisions and brigades and a system (LFATDS) which provides greater capability, but at increased cost and fielding time.

The Army's September 1985 plan did not include any upgrade or replacement of the heavy divisions' TACFIRE capabilities until the AFATDS is fielded in the 1990s. However, the Army has funded an interim improvement program for the equipment of some elements of heavy divisions. If major problems occur in the development of AFATDS, further improvements to fire support C2 could be made by using LFATDS for heavy divisions. However, it would not fully meet heavy division requirements.

In commenting on the draft of this report, the Department of Defense (DOD) disagreed with our evaluation of the status, risk, cost, and capabilities of LFATDS. It also disagreed with our conclusions that the Congress:

--Ask the Army to fully explain the trade offs between the lower cost FIST/DMD and the more capable LFATDS solution for light divisions C2 needs.

--Consider reducing the Army fiscal year 1987 request for AFATDS or restrict the use of funds.

Appendix II contains DOD's comments and our evaluations.

Unless you publicly announce its contents earlier, we plan no further distribution until 5 days from the date of the briefing report. At that time we will send copies to interested parties and make copies available to others upon request. If you have any questions or if we can be of further assistance, please contact Richard Davis, Associate Director, at 275-4841.

Sincerely yours,

Frank C. Conahan
Assistant Comptroller General

Contents

ABBREVIATIONS

ACCS	Army Command and Control System
AFATDS	Advanced Field Artillery Tactical Data System
BCS	Battery Computer System
BCT	Brief Case Terminal
C2	command and control
CEP	concept evaluation phase
DCT	Digital Communications Terminal
DMD	Digital Message Device
DOD	Department of Defense
FDT&E	Force Development Test and Evaluation
FIST	Fire Support Team
GAO	General Accounting Office
IOC	initial operational capability
LFATDS	Light Field Artillery Tactical Data System
MCS	Maneuver Control System
MENS	Mission Element Needs Statement
MIFASS	Marine Integrated Fire and Air Support System
OSD	Office of the Secretary of Defense
SHORAD	Short Range Air Defense
TACFIRE	Tactical Fire Direction System
TCP	Tactical Computer Processor

ARMY FIELD ARTILLERY TACTICAL DATA SYSTEMS

CHART I.1

OBJECTIVES, SCOPE, AND METHODOLOGY

OBJECTIVES

--ASSESS ARMY'S FIRE SUPPORT PLANS AND PROGRAMS TO DETERMINE WHETHER:

- o PLANS ADDRESS ORDERLY TRANSITION FROM CURRENT TO PROJECTED CAPABILITIES THROUGH NEAR- TO MID-TERM IMPROVEMENTS OF EXISTING CAPABILITIES.
- o PRIORITY IS GIVEN TO PROVIDE A VIABLE CAPABILITY TO LIGHT DIVISIONS.
- o THE PROGRAMS ARE DEPENDENT ON HIGH RISK TECHNOLOGIES.

SCOPE AND METHODOLOGY

--WE REVIEWED DOCUMENTS AND INTERVIEWED OFFICIALS AT:

- o THE OFFICE OF THE SECRETARY OF DEFENSE;
- o ARMY HEADQUARTERS;
- o ARMY FORTS AT SILL, ORD, LEWIS, AND MONMOUTH; AND
- o CONTRACTOR PLANTS.

APPENDIX I

The objective of this review was to evaluate the Army's plan for providing near- and longer-term automated fire support capability to both light and heavy divisions. Specifically, our review addressed the following:

--The Army's overall fire support program as represented by its September 6, 1985, modified AFATDS plan.

--Whether that plan provides for an orderly transition from current to projected capabilities.

--Whether the plan provides for near-term improvements in fielded systems.

--Whether the plan gives priority to providing a viable capability to light divisions.

To accomplish these tasks, we reviewed documents and interviewed key officials at:

--the Office of the Secretary of Defense (OSD);

--the Army's artillery school and the fire support C2 systems office at Fort Sill, Oklahoma;

--the 7th Infantry Division at Fort Ord, California;

--the 9th Infantry Division and Army Development and Employment Agency at Fort Lewis, Washington; and

--the AFATDS program office at Fort Monmouth, New Jersey.

In addition, we reviewed documents and interviewed contractor personnel responsible for the systems discussed in this report.

Our review was performed in accordance with generally accepted government auditing standards.

APPENDIX I

CHART I.2

CURRENT FIRE SUPPORT

C2 CAPABILITIES

--TACFIRE IS THE ARMY'S PRIMARY AUTOMATED FIRE SUPPORT C2 SYSTEM.

--TACFIRE FIELDING BEGAN IN LATE 1970s.

--THIRTY-TWO DIVISION SETS OF TACFIRE WERE PROCURED.

--CURRENT COMPLIMENTARY FIRE SUPPORT C2 SUBSYSTEMS INCLUDE:

- o THE BATTERY COMPUTER SYSTEM.
- o THE DIGITAL MESSAGE DEVICE.

TACFIRE, fielded to most heavy divisions and one light division[1] beginning in the late 1970s, provides field artillery units with the means to automate tactical fire control, target analysis, fire planning, and target intelligence. Thirty-two TACFIRE sets have been procured. Within the division, TACFIRE sets are located at division, brigade, and battalion elements of fire support. Two fire support subsystems are in use below the battalion. The Battery Computer System (BCS) is being fielded at the battery level to process artillery fire missions. Also, the hand held DMD is used at the company level and forward observer positions to relay targeting data and fire commands.

[1]Heavy divisions are armored, mechanized, and cavalry divisions. Light divisions, on the other hand, are infantry, airborne, and air assault divisions. Each type has authorized personnel ranging from 14,000 to 18,000.

CHART I.3

FIRE SUPPORT C2 DEFICIENCIES

--MOST LIGHT DIVISIONS HAVE NO AUTOMATED FIRE SUPPORT C2.

--IN JUNE 1985, THE ARMY DECIDED NOT TO PROCURE LFATDS FOR LIGHT DIVISIONS.

--HEAVY DIVISIONS HAVE TACFIRE FOR FIRE SUPPORT C2, BUT IT IS CONSIDERED:

- o LARGE,
- o DIFFICULT TO OPERATE,
- o CAPABILITY LIMITED, AND
- o VULNERABLE.

Since TACFIRE's size and weight made its use impractical for light divisions, most light divisions have no automated fire support C2 capability. The Army had planned to procure the LFATDS[2] to fill this void. However, in June 1985, the Army decided not to procure LFATDS for light divisions since it concluded funding two different systems concurrently (LFATDS and AFATDS) was not justified.

For several years light division commanders, specifically the 82nd Airborne Division commander and the 7th Infantry Division commander, have expressed a need and sought near-term capabilities to more effectively control and coordinate fire support. Further, the November 15, 1985, Near-Term Light Division Fire Support Operational and Organizational Plan identifies a need for an automated man-portable, low-powered artillery fire support system.

Heavy divisions currently have TACFIRE for fire support C2; however, its capabilities are considered inadequate. The Mission Element Needs Statement (MENS) for an advanced fire support system, states that TACFIRE does not meet current Army needs because it requires

--large vehicles, shelters, and power generation equipment;

--excessive operator training;

--upgrading to insure capability with all force level systems;

--upgrading communications capability;

--upgrading remote devices for distributive processing capability; and

--reduced vulnerability.

The MENS further states that in addition to correcting the above deficiencies, the advanced fire support C2 system must meet the following objectives.

--Enable the commander to control rapid sustained delivery of massed firepower by all fire support means.

--Automate the selection and processing of the most important targets for engagement and the optimum method to defeat those targets within available means.

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[2]LFATDS is also known as Light TACFIRE.

CHART I.4

ARMY'S PLAN FOR INTERIM AND NEW CAPABILITIES

--IN SEPTEMBER 1985, THE ARMY ISSUED A PLAN TO PROVIDE:

- o LIMITED LIGHT DIVISION INTERIM CAPABILITY IN FISCAL YEAR 1986 WITH FIST/DMD.
- o FULL LIGHT DIVISION CAPABILITY IN FISCAL YEAR 1989 WITH TCP.
- o FULL HEAVY DIVISION CAPABILITY IN FISCAL YEAR 1990 WITH AFATDS.

--COST ESTIMATES FOR PROGRAMS OUTLINED IN THE SEPTEMBER PLAN:

- o $1.3 MILLION FOR FIST/DMD FOR TWO DIVISIONS.
- o $68 MILLION FOR TCP.
- o $2 BILLION FOR AFATDS.

--IN DECEMBER 1985 CONGRESSIONAL CONFEREES DIRECTED THE ARMY TO SUBMIT ADDITIONAL INFORMATION AND PLANS FOR FIRE SUPPORT C2:

- o $25.6 MILLION PROCUREMENT FUNDS APPROPRIATED BUT NOT AUTHORIZED.
- o OBLIGATION OF FUNDS CONTINGENT ON CONGRESSIONAL REVIEW OF TEST RESULTS AND APPROVAL OF TRANSITION PLAN.
- o ARMY RESPONSE DELAYED UNTIL MID-SEPTEMBER 1986.

The September 6, 1985, plan sets out the Army's latest approach to achieve progressive improvements to field fire support C2 systems, while continuing to evolve toward the longer term AFATDS program. Specifically, the plan called for the fielding of:

--Increased field artillery automation for two light divisions in fiscal year 1986 by procuring FIST/DMDs, BCS, and Digital Communications Terminals (DCT) for the 7th and 82nd light divisions.

--AFATDS functional capability to all light divisions starting in first quarter fiscal year 1989, using existing peripheral equipment[3] and adding TCP. TCP was the selected computer hardware for the Maneuver Control System (MCS).

--The AFATDS system starting in fiscal year 1990.

The cost estimates for the plan's three phases are

--$1.3 million to procure the FIST/DMD for the 7th and 82nd light divisions (does not include peripheral equipment cost),

--$68 million to develop and procure the TCP for all light divisions, and

--$2 billion to develop and procure AFATDS for the total force.

In December 1985, the House and Senate Appropriation Conferees agreed to provide $25,574,000 to maximize the near-term fire support C2 capabilities of light divisions in accordance with a congressionally approved plan which would culminate in the ultimate system for the 1990s. In addition, the conferees directed the Army to report by August 1, 1986, on the test results of LFATDS currently undergoing Force Development Test and Evaluation. Furthermore, the Army must submit an overall transition plan for achieving interim improvements to the fielded systems of both light and heavy divisions. Army responses were delayed until mid-September 1986.

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[3]BCS and DCT costs are not included because these or similar systems are required in all fire support C2 options reviewed.

APPENDIX I

CHART I.5

ISSUES RELATIVE TO FIST/DMD OPTION

--FIST/DMD IS SCHEDULED FOR FIELDING IN FISCAL YEAR 1987.

--FIST/DMD EXPECTED TO BE A LOW-COST UPGRADE TO THE CURRENT MANUAL SYSTEM USED BY LIGHT DIVISIONS:

- o $4.7 MILLION FOR SEVEN LIGHT DIVISIONS.
- o DEVELOPMENT COSTS ALREADY SUNK.

BUT

--FIST/DMD WAS NOT DESIGNED FOR LIGHT DIVISIONS C2 NEEDS AND ITS CAPABILITY TO MEET THEIR NEEDS IS LIMITED AND YET TO BE EVALUATED:

- o FIST/DMD IS DESIGNED PRIMARILY FOR COMMUNICATIONS AT THE COMPANY LEVEL IN HEAVY DIVISIONS.
- o THE PLAN PROPOSES FIST/DMD USE FOR C2 IN LIGHT DIVISIONS AT BATTALION AND ABOVE WHERE ITS CAPABILITIES ARE LIMITED.

Fielding the FIST/DMD to light divisions in fiscal year 1987 is considered a low-risk option. Procurement costs[4] are estimated at $1.3 million for the 7th and 82nd divisions and $4.7 million for all seven light divisions. Further, there are no incremental development costs since these costs are sunk within the Army's buy of FIST/DMDs for heavy divisions.

Since most light divisions do not have any automated fire support C2 capability, the FIST/DMD system could provide some improved effectiveness. However, the Army's plan calls for using the FIST/DMD in a much wider role than for which it was designed. The FIST/DMD was designed for the FIST company level position, and subsequently procured for the company and battalion fire support elements. Fielding FIST/DMDs for battalion level and above Fire Direction Centers and Fire Support Elements (which have much greater requirements than the FIST) would put the FIST/DMD in a role it was not designed to fulfill and it may not be sufficient. Functions required at Fire Direction Center and Fire Support Element which the FIST/DMD does not perform or compute are: ammunition and fire unit status, non-nuclear fire planning, support geometry, tactical fire control, commanders criteria, meteorological messages, and interface with all division artillery TACFIRE functions. The overall impact of these limitations on light division performance has not been studied. That is, the Army has proposed the FIST/DMD option without performing an analysis of how effective light divisions would be with it.

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[4]Contractor costs only, excludes government-furnished peripheral equipment.

CHART I.6

ISSUES RELATIVE TO TCP OPTION

--TCP OPTION CANCELED:

- o NOT AFFORDABLE.
- o EXCESSIVE WEIGHT.
- o HIGH RISK.
- o DOES NOT COMPLY WITH ACCS.

After fielding the FIST/DMD, the Army's plan called for providing light divisions with the TCP with some AFATDS software in fiscal year 1989. However, the TCP option was terminated in January 1986 because of funding constraints and diminished Army support. Specifically, the TCP phase was not considered viable because the

--development effort would increase total AFATDS development costs by $18 million,

--TCP's 800 plus pound weight was considered excessive,

--projected fiscal year 1989 fielding date was considered by Army officials to be highly ambitious, and

--TCP was not considered compatible with Army Command and Control System (ACCS) hardware.

ACCS is the Army program to develop and procure common hardware and software for a variety of Army C2 systems, and to integrate these systems with Army tactical communications programs.

APPENDIX I

CHART I.7

ISSUES RELATIVE TO LFATDS OPTION

--LFATDS OPTION NOT INCLUDED IN ARMY PLAN.

--LIGHT DIVISION COMMANDERS EXPRESS NEED FOR LFATDS.

--LFATDS COULD PROVIDE VIABLE CAPABILITY AT LOW TO MODERATE COST AND RISK:

- o LFATDS PROVIDES SIGNIFICANT CAPABILITY OVER FIST/DMD OPTION.
- o LFATDS DEVELOPMENT COST IS SUNK. A $6.8 MILLION FIXED-PRICE CONTRACT INCLUDES DEVELOPMENT AND ONE DIVISION SET.
- o ADDITIONAL LFATDS PROCUREMENTS PROJECTED TO COST $3.3 MILLION PER DIVISION (EXCLUDING GOVERNMENT-FURNISHED EQUIPMENT).
- o LFATDS CURRENTLY UNDERGOING FDT&E TO DETERMINE IF IT IS A GO TO WAR SYSTEM.
- o ADDITIONAL LFATDS FIELDING COULD BEGIN IN AUGUST 1987 (CONTRACTOR ESTIMATE) OR FISCAL YEAR 1988 (ARMY ESTIMATE).

LFATDS has not been included as part of the Army's plan to field automated C2 field artillery support. Since 1984, light division commanders, specifically the 82nd Airborne and 7th Infantry Division commanders, have expressed a need to field LFATDS to effectively control and coordinate fire support. The 7th Infantry Division artillery commander, as recently as February 28, 1986, stated that the 7th needs LFATDS because the FIST/DMD does not meet its automated C2 requirements.

A functional analysis of LFATDS as compared to the FIST/DMD shows that LFATDS is projected to perform or compute a number of additional mission essential fire support functions in

--non-nuclear fire planning;

--tactical fire control;

--ammunition and fire unit status;

--support geometry, that is, coordinate ground and air movements; and

--meteorological messages.

LFATDS development costs are included in a $6.8 million, fixed-price contract for one light division set for the 9th Infantry Division. LFATDS does not have a light division artillery fire direction center capability. If this capability is required, the contractor estimates that full division capability would cost an additional $1 million in development, and procurement would cost $3.3 million[5] per division.

The ongoing Force Development Test and Evaluation (FDT&E) was performed in May 1986 to determine LFATDS acceptability for use by the 9th Infantry Division. Due to a software problem further tests will be run in September 1986. The Army believes that initial fielding would not begin until fiscal year 1988.

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[5]Excluding government-furnished equipment (such as vehicles, printers, and radios), which are required in all Army options.

CHART I.8

COMPARISON OF LIGHT DIVISION INTERIM CAPABILITY OPTIONS

--FIELD FIST/DMD ONLY TO THE 7TH AND 82ND DIVISIONS, AS IDENTIFIED IN THE ARMY PLAN, AT AN INCREMENTAL COST OF $1.3 MILLION.

--FIELD FIST/DMDs TO THE SEVEN LIGHT DIVISIONS AT AN INCREMENTAL COST OF $4.7 MILLION.

--PROCURE LFATDS FOR THE 7TH AND 82ND DIVISIONS AT AN INCREMENTAL COST OF $7.6 MILLION WITH FIELDING EXPECTED BY ARMY IN FISCAL YEAR 1988.

--BEGIN FIELDING LFATDS TO THE SEVEN LIGHT DIVISIONS STARTING IN FISCAL YEAR 1988 AT A PROJECTED INCREMENTAL COST OF ABOUT $24 MILLION (CONTRACTOR ESTIMATE).

FIST/DMD FOR LIGHT DIVISIONS

--Advantages:
- o Low cost (about $680,000 per division).
- o Low risk.
- o Fielding could begin fiscal year 1987.
- o No impact on ACCS.

--Disadvantages:
- o Limited capability.

PROCURE LFATDS FOR LIGHT DIVISIONS

--Advantages:
- o Low to moderate cost (about $24 million for seven divisions or $7.6 million for only 7th and 82nd divisions per contractor estimates).
- o Capability significantly improved.
- o LFATDS computers can be used in other Army C2 systems when AFATDS is fielded to the light divisions in the 1990s.
- o Low to moderate development and schedule risk.

--Disadvantages:
- o Does not conform with ACCS.

CHART I.9

AFATDS PROGRAM COST AND GROWTH

--TOTAL AFATDS DEVELOPMENT AND PROCUREMENT COSTS ARE ESTIMATED AT OVER $2 BILLION IN FISCAL YEAR 1986 DOLLARS:

- o $277 MILLION FOR DEVELOPMENT.
- o $1.9 BILLION FOR PROCUREMENT, INCLUDING GOVERNMENT-FURNISHED EQUIPMENT AND SUPPORT.

--AFATDS COST GROWTH TO DATE:

- o CONCEPT EVALUATION PHASE CONTRACT HAS GROWN FROM $34 MILLION TO $46 MILLION.
- o COST CEILING CAP ON CONTRACT REACHED.
- o COSTS TO CONTRACTOR MAY ESCALATE.
- o DEFICIENCIES IDENTIFIED IN TESTING COULD CAUSE FURTHER DEVELOPMENT PROBLEMS WITH ASSOCIATED COST GROWTH.

As of March 1986, AFATDS development effort is projected to cost $277 million. Development funds spent through fiscal year 1985 were $68 million. Procurement costs, according to the March 1986 base line estimate, are expected to be $1.9 billion.[6] The cost estimates may be understated in view of the potential development problems, risks related to the ACCS program, and the historical cost and schedule overruns of similar type programs.

The contract for the concept evaluation phase (CEP)[7] of the Fire Support System and Fire Support Terminal was awarded in May 1984. The contract specifically calls for system design, development, fabrication, integration of the software and hardware, and system test. Although the cost of this 33-month contract has grown from $34 million to $46 million, the Army has initiated efforts to contain further cost growth for this phase by placing a $46 million cost ceiling on the contract and reducing the contractor's scope of work.

This CEP contract is a cost plus fixed-fee effort which is scheduled to be completed by February 1987. The contractor is contributing $10 million of the original $34 million. The Army has paid the full cost of the $12 million increase to $46 million. Additional contract cost will be borne by the contractor.

Although the Army has stabilized government costs for the AFATDS CEP with the cost ceiling cap, contractor costs as well as schedules may grow. An Army program analyst, using data through February 1986, has projected a $48.7 million contract cost. This same analyst puts the contract 51 working days behind schedule.

In addition, the first of four required software packages was tested on February 28, 1986, by Magnavox, the prime contractor. This test was held even though Teledyne Brown Engineering, contractually responsible to advise the Army on product quality, recommended that the test plan be rejected. Teledyne reported that the test plan did not conform to contractual requirements and that the deletion of functions originally planned to be tested would result in an insufficient test.

In a March 13, 1986, test assessment report, Teledyne concluded that the test was not a full test. Further, the report states that 37 problems were identified that will impose additional tasks with associated risks on subsequent tests.

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[6]This estimate was developed before the ACCS program was created and does not reflect the savings anticipated from purchase of ACCS common computer hardware and the initiative to buy rugged commercial equipment rather than militarized items.

[7]Software will be developed for use by both light and heavy divisions in this contract phase.

CHART I.10

AFATDS SCHEDULE COULD SLIP

--AFATDS PROGRAM INVOLVES SCHEDULE RISK BECAUSE:

- o REQUIRED ADA TRANSPORTABILITY NOT DEMONSTRATED IN AFATDS CEP.
- o ADA TRANSPORTABILITY DEMONSTRATIONS IN OTHER PROGRAMS HAVE BEEN LIMITED.
- o ACCS DELAYS COULD CREATE SLIPPAGES IN AFATDS PROGRAM.

The AFATDS application system software is being coded in Ada[8] and is planned to operate on yet to be selected ACCS hardware. In order to maximize open competition, Ada must be usable (transportable) at minimum cost on any candidate ACCS hardware. Although software transportability is a major requirement of the AFATDS program, its demonstration is not included in the CEP contract. In addition, although a stated major benefit of Ada is ease of transportability, demonstrations of this have been limited with none at the projected magnitude of AFATDS. The Air Force World Wide Information System has demonstrated the most success by transporting up to 32,000 lines of Ada code. That effort, however, is significantly less than is envisioned with AFATDS--240,000 lines of code.

The ACCS concept was developed by the Army to guide the development of all automated C2 and communications systems for the battlefield of the future. It includes the eventual use of Ada and nondevelopmental equipment for the five components[9] of the ACCS, which includes AFATDS. Consequently, delays in the ACCS program could create slippages in the AFATDS program. For instance, the AFATDS plan projected a 1st quarter fiscal year 1990 initial operational capability (IOC). This date was based on an earlier ACCS schedule that has already slipped. That schedule showed the ACCS proposal and demonstration phase starting in the 4th quarter fiscal year 1985 and ending in September 1986. However, the ACCS request for proposal release date is now August 1986 with a March 1987 proposal and demonstration phase completion date. In addition, the ACCS program does not yet have a budget line item.

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[8]Ada is the name given to the high order computer language developed as a standard language for use in military computers and computerized systems.

[9]The five components are fire support, air defense, intelligence, combat service support, and maneuver control.

CHART I.11

AFATDS RISKS INDICATED BY

OTHER C2 PROGRAMS

--THE ARMY HAS NOT FIELDED A MAJOR TACTICAL C2 SYSTEM WITHIN ORIGINAL COST OR FIELDING PROJECTIONS:

- o MCS DEVELOPMENT COST ESTIMATES INCREASED FROM $182 MILLION IN DECEMBER 1984 TO $217 MILLION IN JANUARY 1986; AND THE PROGRAM SCHEDULE HAS SLIPPED MORE THAN 3 YEARS.

- o SHORAD DEVELOPMENT COST ESCALATED FROM $35 MILLION TO AN ESTIMATED $245 MILLION WITH A 4-YEAR SCHEDULE SLIP.

--EXPERIENCE ON SIMILAR MILITARY C2 DEVELOPMENTS:

- o MIFASS DEVELOPMENT COSTS HAVE ESCALATED FROM $32 MILLION TO AN ESTIMATED $112 MILLION WITH A 5-YEAR SCHEDULE SLIP.

There appear to be risks in achieving AFATDS cost and schedule goals since no major Army tactical C2 system has been developed without significant cost overruns and schedule slippages. Examples of cost and schedule experiences with automated C2 systems are illustrated in the development of the Army's MCS and the Short Range Air Defense (SHORAD) C2 system. In addition, the Marine Corps Fire Support C2 System development has experienced significant cost and schedule overruns.

During the 1970s, the Army began to develop a division level Tactical Operations System to provide automated tactical data assistance for battlefield commanders. Tests in 1977 revealed serious software and design problems with the system, and in 1979, the Congress terminated funding for the project. Since then, the Army has developed its MCS concept using several components from the Tactical Operations System. However, MCS has experienced several changes in design and capability. As a result, according to one set of estimates, development of MCS has fallen more than 3 years behind schedule and MCS development cost has also grown from $182 million in December 1984 to $217 million in January 1986. Also, acquisition cost has increased from $0.5 billion in 1982 to $0.9 billion in 1986.

The SHORAD C2 system was originally to be fielded in 1985, but disputes over the requirement for a sensor and changes to the acquisition strategy have delayed fielding until 1989 at the earliest. Like AFATDS, the SHORAD system is to be developed with Ada and will use nondevelopmental hardware and software to the extent possible. According to data presented during 1982 congressional hearings, fiscal year 1980 cost for system development was estimated at $35.5 million. In 1983, the estimated cost was raised to $245.4 million.

In developing the Marine Integrated Fire and Air Support System (MIFASS), the Marine Corps has experienced schedule and cost overruns. For example, MIFASS was initially scheduled to be developed for $32 million over a 3-year period. According to a Navy program official, development problems have since increased the estimated cost to $112 million (with the contractor contributing additional millions to ensure completion), and the schedule has been extended to more than 6 years. Furthermore, a Navy official told us that IOC is not expected until 1992. This is 5 years later than what the Marine Corps estimated in 1983.

CHART I.12

IMPROVEMENTS FOR HEAVY DIVISIONS' SYSTEMS

--THE ARMY'S PLAN DOES NOT ADDRESS IMPROVEMENTS TO HEAVY DIVISIONS' FIRE SUPPORT SYSTEMS.

HOWEVER,

--SOME IMPROVEMENTS COULD BE EXPECTED FROM PROGRAMS NOT INCLUDED IN THE PLAN.

- o FIST/DMD PROCUREMENT FOR HEAVY DIVISIONS WILL UPGRADE FIRE SUPPORT C2 AT THE COMPANY LEVEL AND PROCUREMENT OF IMPROVED FORWARD ENTRY DEVICES WILL UPGRADE FORWARD OBSERVER CAPABILITY. (ACTIVE FUNDED PROGRAM.)

- o PROCUREMENT OF TACFIRE EMULATORS COULD PROVIDE COST SAVINGS AND SIGNIFICANTLY UPGRADE DIVISION TACFIRE. (UNFUNDED OPTION.)

The Army's plan does not address C2 interim improvements for heavy divisions. The plan focuses only on AFATDS replacing TACFIRE at division, brigade, and battalion echelons in fiscal year 1990. However, critical equipment below battalion are scheduled for near-term upgrades through programs not mentioned in the plan.

Although not included in the plan, the Army has funded the procurement of the FIST/DMD and improved forward entry devices for heavy divisions. The FIST/DMD, developed under a product improvement program contract, is scheduled for fielding in November 1986. The FIST/DMD is a man-portable or vehicle-mounted device intended to provide the FIST chief with an automated capability to plan and execute fire support at the company level. In addition, it provides the FIST chief with TACFIRE and forward entry device automated interface capability.

The planned fiscal year 1987 competitive procurement of a new forward entry device should significantly upgrade the forward observers automated input/output capability. This device is projected to give the forward observer an automated digital link to the BCS as well as TACFIRE.

The AFATDS program office, in September 1985, submitted a $27.3 million improvement plan that could be cost recovering and significantly improve TACFIRE operations. A March 1986 economic analysis shows that fielding L3212 emulators to divisions with TACFIRE would result in a savings of $3.5 million[10] in reduced parts and maintenance. This analysis assumes a September 1986 production contract award. It also assumes that AFATDS fielding will start in fiscal year 1992 and be completed by the end of fiscal year 1995. This improvement will significantly enhance operational benefits until AFATDS is fielded. Specifically, the L3212 emulator would increase reliability, operating speed, and needed memory while reducing vehicles, weight, personnel, and tear down and set up time.

Although substantial benefits could be realized from this interim improvement, the Army has not funded it because the Army has placed priority on funding AFATDS over interim capabilities. Delays in funding would result in the loss of its cost benefits and the capability to make significant interim upgrades to division TACFIRE.

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[10]Fiscal year 1986 current dollars.

CHART I.13

POTENTIAL TOTAL FORCE CAPABILITY ALTERNATIVE

--IF SIGNIFICANT COST OR SCHEDULE GROWTH ARE ENCOUNTERED WITH AFATDS, THE LFATDS, COMBINED WITH THE TACFIRE EMULATOR COMPUTER, IS A POTENTIAL ALTERNATIVE FOR BOTH LIGHT AND HEAVY DIVISIONS:

- o LFATDS PLUS EMULATOR COST FOR 65 SETS IS ESTIMATED AT $225 MILLION (EXCLUDING GOVERNMENT-FURNISHED EQUIPMENT), WITH A PROJECTED FISCAL YEAR 1988 IOC DATE.
- o THIS OPTION WOULD NOT INTRODUCE UNIQUE EQUIPMENT INTO THE ARMY SYSTEM BECAUSE THE EMULATOR, WHICH HAS BEEN SUCCESSFULLY TESTED, IS BEING PROCURED FOR USE IN TACTICAL COMMUNICATION SWITCHES. ALSO LFATDS COMPUTERS ARE BEING ACQUIRED FOR DEVELOPMENT AND TESTING THE ALL SOURCE ANALYSIS SYSTEM PROGRAM.
- o LFATDS IS CURRENTLY UNDERGOING FDT&E TESTING WITH THE 9TH DIVISION.
- o THIS OPTION WOULD PROVIDE SIGNIFICANT CAPABILITY OVER TACFIRE.

--HOWEVER, THIS OPTION WOULD NOT CONFORM TO THE ACCS ARCHITECTURE.

Contractor estimates to produce 65 sets of LFATDS plus emulator are about $225 million, with an August 1988 IOC date. An Army AFATDS program official stated that over $400 million more would be needed for government-furnished equipment and support. Development costs are projected at $7 million since the majority of this effort was performed under the fixed-price LFATDS contract. Procurement is estimated at $3.3 million per division set, excluding government-furnished equipment.

Fielding this configuration would not add unique hardware into the Army inventory, since the LFATDS computer and the L3212 series emulator are being procured for two Army tactical communications switch programs.

The development risks associated with this heavy division option would be low if the one major software problem still outstanding from the LFATDS field test at the 9th division in May 1986 is identified and resolved, since the emulator was already successfully tested in the TTC-39 tactical switch program.

The LFATDS plus emulator option would significantly upgrade current fire support C2 capabilities, and it largely complies with requirements of the MENS for AFATDS. Some of the major deficiencies of the TACFIRE system that would be corrected with this solution are mobility, trainability, decentralization, survivability, and responsiveness. Specifically:

--Division TACFIRE centers would use a single, smaller truck instead of four 5-ton trucks with shelters and generator sets. Also, the 15-minute set up time for TACFIRE would not be required. The resulting weight reduction would be from 108,000 pounds to 6,000 pounds.

--Operator training would be reduced from 7 weeks to 3 weeks with soldier friendly man-machine interface.

--Electronic signature would be reduced by replacing generator sets with vehicle battery power source. Also, reduced size, and increased maneuverability add to the systems survivability.

--The system is more responsive because the menu-driven system alleviates communication saturation.

The system's main deficiencies are that it does not automate C2 for naval gunfire and has limited intraservice, interservice, and allied interface capability.

The major disadvantage of this option is that it does not conform with the Army's ACCS plan for a single software language--Ada--and one 32-bit hardware architecture for the Army in the 1990s, without major software and hardware upgrades.

CHART I.14

CONCLUSIONS

--THE ARMY'S PLAN WAS AN ACTION PLAN AND DID NOT INCLUDE AN EVALUATION OF ALTERNATIVES.

--THE FIST/DMD LOW COST OPTION FOR LIGHT DIVISIONS, INCLUDED IN THE ARMY'S PLAN, PROVIDES LIMITED INCREASED CAPABILITIES.

--THE LFATDS OPTION FOR LIGHT DIVISIONS, NOT INCLUDED IN THE ARMY'S PLAN, WOULD PROVIDE SIGNIFICANT INCREASED CAPABILITY AT MODERATE COSTS.

--AFATDS IS ONLY SOLUTION DESIGNED TO MEET ALL MENS AND ACCS OBJECTIVES. HOWEVER, FIELDING AFATDS TO HEAVY DIVISIONS IN FISCAL YEAR 1990 APPEARS TO BE OPTIMISTIC.

--THE ARMY HAS FUNDED AN INTERIM IMPROVEMENT PROGRAM FOR SOME ELEMENTS WITHIN HEAVY DIVISIONS.

--ANOTHER INTERIM PROGRAM WHICH COULD PROVIDE SIGNIFICANT INCREASED CAPABILITIES FOR HEAVY DIVISIONS HAS NOT BEEN FUNDED.

--AN ALTERNATIVE TO AFATDS EXISTS TO IMPROVE EXISTING SYSTEMS SHOULD AFATDS ENCOUNTER MAJOR DEVELOPMENT PROBLEMS.

--POTENTIAL CONGRESSIONAL ACTIONS:

- o ASK ARMY TO FULLY EXPLAIN TRADEOFFS BETWEEN THE LOW COST FIST/DMD OPTION AND THE MODERATE COST LFATDS OPTION FOR LIGHT DIVISIONS.
- o CONSIDER HAVING THE ARMY FUND THE TACFIRE EMULATOR OPTION FOR HEAVY DIVISIONS SINCE IT PROVIDES INCREASED CAPABILITY AT REDUCED COST.
- o CONSIDER REDUCING AND/OR RESTRICTING USE OF FISCAL YEAR 1987 AFATDS FUNDS PENDING RESULTS OF AFATDS DEVELOPMENT TESTING.

The Army's September 1985 plan to provide automated fire support C2 is an implementation plan, and therefore, it did not include an evaluation of alternative interim or longer term systems such as the LFATDS.

According to light division commanders, the FIST/DMD option, which would be a relatively low cost upgrade, does not provide enough increased capability to meet their needs.

The LFATDS option was not included in the Army's plan, but light division commanders have requested it since they believe it would provide sufficient capability. This increased capability over the FIST/DMD option could be achieved at some increased cost and fielding time.

The AFATDS program outlined in the Army's September 6, 1985, plan is the only fire support C2 option that is projected to meet all MENS requirements. In addition, it is designed to comply with the ACCS program objectives of software development in Ada and nondevelopment common ACCS hardware procurement. However, the AFATDS program has significant cost and schedule risks.

The Army has funded the FIST/DMD as an interim improvement program for some units within the heavy divisions.

A proposed upgrade for heavy divisions (TACFIRE emulator) that could achieve savings as well as significantly upgrade capabilities, has not been funded. The TACFIRE emulator is the most cost and operational effective improvement option available to heavy divisions in the near term with projected net savings and significant operational upgrades.

Should AFATDS encounter major cost or schedule growth, fielding LFATDS plus emulator to the total force could be an alternative solution that would cost about one-third as much as AFATDS and have nearly as much capability. This configuration, however, does not comply with the ACCS plan without major software and hardware changes.

Since the low cost FIST/DMD does not meet light division needs, according to artillery commanders, and the LFATDS costs about three times as much but meets their stated needs, perhaps the Army should be required by the Congress to explain the tradeoffs between the lower cost FIST/DMD and the more capable LFATDS solution for automated fire support capability for light divisions.

In view of the potential operational benefits and cost savings associated with the TACFIRE emulator for heavy divisions, the Congress could consider having the Army fund the TACFIRE emulator option for such divisions. Furthermore, in view of AFATDS cost and development risks, it might be advisable to either reduce the Army's fiscal year 1987 request for AFATDS and/or restrict the use of the funds until the results of the CEP have been fully evaluated.

LETTER DATED JUNE 16, 1986, FROM THE UNDER SECRETARY OF DEFENSE

THE UNDER SECRETARY OF DEFENSE

WASHINGTON D C 20301

16 JUN 1986

RESEARCH AND
ENGINEERING

(TWP)

Mr. Frank C. Conahan
Director, National Security and
International Affairs Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Conahan:

This is the Department of Defense (DOD) response to the General Accounting Office (GAO) draft report, "Army's Efforts to Improve the Field Artillery Tactical Data System," dated May 9, 1986 (GAO Code 395045/OSD Case 7011).

The Department of Defense nonconcurs with a majority of the findings and their implications. The Department also nonconcurs with two of the three suggestions to the Congress. With respect to the Light Field Artillery Tactical Data System (LFATDS), the major disagreements are:

-- the capabilities of LFATDS are overstated;

-- the cost of LFATDS is understated; and

-- the implied low risk and assumed schedule to field LFATDS to light divisions are not realistic.

The Army evaluated the LFADTS as an interim system to the Advanced Field Artillery Tactical Data System (AFATDS). While LFATDS can provide some additional capability, it would be at a significant additional cost, not moderate cost as claimed by the GAO. LFATDS was, therefore, determined to be too expensive for an interim system that could not realistically be deployed until a year before AFATDS and which has no potential for growth to meet the needs of the 1990s without major and costly redesign.

As to AFATDS, the GAO correctly recognized that it is the only option that meets all the approved Mission Element Need Statement requirements and also complies with the Army Command and Control System (ACCS) objectives. Little importance, however, has apparently been given by the GAO to this very important issue. Without the ACCS compatibility, the Army will end up with a collection of stand alone systems, which are loosely coupled (if at all), providing fragmented/partial solutions for C^2 support in the field.

The GAO also claims that the cost and schedule risks for AFATDS are high--apparently basing this on historical, tactical C^2 system development and fielding. The DoD strongly disagrees with this conclusion. No other system developments have followed the strategy of AFATDS--i.e., software first and then NDI hardware. In addition, these historical efforts have not had the advantages offered by the power of Ada language/tools and a top down detailed/documented requirements definition. The Naval Research Laboratory Report (Attachment 1 to the enclosure)[1] confirms that the current strategy for AFATDS is the right strategy with a high probability for success.

The DoD also disagrees with the GAO suggested action to the Congress to reduce or restrict AFATDS funding. Such an approach could only exacerbate cost and schedule risk. The Army simply cannot afford to develop and field an interim system to AFATDS.

The AFADTS program is receiving high level management attention. There will be review of the results of the concept evaluation phase by both the Army and the Office of the Secretary of Defense, before approving additional expenditures. A Milestone II ASARC for AFATDS is scheduled for July 1987. This will be followed by a DSARC.

The detailed DoD comments on each finding and suggestion to the Congress contained in the report are provided in the enclosure. The Department appreciates the opportunity to comment on this draft report.

Sincerely,

Donald A. Hicks

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[1]The Naval Research Laboratory Report is not attached because of its length and it does not discuss the Army's AFATDS program. Instead it discusses Navy command and control automation.

COMMENTS FROM DOD AND OUR EVALUATION

DOD COMMENT

Finding A: Most Light Divisions Do Not Have An Automated Fire Support Capacity. The GAO reported that in the early 1980s, the Army provided most heavy divisions and one light division with an automated artillery fire support (C2) system called TACFIRE. The GAO found, however, that subsequently, because the TACFIRE was large and heavy, and becoming technically obsolete, the Army stopped buying it and began to develop a new system with improved mobility and capability called AFATDS. The GAO observed that since most light divisions do not have automated fire support C2 capacity and the AFATDS is not scheduled to be fielded before 1990, several congressional committees expressed a concern about the absence of such capability for light divisions. (pp. 1-2, pp. 8-13, pp. 32-33, Appendix I/GAO Report)

DOD RESPONSE: Partially Concur. The DOD disagrees with the implication that the light divisions do not have automation for their fire support mission. The light divisions are, in fact, equipped with the BCS. The BCS provides automated fire control at the battery level.

GAO EVALUATION

FINDING A: We do not imply that "most light divisions lack an automated fire support capacity." We stated that most light divisions have no automated fire support C2 capability, a void recognized by the heads of three Army Commands and by the Army's Vice Chief of Staff. We agree that the BCS does give light divisions some fire support automation at the battery level, however, the BCS is only a part of the total system needed for fire support. The BCS, fielded at artillery cannon batteries, accepts fire requests and computers gun firing data. The BCS does not automate required fire support C2 functions at division, brigade, battalion, company, and forward observer levels in the maneuver and fire support echelons. These missing functions are integral parts of an automated fire support C2 system.

DOD COMMENT

FINDING B: The Army Plan Did Not Include An Evaluation of Alternatives. The GAO found that in 1985, as a result of congressional interest, the Army prepared a plan for providing interim capability to light divisions and increased capabilities

to the total force. The GAO reported that the objectives were to provide light divisions with:

--increased quantities of FIRT/DMDs (the GAO noted that these were initially bought for company level units and forward observers, but the Army plan now is to provide them to division and battalion fire direction centers) and

--a Tactical Computer Processor (TCP) (the GAO, noted, however, that the Army has subsequently abandoned plans to field the TCP due to cost and weight concerns).

The GAO observed that the September 6, 1985, plan sets out the Army's latest approach to acheive progressive improvements to field support C2 systems while continuing to evolve toward the longer term AFATDS programs. The GAO found, however, that because it is an implementation plan, it did not include an evaluation of alternative systems such as the LFATDS. (pp. 1-2, pp. 8-13, pp.32-33, Appendix I/GAO Report)

DOD RESPONSE: Partially Concur. The DOD disagrees that the FIST/DMDs were initially bought only for company level units and forward observers. The FIST/DMD was developed for company level use by the FIST headquarters, but it was also developed for use at battalion level in the fire support element. Use of the FIST/DMD at field artillery battalion, division artillery and maneuver brigade in the light divisions, however, is an expansion of its original use.

As indicated by the GAO, the September 1985 plan was an implementation plan, not an evaluation plan. The Army did, however, consider LFATDS as an alternative prior to the decision to go with FIST/DMD, but rejected it because it was duplicative and not cost effective. Automated fire support capability was already available with BCS. While LFATDS would provide some improved capability over FIST/DMD, it would not be compatible with the ACCS and required costly contractor maintenance support.

GAO EVALUATION

FINDING B: The FIST/DMD was initially procured for heavy division battalion fire support elements, in addition to company level units. However, as an interim capability to AFATDS the Army plans to use FIST/DMDs in light divisions at brigade and division fire direction centers and fire support elements where its capabilities fall significantly short of requirements. The FIST/DMD development effort was initiated in 1979 to modify digital message devices. The modification would enable it to handle multiple communications net messages

and routing controls at the company level. Its application was later expanded to include the battalion fire support element. However, some of the functions required at fire support elements and fire direction centers which the FIST/DMD does not perform and LFATDS does perform are: ammunition and fire unit status, non-nuclear fire planning, and meteorological messages. In addition, the FIST/DMD does not interface with all division artillery TACFIRE functions.

DOD COMMENT

FINDING C: The FIST/DMD Option Provides Limited Increased Capabilities. The GAO concluded that fielding FIST/DMDs for battalion level and above fire direction centers (FDCs) and fire support elements may not be sufficient. The GAO reported that, two light division commanders said that the FIST/DMD option does not meet their C2 needs. (p. 2, pp. 14-15, pp. 32-33, Appendix I/GAO Report).

DOD RESPONSE: Partially Concur. It is recognized that the FIST/DMD option does not provide all of the needed automation capability for fire support C2. Although it does not satisfy all the planning requirements that will be met by AFATDS, the FIST/DMD offers a very useful, reasonable and affordable first step. The FIST/DMD option provides an adequate and cost-effective interim solution for automated fire support C2 for the light divisions. This interim solution provides an automated capability at all fire support nodes between the forward observer and the FDC so that fire requests, approval, and C2 procedures can be maintained. This solution also satisfies the critical need for digital input to the BCS. The FIST/DMD also improves fire planning/coordination with the capability to transmit fire planning targets and battlefield information by rapid and accurate digital means. In addition, the FIST/DMD improves information management and provides interoperability with TACFIRE equipped units.

The Army has long recognized the power and capability of the FIST/DMD to meet the needs above company level. The initial fielding will include the FIST/DMDs at heavy and light division maneuver battalions. The Army's Close Support Study Group III also recommended fielding at the brigade level in TACFIRE equipped units. This recommendation was not implemented due to affordability and the planned fielding of AFATDS in the 1990s.

The Army is unable to confirm that two light division commanders have stated that the FIST/DMD option does not meet their interim needs. The FIST/DMD option has been briefed to both the 7th and 82nd Divisions. These briefings were well received and both

light division were enthusiastic about the improved interim capability.

GAO EVALUATION

FINDING C: We reported that the FIST/DMD did not meet the needs of light divisions and that light division commanders requested LFATDS, as evidenced by the following:

--A July 6, 1984, letter from the 82nd Division Commanders to the Commander 18th Airborne Corps requested immediate purchase of LFATDS.

--A March 1985 eyes only correspondence from the Commander, Forces Command to the Commander, 7th Infantry Division confirmed the request for LFATDS.

--In a February 28, 1986, meeting with GAO, the Commander, Chief of Staff, and the Acting Division Artillery Commander, 7th Infantry Division, confirmed that LFATDS is needed to meet automated fire support C2 requirements.

--In a May 28, 1986, meeting with GAO, the Acting Chief of Staff, 18th Airborne Corps and 82nd Airborne Division fire support officers confirmed that LFATDS or equivalent capability is needed and that the FIST/DMD would not meet brigade or division fire direction and planning requirements. They also pointed out that the FIST/DMD is needed for digital communications which are now voice and for planning at the company and battalion level but the company will not receive FIST/DMDs since they are diverted to higher echelons.

In addition, as recently as June 1986 the Commander, 7th Infantry Division in a message to the Commandant of the Field Artillery School stated that the FIST/DMD does not provide all the automation that the division needs for fire support C2. The message states that the 7th Infantry Division requested LFATDS.

DOD COMMENTS

FINDING D: Status Of The LFATDS Option. The GAO found that light division commanders have requested LFATDS to meet their needs and that LFATDS could provide viable capability at low to moderate cost and risk. (p. 2, pp. 18-21, pp. 32-33, Appendix I GAO Report)

DOD RESPONSE: Nonconcur. The DOD disagrees with the implication that light division commanders have specifically requested LFATDS and rejected the FIST/DMD. LFATDS, as it currently exists, is still plagued with major software deficiencies, and it is not logistically supportable by Army personnel. LFATDS also introduces unique, non-type classified equipment into the Army inventory, as well as a requirement to maintain yet another software package. The software problem is compounded by the fact that it is programmed in a low order rather than a high order language. In addition, LFATDS must be contractor maintained because it does not have a MIL-STD data package and the Army does not own all of the software rights. While light division commanders have expressed a need for increased fire support C2 automation, they have not specifically requested LFATDS. FIST/DMD assets, will be retained as part of the AFATDS system, whereas LFATDS hardware cannot be so retained.

The DOD disagrees that the development cost of LFATDS is already sunk. The system, as tested, requires major hardware and software improvements, if it is to be proliferated. GAO's reported costs to develop a division system conflicts with the $10.4 million cost that was proposed to the Army in November 1984, by the same contractor.

In addition, the DOD disagrees with the reported procurement cost. The contractor proposed cost of hardware alone is $3.4 million. The Army estimate of the total procurement cost is $9.4 million per division. The GAO also did not include the contractor proposed cost of software maintenance, which is $22 million for 4 years.

The DOD, therefore, nonconcurs with the GAO conclusion that LFATDS would provide significant increased capability over FIST/DMD at moderate cost. LFATDS can provide some additional capability, but at a significantly additional cost, not a moderate one. LFATDS was determined to be too expensive for an interim system that could not be deployed until a year before AFATDS and which has no potential for growth to meet the needs of the 1990s without major and costly redesign.

GAO EVALUATION

FINDING D: DOD's views on the problems with LFATDS appear to be overstated. Of 80 major software deficiencies outstanding in November 1985, only one remains, which has been addressed by the contractor and is being tested by the 9th Infantry Division.

The concern over logistic support also appears overstated. The Army plans to field LFATDS to the 9th Infantry Division, and regardless of whether the system is fielded to light divisions, the Army will still require LFATDS (1) contractor support, (2) non-type classified equipment, and (3) software maintenance.

Differences over LFATDS' development costs resulted from DOD using heavy division cost estimates for light divisions, and outdated cost projections. Costs to develop a light division battalion and brigade system are already sunk at $6.8 million in the 9th Infantry Division's LFATDS. The contractor estimates an additional $1 million is needed to develop a division level system for light divisions and $7 million for heavy divisions. These are March 1986 estimates, as opposed to the contractor's November 1984 projection used by DOD.

The disparity over procurement costs resulted from different treatments of government-furnished equipment. As stated in our report, the $3.3 million cost per division exclude government-furnished equipment while DOD's $9.4 million estimate does not. The $22 million software maintenance cost will already be incurred to support LFATDS for the 9th Infantry Division. Thus, it is not an additional cost to field LFATDS to the light divisions.

Our rationale for labeling LFATDS as a moderate cost solution for light divisions was determined relative to the lower cost of the FIST/DMD and higher cost of AFATDS. DOD's statement that LFATDS could not be deployed until a year before AFATDS is based on the assumption that AFATDS will meet accelerated milestones. However, AFATDS is still in the concept evaluation phase of development and milestones dates have slipped.

DOD COMMENT

FINDING E: Status of the AFATDS Program. The GAO found that the AFATDS program outlined in the Army's September 6, 1985, plan is the only fire support C2 option that is projected to meet all MENS requirements. In addition, the GAO found that AFATDS is designed to comply with the ACCS program objectives. The GAO observed that AFATDS development and procurement costs, including government-furnished equipment and support are estimated at over $2 billion. The GAO further observed that there has been cost growth on AFATDS.

The GAO concluded that the AFATDS program involves significant cost and schedule risks. (p. 2, pp. 16-27, pp. 32-33, Appendix I/GAO Report).

DOD RESPONSE: Partially Concur. The DOD agrees that the AFATDS program is the only option that meets all the approved MENS requirements and complies with ACCS objectives.

In addition, DOD agrees that the AFATDS program did experience a $12 million contract cost growth. The underlying cause for this cost growth was the need to expand, refine, and document the functional definition of AFATDS. In its review of this definition, the Army also deleted those functions that were redundant. In August 1985, the AFATDS contract was renegotiated and the government liability was capped at $36 million.

The DOD disagrees, however, that the AFATDS program involves significant cost and schedule risk. The AFATDS program is using the latest in software development tools and development procedures that will reduce risk of schedule and cost growth. The AFATDS program is under management control and is in a relatively low risk posture. Cost and schedule discrepancies are small, given the state of AFATDS progress, and are generally indicative of a low risk posture. The Naval Research Laboratory Report confirms that the current strategy for AFATDS is the right strategy, with a high probability for success.

The estimated procurement cost is $1.5 billion, as opposed to the $1.9 billion reported by the GAO. In addition, DOD disagrees that the deficiencies identified in testing could cause further development problems with associated cost growth. Based on the DOD experience with similar magnitude developments, the cited 37 deficiencies are a small number of trouble reports.

GAO EVALUATION

FINDING E: DOD's statement that "the Naval Research Laboratory Report confirms that the current strategy for AFATDS is the right strategy with a high probability to success" could be misleading. The report did not specifically address the AFATDS program. It outlined a general strategy for conceptual development of an integrated command support system which the AFATDS program is not following. The Navy report states that verification of compliance with system requirements is crucial for avoiding development problems. However, in February 1986, the Army's Product Assurance and Test Directorate reported that there has been no verification of compliance with AFATDS requirements in completed or planned tests. The Directorate report further stated that there are some high risks in meeting projected costs and milestones because the contractor is on an accelerated schedule. The report also stated that the remaining concept and evaluation phase software and brassboard hardware development efforts appear to be very high risk.

DOD believes that the 37 deficiencies cited for the first of four software packages to be developed is a small number. This may be true if the software was adequately tested. However, according to the contractor monitoring AFATDS testing, the small number of deficiencies were generated by a success oriented demonstration and not a test.

DOD questioned GAO's use of the Army's officials AFATDS development and procurement cost estimate of $1.9 billion. DOD said it should be $1.5 billion. The $1.5 billion estimate was developed by the Army more recently. The decrease resulted from AFATDS program modifications and the shifting of costs to the ACCS program.

DOD COMMENT

FINGIND F: Improvements For Heavy Division's Systems. The GAO reported that the Army plan does not address improvements to the heavy divisions' fire support systems. Specifically, the GAO observed that the plan focuses only on AFATDS replacing TACFIRE at division, brigade, and battalion echelons in fiscal year 1990. The GAO found, however, that critical equipment below battalion are scheduled for near-term upgrades through programs not mentioned in the Army's plan. The GAO concluded that some

improvements could be expected from these programs. (p. 2, pp. 28-29, pp. 32-33, Appendix I/GAO Report)

DOD RESPONSE: Concur. The Army plan did not address near-term improvements to the heavy divisions' fire support systems. The Army has, however, always intended to improve and continues to work toward improving the capability of the heavy divisions' fire support systems prior to the replacement of TACFIRE with AFATDS. Some of the programs that will accomplish this objective are:

--The fielded TACFIRE capabilities have continued to be improved through new software revisions that incorporate evolving doctrine and new weapons systems munitions.

--The FIST/DMD program, which went into production in fiscal year 1984, is fully funded for a quantity of 1,212 units. These units are to be deployed in all light and TACFIRE equipped divisions.

--The TACFIRE Emulator Product Improvement Program for the heavy division artillery TACFIRE was initiated by the Army in June 1985. The acquisition plan was approved in May 1986. Funds for reprogramming in fiscal years 1986 and 1987 have been identified. This equipment will not, however, be fielded at the battalion echelon and below because it is not cost effective at those levels.

--The BCS program initially went into production in fiscal year 1980 and is fully funded for a quantity of 1,120 units. These units are also to be deployed in all light and heavy divisions.

GAO EVALUATION

FINDING F: DOD concurred with the finding.

DOD COMMENT

FINDING G: Potential Total Force Capability Alternative. The GAO found that if significant cost or schedule growth are encountered with AFATDS, the LFATDS, combined with the TACFIRE emulator, is a potential alternative for both light and heavy divisions. The GAO also found that this alternative would cost about one-third as much as AFATDS and have nearly as much capability. The GAO concluded, however, that this option would not conform to the ACCS plan without major software and hardware changes. (p. 2, pp. 30-33, Appendix I/GAO Report)

DOD RESPONSE: Nonconcur. DOD disagrees that LFATDS, combined with the TACFIRE emulator, is a viable alternative. IF AFATDS development were to fail for any reason, the DOD would reevaluate the requirement. It is the DOD's judgment that LFATDS cannot realistically be grown to the ultimate requirements and is therefore not a viable option. DOD's position is based on the fact that LFATDS has significant technical limitations that would require extensive hardware and software upgrades before the Army requirements could be met. Significant LFATDS shortcomings are (1) no Ada language capability, (2) limited memory capacity, (3) poor graphic display, and (4) the processor is 16-bit architecture. The ACCS, as well as commercial technology, is moving to 32-bit architecture due to increased processing speed, more memory capacity and improved graphics capabilities. Functionally, LFATDS is less capable than the current TACFIRE, but with smaller, lightweight hardware. LFATDS has no capability, without extensive redesign, to accomplish required advanced applications, such as: target value analysis; target prioritization; deep battle operations; employment of terminal homing munitions; integration of all fire support systems; interoperability with other battlefield functional areas, services, and allied fire support systems; nor is it capable of accommodating expected systems growth.

LFATDS could become more expensive than AFATDS if it were upgraded to meet the approved requirements. In addition, the same degree of system functionally and flexibility cannot be achieved if system design is driven by a hardware solution.

GAO EVALUATION

FINDING G: Although LFATDS plus emulator does not meet all the requirements that AFATDS is projected to meet, it is an attainable improvement over TACFIRE. We know of no other interim or alternative solution where both software and hardware has been designed and tested for fire support C2.

DOD COMMENT

SUGGESTION 1: The GAO suggested that the Army should be required by the Congress to explain the tradeoffs between the lower cost FIST/DMD and the more capable LFATDS solution for automated fire support capability for light divisions. (p. 3, Appendix I/GAO Report)

DOD POSITION: Nonconcur. As directed by the FY 1986 Defense Appropriations Act, the DOD will be providing an August 1, 1986, report to the Congress that will include (1) a comprehensive status report, (2) the detailed plans for achieving the objective system requirements, and (3) a schedule for bringing AFATDS under the ASARC/DSARC reviews. In addition, the report will include an overall transition plan for achieving near-term improvements for both the light and heavy divisions. An appendix to that report will also provide a limited description of the alternatives considered during 1984 and 1985, before the decision was made to go with the FIST/DMD to provide an interim capability for the light divisions. DOD strongly disagrees, however, with the implication of this suggestion that the decision should be revisited. The appropriate analyses have already been completed and the decisions have been made. Revisiting of past decisions in the absence of new substantive information could only serve to add costly delays to an already cumbersome acquisitions process. Serious consideration has already been given to several alternatives for providing the light divisions with an improved fire support C2 capability during the interim period, prior to fielding AFATDS. The LFATDS option was compared against the FIST/DMD option. The Army recognizes that LFATDS has a potentially greater capability than the FIST/DMD option, but at a significantly greater cost. On the other hand, the FIST/DMD will provide a significant interim enhancement to the light division capabilities at an affordable cost. LFATDS is not affordable as an interim to AFATDS and cannot meet the AFATDS requirements.

GAO EVALUATION

SUGGESTION 1: We concluded that the Army should explain to the Congress the tradeoffs between alternatives. We believe that substantive events have occurred and substantive new information is available since the Army submitted its September 1985 plan. The report of these events and information should be evaluated before implementing the FIST/DMD solution for light divisions. For example:

--LFATDS is being field tested, demonstrating actual capabilities for analysis rather than projections.

--The Army's September 6, 1985, plan proposes fielding the FIST/DMD in the 4th quarter fiscal year 1986. However, the system has experienced technical problems and planned fielding has slipped.

--The Army, now plan to upgrade the FIST/DMD. If the need for an upgraded FIST/DMD is justified, then capabilities, cost, and development risks should be evaluated against

alternatives. In addition, any decision should take into consideration that this solution does not comply with ACCS equipment and software requirements which the Army states as a major reason for not procuring LFATDS.

--Problems in developing and procuring the Digital Communications Terminal (DCT) have now delayed the planned fielding date of this system to the 1st quarter fiscal year 1989. Without the DCT or some other forward entry device the light division FIST/DMD solution will not have the critical automated links from platoon to company and company to battalion. As a result, the FIST/DMD solution will not provide the envisioned near-term capability outlined in the Army's September 1985 plan.

DOD COMMENT

SUGGESTION 2: The GAO suggested that the Congress could consider having the Army fund the TACFIRE emulator option for such divisions. (p. 33, Appendix I/GAO Report)

DOD RESPONSE: Concur. The Department of the Army has already approved acquisition of TACFIRE emulators.

GAO EVALUATION

SUGGESTION 2: DOD concurred with GAO's conclusion.

DOD COMMENT

SUGGESTION 3: The GAO suggested that it might be advisable to either reduce the Army fiscal year 1987 request for AFATDS and/or restrict the use of the funds until the results of the concept evaluation phase have been fully evaluaed. (p. 33, Appendix I/GAO Report)

DOD RESPONSE: Nonconcur. The proposal that AFATDS funding be reduced because of possible schedule and cost risks is neither constructive nor reasonable, and appears to be based on conjecture rather than substantive evidence of problems. Should the Congress reduce/restrict fiscal year 1987 funding for AFATDS, it would put the Army in the position of not being able to exercise contract options, which would guarantee a schedule slippage--perhaps as much as 12 to 18 months. The Army and the Office of the Secretary of Defense will review the results of the CEP before approving additional expenditures. A Milestone II Army Systems Acquisition Review Council (ASARC) for AFATDS is scheduled for July 1987. This will be followed by an August 1987 Defense System Acquisition Review Council[1] (DSARC).

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[1]The DSARC has now been replaced by the Joint Requirements Management Board.

GAO EVALUATION

SUGGESTION 3 Our conclusion that it might be advisable to reduce or restrict the AFATDS fiscal year 1987 funding request to initiate full-scale development is based on the AFATDS program's cost and schedule risks, as indicted in Appendix I and in our response to DOD comments on "Finding E".

The AFATDS CEP contract contains an option which, if exercised, would award the same contractor the follow on full-scale development contract. DOD said that our conclusion on reducing or restricting funds puts the Army in a position of not being able to exercise this option, thereby guaranteeing a schedule slip. However, unless this contract option is exercised prematurely, the Army is already in a position where it cannot exercise the contract option before it expires. If the CEP completion date is extended so that the option can be exercised, then full fiscal year 1987 funding would not be needed.

The AFATDS program is a major system acquisition subject to ASARC/DSARC reviews before it can enter full-scale development. However, the ASARC/DSARC reviews are not scheduled until July/August 1987, or about 5 months after the full-scale development contract option expires in February 1987. In addition, the AFATDS' contract specialist stated that the development and submittal of contractor proposals, Army technical evaluations and audit, and contract cost negotiations would delay contract award until at least 2 months after the option expiration date. Consequently, the program manager must either let the contract expire or extend the contract.

If the current contract expires without exercising the option, the Army may be required to compete the full-scale development phase contract. This action could cause program slips of 12 to 18 months and would obviate the need for most fiscal year 1987 funding. Similarly, if the current contract is extended so that the option can be exercised in fiscal year 1988 (about 6 weeks after the scheduled date of the ASARC/DSARC reviews) then most fiscal year 1987 funding request of $40.4 million for full-scale development would not be needed. According to the AFATDS Program Manager, funds would still be needed for in house and subcontracator support costs. Our review of the AFATDS' fiscal year 1987 fuding request disclosed $10.8 million budgeted for these costs.

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