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DESCRIPTIVE SUMMARIES OF THE RESEARCH DEVELOPMENT TEST & EVALUA--ETC(1)
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Descriptive Summaries Of The



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Army Appropriation FY 1982(U)

DEPARTMENT OF THE ARMY DEPUTY CHIEF OF STAFF
FOR RESEARCH DEVELOPMENT AND ACQUISITION
RDTE PROGRAMS AND BUDGET DIVISION

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VOLUME II
DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS
OF THE
RESEARCH, DEVELOPMENT, TEST AND EVALUATION, ARMY PROGRAM
FY 1982 (U)
JANUARY 1981

Department of the Army
Deputy Chief of Staff for Research, Development, and Acquisition

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FOREWORD

These volumes have been prepared to provide information on the US Army Research, Development, Test and Evaluation Program for Congressional Committees during the Fiscal Year 1982 hearings. This information is in addition to the testimony given by US Army witnesses.

These volumes contain a descriptive summary for each program element to be financed during FY 1982. Descriptive Summaries for projects within the program elements to be financed during FY 1982 for \$5.0 million or more appear immediately following the applicable program element. Where there are several items under development within a project, a separate summary has been provided for each item that exceeds \$5.0 million during FY 1982. A Test and Evaluation Section is provided for all major weapon systems. Major weapon systems are identified by an asterisk in the Table of Contents.

The formats and contents of these volumes are in accordance with guidelines and requirements of the Congressional Committees insofar as possible. Information previously provided in the SAC Data Book is consolidated into these volumes. The SAC Data Book information appears at the beginning of each program element descriptive summary.

A direct comparison of FY 1980, FY 1981, FY 1982, and FY 1983 data in this Program Element Listing with data shown in the Program Element Listing dated January 1980 will reveal significant differences. Many of the differences are attributable to the following factors:

- a. Restructuring of the FY 1980 and FY 1981 programs for comparability to the FY 1982 program structure.
- b. Reclassification to provide greater visibility and contribute to the effective management of the RDTE program such as the following:
 - (1) RDTE Headquarters Management.
 - (2) Further extension of the Single Program Element Funding Concept.
 - (3) Restructuring of Exploratory Development personnel RDTE programs.

The funding information used in these volumes corresponds to that contained in the President's Budget except for FY 1980. FY 1980 funds in the President's Budget are not restructured. The attached Descriptive Summaries have the FY 1980 column restructured to reflect more realistic historical information. Procurement data is shown where applicable for items in engineering or operational development. Military construction data is shown where applicable.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.33.04.A

Title: Ballistic Missile Defense Advanced Technology

DOD Mission Area: #121 - Ballistic Missile Defense

Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in Thousands):

<u>Project Number</u>	<u>Title</u>	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional To Completion</u>	<u>Total Estimated Costs</u>
	Total for Program Element	119854	123222	126883	146623	Continuing	Not Applicable
D215	BMD Advanced Technology	119854	123222	126883	146623	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Ballistic Missile Defense (BMD) Advanced Technology Program is a broadly-based research and development effort designed to exploit new and emerging technologies -- seeking improved cost-effective methods to perform ballistic missile defense. The US is faced with a growing Soviet ballistic missile threat and must continue to advance and develop the technologies required to provide options to counter this threat. The program is essential to assure that persistent Soviet BMD efforts do not further erode the level of national ballistic missile defense capability that the US has maintained since the 1972 ABM treaty was entered into force.

C. BASIS FOR FY 1982 RDTE REQUEST: The BMD Advanced Technology Program is designed to maintain the pace of BMD advanced development needed to aggressively search for and exploit innovative concepts as a guard against technological surprise. The FY 82 program objectives are to develop the technology which will provide a realistic exoatmospheric BMD option to be offered by and provide selected technology support for low-altitude BMD. Emphasis is to be placed on technology development to enhance producibility of hardened exoatmospheric optical sensors. Additional exoatmospheric target signature collection programs are to be initiated. Selected developments in hardening technology for enhanced low-altitude BMD survivability are to be initiated. Advanced technology programmed efforts are to be continued on radar technology, sensor technology, unique discrimination techniques, advanced data processing techniques, advanced interceptor missiles, and advanced BMD construct analysis.

Program Element #6.33.04.A
DOD Mission Area: #121 - Ballistic Missile Defense

Title: Ballistic Missile Defense Advanced Technology
Budget Activity: #3 - Strategic Programs

<u>Major Milestones</u>	<u>Current Milestone Dates</u>	<u>Milestone Dates Shown in FY 1981 Submission</u>
Designating Optical Tracker Flight	2nd QTR FY 1982	None Shown
Shipboard Radar Operational		None Shown
Millimeter Wave Module Tests	2nd QTR FY 1982	None Shown

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST (\$ in Thousands):

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (Current requirements)	119854	123222	126883	Continuing	Not Applicable
Funds (as shown in FY 1981 Submission)	120804	132751	143535	Continuing	Not Applicable

The decrease in FY 80 resulted from a \$950 reduction in the Advanced Technology Program due to increased fuel costs at Kwajalein Missile Range.

The decrease in FY 81 reflects the application of a general Congressional reduction for inflation and President Reagan's reduction in travel, consultants, furniture and inflation.

The decrease in FY 82 will result from the transfer of \$12,500 to Project 6.33.08.A, BMD Systems Technology Program, for use on the Low Altitude Defense Preprototype Demonstration program, a \$5,800 Army decrement, and \$4,434 added for civilian pay increase, higher fuel costs and increased inflation, plus a \$2,843 decrease for use of consultants and increased efficiencies.

E. (U) OTHER APPROPRIATION FUNDS: Not applicable.

Program Element: #6.31.04.A
DOD Mission Area: #121 - Ballistic Missile Defense

Title: Ballistic Missile Defense Advanced Technology
Budget Activity: #3 - Strategic Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The major objectives of the BMD Advanced Technology Program are to maintain U.S. leadership in BMD technology, prevent technological surprise, support offensive deterrent forces, and support intelligence assessments. The BMD Advanced Technology Program has, in recent years, placed increasing emphasis upon exoatmospheric intercept technologies and upon the technological upgrading of state-of-the-art terminal defense systems with non-nuclear kill interceptors and distributed defense components. Major technology accomplishments have included significant advances in the fields of BMD sensors, discrimination techniques, data processing hardware and software for BMD applications, and advanced endoatmospheric and exoatmospheric interceptor missiles. Long wave infrared (LWIR) optical sensor technology has been developed allowing long-range target acquisition, discrimination, and tracking from missile-borne sensors. Non-nuclear homing kill vehicle technology has been developed and ground tested. Solid state radar techniques have been developed which allow for smaller, higher power, less expensive radars for terminal defense. Considerable progress has been achieved in directed energy weapon (DEW) phenomenology. High energy kill mechanisms have been successfully demonstrated using simulated ICBM components. The program will continue to address key issues and expand BMD capabilities in the exoatmospheric defenses pressing toward demonstrations of exoatmospheric systems and exploitation of potential space-based defense concepts. Terminal defense technology advancement will pursue optical airborne adjuncts, non-nuclear kill constructs, and technology development of low-cost, rapidly manufacturable, rapidly deployable interceptors to achieve non-nuclear defense of point targets.

G. (U) RELATED ACTIVITIES: The BMD Advanced Technology Program is fully coordinated with related programs being sponsored by other Army, other DOD, and other Government agencies. Included are Army Materials and Mechanics Research (PE 6.11.02.A), Air Force Intelligence Gathering (PE 3.10.15.F), Air Force Deep Space Satellite Surveillance (PE 6.34.28.F), Air Force Flight Test Measurements (PE 6.33.11.F), and DOE Particle Beam Technology programs. Every effort is made to prevent duplication of effort through automated literature searches, coordination meetings, memorandums of agreement, etc.

H. (U) WORK PERFORMED BY: The five major contractors currently are: Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, MA; The Boeing Company, Seattle, WA; McDonnell Douglas Corporation, Huntington Beach, CA; Rockwell International Corporation, Anaheim, CA; and Honeywell, Inc., Minneapolis, MN. There will be approximately one hundred additional contractors and other Government agencies for an additional estimated dollar value of \$99 million. The developing organization responsible for the program is the Ballistic Missile Defense Advanced Technology Center, Huntsville, AL.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS

1. (U) FY 1980 and Prior Accomplishments: Major technology accomplishments have included the development of small netted radars, improved interceptor missiles, new discrimination techniques and the adaptation of large, high-powered, commercial data processors for BMD use. The design of a modular missile-borne computer that is capable of performing a multiplicity of data processing functions on board the interceptor missile was completed. The assessment of directed energy weapon technology for BMD

Program Element: #6.33.04.A
DOD Mission Area: #121 - Ballistic Missile Defense

Title: Ballistic Missile Defense Advanced Technology
Budget Activity: #1 - Strategic Programs

applications was initiated. The Designating Optical Tracker (DOT) Flight Test Program to verify LWIR sensor performance in a realistic BMD environment was initiated and three successful flight tests have been conducted to date. Development of the technology base to provide the potential for the utilization of non-nuclear kill (NNK) devices in endoatmospheric ballistic missile defense. High technology engagement constructs for the exoatmospheric regime were synthesized based upon flight tested optical sensors, direct impact kill guidance and control technology and miniaturized data processing technology. The Forward Acquisition Sensor (FAS) integrated ground test program was initiated to resolve technological issues associated with early warning and attack assessment for BMD systems.

2. FY 1981 Program: The FY 81 BMD Advanced Technology Program is structured to address BMD technology within the context of overall program objectives. The radar program will continue to be a broadly-based technology effort covering the major frequency regimes (microwave, millimeter, and micrometer) and stressing cost reduction, rapid deployment, component hardening, and improved information gathering. Emphasis will continue on the development of millimeter wave and solid state X band radar technology. The optics technology program will provide for: one Designating Optical Tracker (DOT) flight; the continued development of mosaic sensor technology; and demonstration of a testbed capability for mosaic technology components. The discrimination technology program will include continued installation of the COBRA JUDY shipborne data collection radar, and preparation of specifications supporting the initiation and hardware procurement for an airborne optical data gathering platform. The data processing program will provide for development of a laboratory prototype of a modular missile-borne computer to address the stressing on-board data processing requirements of BMD systems. Critical research issues for distributed data processing in a BMD scenario will be emphasized to provide high performance configurations and computer architecture for BMD systems. The interceptor program, will continue critical interceptor component testing; conduct full-scale tests of a missile forebody fabricated from advanced materials; and initiate the design of warhead subsystems for the Endo NNK program will be conducted. Hardware procurement for the Forward Acquisition Sensor (FAS) integrated ground test program will be initiated. Evaluation of strategic options from a defense viewpoint will be continued. Critical component developments for a near-term, low-altitude defense system will be continued.

1. FY 1982 Planned Program: The FY 82 BMD Advanced Technology efforts will include research and hardware purchase in the areas of: advanced sensors, unique discrimination techniques, advanced data processing networks and software, advanced endo-atmospheric and exoatmospheric interceptors, and advanced BMD construct analysis. The radar technology program will include: Initial Operating Capability (IOC) for an improved signature measurements radar at Kwajalein; the testing of Millimeter Wave (MMW) radar modules; and at Kwajalein. The optics technology program will provide for the testing of a ten-element, hardened optical array; the development of a laser vulnerability prediction model; and one Designating Optical Tracker (DOT) Flight. The discrimination technology program will include data gathering radar; aircraft procurement and continued design and fabrication of the sensor for an airborne optical platform for use in obtaining an LWIR data base needed for optical discrimination development; continued acquisition and analysis of field test data on offensive threat

Program Element: #6.33.04.A
DOD Mission Area: #121 - Ballistic Missile Defense

Title: Ballistic Missile Defense Advanced Technology
Budget Activity: #3 - Strategic Programs

vehicles and penetration aids. Data processing technology will include: demonstration of a dynamically reconfigurable architecture; demonstration of a residue processor prototype; and demonstration of real-time processor and memory allocation under decentralized control. The interceptor technology program will complete design review for test hardware for an improved direct impact kill vehicle prototype; initiate fabrication of MMW fuze components; and complete proof-of-principle tests for an advanced programmable auto pilot. Critical technology integration and flight test planning for the Endoatmospheric NNK program will be continued. Analytical simulations and pre-testing of components for the Forward Acquisition Sensor (FAS) integrated ground test program will be continued. Technology assessment and integration programs will be continued.

4. FY 1983 PLANNED PROGRAMS: Critical technology integration and flight test planning will be completed for the program to allow for flight experiment decisions. Design and fabrication of sensor components data processor and associated hardware relating to an integrated ground test of will be continued. A series of to obtain data on; will be initiated. Design and development of the integrated ground test of an will continue. Technology assessment and integration programs will continue.

5. (U) PROGRAM TO COMPLETION: This is a continuing program.

FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.13.08.A

Title: Ballistic Missile Defense Systems Technology Program

DOD Mission Area: #1 - Ballistic Missile Defense

Budget Activity: #3 - Strategic Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in Thousands):

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	120814	181038	301685	263143	Continuing	Not Applicable
D991	BMD Systems Technology Program	120814	181038	301685	263143	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides a hedge against the strategic uncertainties associated with the ballistic missile threat to the United States by providing for BMD systems technology research and development activities which will advance BMD systems state-of-the-art technology; maintain the capability to initiate design and development of a deployable BMD system, if directed; conduct systems definition studies; and test selected components in a systems context to assess responsiveness to a variety of BMD missions.

C. BASIS FOR FY 1982 RDTE REQUEST: This program provides for the definition of tactical BMD systems, the resolution of key exoatmospheric system issues in the Homing Overlay Experiment and validation of endoatmospheric issues in the Low Altitude Defense (LoAD) Preprototype Demonstration (PPD) Program. The HOE will complete fabrication, assembly and in-plant testing of flight interceptors, along with system integration and testing of ground test units. First flight tests will be conducted. The LoAD PPD Program will continue with systems engineering hardware/software design and preparation for hardware fabrication.

Major Milestones

Current Milestone Dates

Milestone Dates Shown in FY 1981 Submission

1st Homing Overlay Experiment Flight

June 1982

Completion of Low-Altitude Defense Preprototype Demonstration

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Program Element: #6.33.08.A

DOD Mission Area: #121 - Ballistic Missile Defense

Title: Ballistic Missile Defense Systems Technology Program

Budget Activity: #3 - Strategic Programs

D. (U) COMPARISON WITH 1981 RDTE REQUEST: (\$ in Thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	120814	181038	301685	Continuing	Not Applicable
Funds (as shown in FY 1981 Sub- mission)	120814	133503	188620	Continuing	Not Applicable

The increase in FY 81 reflects a \$15 million increase by Congress to preserve the option to accelerate the LoAD PPD and a \$39 million Supplemental to be provided Congress to accelerate the LoAD PPD. This program was also reduced a prorata share of the Congressional Inflation cut to the FY 81 Army R&D appropriation and for increased efficiencies.

The increases in FY 82 reflects a \$26 million increase in LoAD PPD costs caused by MX design changes and a \$90 million amendment provided to Congress to accelerate the LoAD PPD offset slightly by decreases for improved efficiencies.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

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Program Element #6.33.08.A
DOD Mission Area: #121 - Ballistic Missile Defense

Title: Ballistic Missile Defense Systems Technology Program
Budget Activity: #3 - Strategic Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The Site Defense Program was initiated in FY 1971 to conduct prototype demonstration of a defensive system against Soviet ballistic missile improvements which were becoming a threat to the US MINUTEMAN force. The FY 1975 and FY 1976 Congressional budget authorization hearings directed reorientation of the Site Defense Program from prototype demonstration to systems technology advancement and redesignated the program as the Ballistic Missile Defense Systems Technology Program (STP). The reoriented program investigates systems capable of defending a variety of national strategic targets with primary emphasis on defense of land-based intercontinental ballistic missiles. The primary objective of the STP is to retain a posture from which a full-scale development program can be initiated if required, which will result in a cost-effective ballistic missile defense system which incorporates the most advanced technology and provides an acceptable leadtime to deployment. The program is in consonance with the US Strategic Arms Limitation Agreements, the US strategic offensive nuclear arms research and development community and the US ballistic missile intelligence community.

G. (U) RELATED ACTIVITIES: Related activities include testing at the Kwajalein Missile Range, Program Element 6.53.01.A, and the Ballistic Missile Defense Advanced Technology Program, Program Element 6.33.04.A. The Systems Technology Program is designated to validate and merge mature technology into BMD systems while Advanced Technology Programs explore technology associated with specific program objectives. Kwajalein Missile Range provides the support and test facilities for test and evaluation of the Ballistic Missile Defense Systems Technology Program. These programs are centrally managed to avoid duplication of effort.

H. (U) WORK PERFORMED BY: Contractors include: McDonnell Douglas Astronautics Company, Huntington Beach, CA; Lockheed Missiles and Space Co., Sunnyvale, CA; Honeywell, Inc., Avionics Division, St. Petersburg, FL; Honeywell, Inc., Defense Electronics Div., Lexington, MA; Rockwell International, Rocketdyne Div, Canoga Park, CA; Martin-Marietta Corporation, Orlando, FL; Teledyne Brown Engineering Co., Inc., Huntsville, AL; Kaman Sciences Corp., Colorado Springs, CO; and General Electric Co., Syracuse, NY. Government agencies; Supporting government agencies include: Army Materials and Mechanics Research Center, Watertown, MA; San Antonio Air Logistics Center, Kelly AFB, Texas; and US Army Missile Command, Huntsville, AL. The developing organization responsible for the program is the Ballistic Missile Defense Systems Command, Huntsville, AL.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS

1. (U) FY 1980 and Prior Accomplishments: In 1975, the Site Defense Program was restructured from a prototype demonstration to one of validating key technology issues. The Technology Validation Program (TVP) continued the design and development of site defense hardware/software for initial bulk filtering, discrimination and realtime data processing. The validation testing of this hardware/software was completed in FY 80 and final data reduction and analysis are continuing. The TVP was highly successful and these technology issues appear resolved for the system context tested. The data processing effort continued in order to investigate distributed data processing as a means to increase throughput. Technical studies on the layered defense system concepts, and analysis for defending a variety of strategic national assets continued. Studies were completed in FY 80 which showed the potential contribution of BMD to nuclear deterrence and concluded that a potential mission for BMD systems in the 1990s includes the defense

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Program Element: #6.11.08.A

DOD Mission Area: #121 - Ballistic Missile Defense

Title: Ballistic Missile Defense Systems Technology Program

Budget Activity: #3 - Strategic Programs

of ICBMs and other high value targets. Selection of an Interceptor Systems Integration Contractor (ISIC) and initial development work was initiated for the Homing Overlay Experiment (HOE) in Aug 78. The preliminary design review for the HOE was completed in Nov 79. The HOE design was continued and fabrication and assembly of hardware was begun for design verification testing; seven major subcontractors began design verification tests for the infrared sensor, warhead, propulsion system, guidance system, ground support equipment, data processing hardware/software compatibility, and electronic control systems. Construction of required HOE test facilities at Kwajalein Missile Range was begun in FY 80. The first complete interceptor ground test unit was completed Nov 80 and integration testing of the interceptor ground test unit was begun. Hardware testing, augmented by system simulation, was performed and procurement of the first interceptor flight test hardware was begun in early FY 80. Advanced data processing hardware configuration experiments were continued and the detailed design of a facility to support the development of tactical distributed data processing software was initiated. Two Systems Technology Reentry Vehicle Experiment Program (STREP) dedicated targets were flown to complete the evaluation of the discrimination performance of the Site Defense Radar and to provide Soviet-like reentry vehicle data. Mothballing of the Systems Technology Test Facility was begun after the last STREP flight in Sep 80. System Analysis was completed in FY 79 for the Low Altitude Defense (LAD) Preprototype Demonstration (PPD), and cost and schedules were developed during CY 79. The LoAD PPD began in FY 80 with major effort directed toward system definition and source selection of contractors for the Sensor and Engagement Controller. Definition work continued on the Interceptor subsystem and ground support equipment areas.

2. FY 1981 Planned Program: The design verification testing of the Homing Overlay Experiment (HOE) component hardware will be completed and a critical design review is scheduled for Dec 80. Complete fabrication and assembly of the flight test units for the Homing and Kill phase of the HOE will begin and continue throughout the year. The ground support unit system integration testing will be completed in CONUS and testing will begin at Kwajalein Missile Range (KMR). Construction of test facilities will be completed at KMR for the first HOE flight test scheduled in FY 81. The Systems Technology Test Facility (STTF) will be closed, and personnel and some equipment will be returned to CONUS. System functional design for the Low Altitude Defense Preprototype Demonstration will begin. The Sensor and Engagement Controller (SEC) contractor will be selected by mid-to-late FY 81. Preliminary design for the SEC radar subsystem, development and testing of radar brassboard models, engineering modeling and blast radiation analysis for the interceptor airborne guidance subsystem, wind tunnel tests of the proposed interceptor configuration, and design and development of the propulsion system will also be initiated. A competitive effort to define BMD system concepts for the 1990 time frame will examine defense of ICBMs and other high value targets.

3. FY 1982 Planned Program: The Low Altitude Defense Preprototype Demonstration will continue with system engineering and development and testing components for the Sensor and Engagement Controller (SEC) and Interceptor. Hardware and software development and testing will continue for the data processing and support equipment. The System Design Review (SDR) will be held during 2nd Qtr, FY 82 and preliminary design reviews are scheduled for the SEC and Interceptor equipment during the 3rd Qtr. The flight test program for the Homing Overlay Experiment (HOE) will start in FY 82. The fabrication, assembly and test of the four HOE flight interceptors will be completed, along with system integration and test of the ground test units. First and second interceptor

Program Element: #6.33.08.A
DOD Mission Area: #121 - Ballistic Missile Defense

Title: Ballistic Missile Defense Systems Technology Program
Budget Activity: #1 - Strategic Programs

flights will be flown in _____ respectively against dedicated MINUTEMAN-I reentry vehicles which will be instrumented for lethality evaluation. Based on the results of the competitive effort in FY 81, a single contractor will be selected to initiate system design and validation of the BMD System for the 1990s.

4. FY 1983 Planned Program: The Low Altitude Defense Preprototype Demonstration will continue with detail design of the Sensor and Engagement Controller (SEC). Data processing hardware and software design release is scheduled for early FY 83. Interceptor preliminary design studies will be completed.

5. (U) Program to Completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.32.15.A

DOD Mission Area: #225 - Air Warfare Support

Title: Joint Survivability Investigations

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	600	645	948	1130	Continuing	Not Applicable
D079	Joint Survivability Investigations	600	645	948	1130	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This Program Element provides the Army's contribution to the Tri-Service Joint Aircraft Survivability Program. The program operates under the aegis of the Joint Logistics Commanders, and is conducted by the Joint Technical Coordinating Group on Aircraft Survivability (JTCCG/AS). All efforts are directed at improving the survivability of US aircraft in the nonnuclear threat environment to increase assets available/sorties possible over a given period of conflict. In addition to coordination of research and advanced development programs of the Services, these resources are applied to efforts that have been identified by Tri-Service working groups to be critical, technology void-filling projects. They are anticipated to provide low-risk, high-payoff technology for two or more services. Research conducted is in support of and complementary to the Required Operational Capability (ROC) for Aircraft Survivability Equipment. The JTCCG/AS mission is to: (1) coordinate research and advanced development efforts and plan and propose joint critical technology programs contributing to the reduction of vulnerability and the improvement of survivability in aeronautical systems in a combat environment; (2) review and analyze data on combat damage; (3) conduct studies of future threat environments to determine survivability requirements and to assess enhanced survivability design features; (4) plan and coordinate joint service tests and maintain cognizance over single service tests to validate improved survivability design features. The JTCCG/AS is required by its charter to promote survivability/vulnerability as a design discipline and coordinate research and development results among the services and industry.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Based upon analysis of combat experience in Southeast Asia, intelligence gathered from the 1973 Mideast conflict, and the latest threat data available, the JTCCG/AS, in conjunction with the research and development organizations of the Joint Logistics Commanders, developed an overall technology plan to provide the knowledge required for the design of combat-survivable aircraft and equipment. This program element funds the Army portion of the joint plan. The FY 1982 submittal includes support for the Combat Data Information Center; continued engine vulnerability tests; develop canopy laser countermeasure for integration in preliminary design phase; develop and process related military standards; complete development of low-cost pilot seat/armour; advanced small engine vulnerability reduction; study durability payoff of survivable engine design; high-power transmission systems vulnerability reduction; evaluate effects of nonferrous

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Program Element: #6.32.15.A
DOD Mission Area: #225 - Air Warfare Support

Title: Joint Survivability Investigations
Budget Activity: 74 - Tactical Programs

material fractures on engine survivability; continued support of IR measurements standardization; Full Authority Digital Electronic Engine Control (FADEC) for increased engine survivability; control signal transmission efforts; and analysis of helicopter combat damage repair.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	600	645	948	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	600	693	914	Continuing	Not Applicable

Differences in funding profiles between the FY 1982 and the FY 1981 Congressional Descriptive Summaries reflect program adjustments for inflation. The FY81 decrease reflects the application of general Congressional reductions.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable

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Program Element: #6.32.15.A
DOD Mission Area: #225 - Air Warfare Support

Title: Joint Survivability Investigations
Budget Activity: #4 - Tactical Programs

F. (U) **DETAILED BACKGROUND AND DESCRIPTION:** In 1971, a Joint Technical Coordinating Group on Aircraft Survivability (JTCG/AS) was established under the Joint Logistics Commanders Group to acquire and make available technology for designing nonnuclear survivability enhancements into new aircraft. The JTCG/AS is chartered to: (1) implement interservice efforts to reduce nonnuclear vulnerability of aircraft, (2) coordinate research and advanced development in nonnuclear survivability, and (3) maintain liaison between technology experts and those actually designing new aircraft. In 1972, the JTCG/AS formulated a tri-Service nonnuclear survivability program named Test and Evaluation Aircraft Survivability (TEAS). The TEAS program was approved by the Under Secretary of Defense for Research and Engineering (USDRE), and \$10 million in USDRE funds were allocated for the program over a three-year period (FY 1973-FY 1975). As a technology-oriented program, TEAS involved experiments to strengthen the data base, evaluate prototype hardware, and develop engineering theory and design criteria. A USDRE decision in early FY 1975 called for further nonnuclear survivability efforts to be budgeted by each of the services beginning in FY 1976. (Interservice coordination continues under the JTCG/AS). The objective of this program element is to support the Army portion of the overall nonnuclear survivability efforts of the Department of Defense.

G. (U) **RELATED ACTIVITIES:** This program is related to Army, Air Force, and Navy programs to insure improved aircraft survivability in nonnuclear threat environments. Coordination of these efforts is accomplished through a JTCG/AS Central Office staffed by service representatives from each command represented on the Joint Logistics Commanders Group. Duplication is avoided through joint reviews by that office and individual Service task agencies. This program is specifically related to Army Program Element numbers 6.37.11.A/D852, Scout/Attack Helicopter Survivability Equipment; 6.37.114/D653, Special Electronic Mission Aircraft Survivability Equipment; 6.47.11A/DC52, Scout/Attack Helicopter Survivability Systems; 6.47.11A/D665, Special Electronic Mission Aircraft Survivability Systems. It is coordinated with and complementary to Air Force and Navy Programs (Program Element numbers 6.32.44.F and 6.32.62.N respectively). Additionally, coordination is effected with existing and planned programs of the Federal Aviation Administration, NASA, and plans are being developed for exploration of coordinated efforts with NATO.

H. (U) **WORK PERFORMED BY:** Ballistic Research Laboratory, Aberdeen Proving Ground, MD; US Army Research and Technology Laboratory, Fort Eustis, VA; Naval Research Laboratory, Washington, DC; US Army Materials and Mechanics Research Center, Watertown, MA; Air Force Flight Dynamics Laboratory, Wright-Patterson AFB, OH.

I. (U) **PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:**

1. (U) **FY 1980 and Prior Accomplishments:** In FY 1980 and prior years this program accomplished efforts in the areas of survivability and vulnerability assessment methodologies, design criteria development, and hardware feasibility studies and investigations. Efforts included aircraft engine vulnerability baseline tests, laser vulnerability analysis procedures, determination of damage tolerances, and the characterization of battle damage to composite structures, development of design enhancement features contributing to flight control systems for the AH-1G, UH-1, and OH-58 helicopters. The program completed extensive surveys of infrared measurements facilities capabilities and prepared a nine-chapter Infrared Measurement

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Program Element: #6.32.15.A

DOD Mission Area: #2.5 - Air Warfare Support

Title: Joint Survivability Investigations

Budget Activity: #4 - Tactical Programs

Guide; completed DOD coordination on military standards for Aircraft Nonnuclear Survivability Programs and Aircraft Nonnuclear Survivability/Vulnerability terms; placed Military Handbook for Aircraft Nonnuclear Survivability into final coordination cycle. Fabricated and ballistically tested electro-slag-remelt steel plates for use in helicopter pilot seat armor, augmented an optical countermeasures effectiveness model to reflect threats to helicopters in nap-of-the-earth (NOE) environments, completed initial development and testing of radar-attenuating, thermal/ballistic-tolerant composite structural elements.

2. (U) FY 1981 Program: Standardization of infrared (IR) measurement test and reporting procedures; field testing of laser visual aerosol countermeasures; development of helicopter canopy strips as a laser countermeasure; maintenance of the Combat Data Information Center (CDIC); develop and process related military standards; develop low-cost pilot seat/armor, evaluate high-performance armor materials; develop powder-filled structural panels for fire protection; develop/evaluate composite structural elements integrating radar/IR/Laser/ballistic protection; develop Full Authority Digital Electronic Engine Control (FADEC); evaluate engine rapid damage repairability; refine engine combat damage prediction methodology, evaluate feasibility of control signal transmission through structures.

3. (U) FY 1982 Planned Program: Develop canopy laser countermeasures for integration in preliminary design phase; develop and process related military standards; complete development of low-cost pilot seat/armor, advanced small engine vulnerability reduction; study durability payoff of survivable engine design; high-power transmission system vulnerability reduction; evaluate effects of nonferrous material fractures on engine survivability; continue support of IR measurements standardization, CDIC, FADEC, engine damage prediction, and control signal transmission efforts shown in FY 1981 plan above; analysis of aircraft/helicopter combat damage repair.

4. (U) FY 1983 Planned Program: Continue development/evaluation of canopy laser countermeasure; develop standards for radar cross-section measurements; develop and process military standards; evaluate of high performance armor materials; evaluate transparent armor materials; continue FY 1982 efforts in small engine vulnerability reduction, high-power transmission vulnerability reduction, effects of nonferrous material fractures on engine survivability; and complete FADEC effort initiated in FY 1981; evaluate battle damage repairability of composite material structures; develop combat damage-tolerant shaft for drive-train components; develop component vulnerability/ballistic resistance data.

5. (U) Program to Completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.33.03.A

Title: MLRS Terminal Guidance Warhead (TCW), formerly
Surface-to-Surface Missile Rocket System

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	1000	790	3057	16785	170842	192474
D216	(MLRS Terminally Guided Warhead)	1000	790	3057	16785	170842	192474
	Quantities	0	0	0	0	To Be Determined-----	

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The concept of a Terminal Guidance Warhead (TCW) for the Multiple Launch Rocket System (MLRS) envisions the attack of armored targets from above using highly accurate and lethal submunitions dispensed from an MLRS rocket. There is an urgent need for an autonomous, terminal homing, indirect fire-and-forget capability to defeat hardpoint targets such as armored vehicles and equipment before they are committed into the central battle, thereby reducing their presentation rate. The TCW for the MLRS will contain from one to six terminally guided submunitions packaged within the rocket warhead section. The Army intends to develop this warhead in cooperation with France, Germany, and the United Kingdom.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Four concept definition study contracts will be awarded to define the MLRS TCW concept and development program. These studies will propose:

1. (U) Terminally Guided Submunition Design
2. (U) Warhead Packaging Concept
3. (U) Dispersal System Concept and Design
4. (U) Warhead/Fire Control System Interface Solutions

Program Element: #6.33.03.A

Title: MLRS Terminal Guidance Warhead (TGW) formerly
Surface-to-Surface Missile Rocket System

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

5. (U) International Industrial Teaming Arrangements
6. (U) System Cost Effectiveness Analysis
7. (U) System Total Cost and Schedule

A multinational (US/UK/GE/FR) evaluation team will evaluate the Concept Definition Studies, establish a best technical approach and prepare the MLRS TGW Validation Phase Specification and Request for Proposal. It is emphasized that both the cost and milestone data contained in this report represent the Army's best estimate prior to conduct of concept definition studies. The above cost estimates assume that the infrared seeker being developed in the Defense Advanced Research Project Agency's "Assault Breaker" technology demonstration is directly applicable to the TGW requirement. The costs further assume that only one contractor team will be advanced into the system Validation Phase. When completed, the concept definition studies will enable refinement of cost and schedule data. Current milestone projections are:

Major Milestones	Projected Completion Date
Approve MOU Supplement	April 1981
Award Concept Definition Contracts	October 1981
Complete Concept Definition Studies	June 1982
Complete Army Systems Acquisition Review Council I	October 1982
Award Validation Phase Contract(s)	May 1983

Future milestones and projected completion dates will be determined during evaluation of the Concept Definition studies.

D. (U) COMPARISON WITH 1981 RDTE REQUEST (\$ in thousands):

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	1000	700	3057	187627	192684
Funds (as shown in the FY 1981 submission)	984	2692	34533	144099	182308

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Program Element: #6.33.03.A

Title: MLRS Terminal Guidance Warhead (TGW) Formerly
Surface-to-Surface Missile Rocket System

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

Monetary requirements have been reprogramed based upon more current planning which includes quadrilateral negotiations in advance of the conduct of concept definition studies planned for FY 1982.

E. (U) OTHER APPROPRIATION FUNDS: Provided that the US does enter into a joint development program with its European partners, those nations will fund a portion of the development costs. The proportionate shares to be funded by each nation will be determined after completion of Concept Definition studies and during negotiations of the Validation Phase Memorandum of Understanding. With the exception of the Concept Definition Phase, the current profile assumes that the US is proceeding unilaterally. Therefore it is probable that the US share will be decreased. At this time, there are no other US appropriations visualized for the program.

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Program Element: #6.33.03.A

Title: MLRS Terminal Guidance Warhead (TCW) formerly
Surface-to-Surface Missile Warhead System

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: Efforts to provide an indirect fire terminal homing capability were initiated in 1970 on the hypothesis that a terminally guided system could be effective if delivered by a parent system to a preselected point in space, dispersed from a delivery vehicle, and caused to decelerate to a low velocity, allowing time for a seeker to automatically scan, locate, track, and guide the homing missile to the target. Between 1971 and 1976 a series of demonstration tests were conducted. In conjunction with these tests, basic seeker technology was being improved. Emphasis was placed on infrared and millimeter wave seekers. Subsequent studies conducted by the Army, although limited in scope, have shown that smart or guided munitions provide large increases in both mission and cost effectiveness. In June 1976, the FY 1977 Authorization Conference Report authorized \$5 million to the MLRS program with the understanding that the Army would include a terminal homing option for the system. In December 1977, the Army was advised that the basic MLRS program would not be accorded OSD support unless the Army reached agreement with its NATO allies for a joint development program. This admonishment was repeated in the Defense Systems Acquisition Review Council (DSARC) I decision memorandum in February 1977. The Culver-Nunn legislation was quoted to emphasize both admonishments. Since that time the Army has been involved in a series of continuing discussions: first, with representatives of Germany and later with representatives of the United Kingdom and France. These discussions led to formulation of a formal Memorandum of Understanding (MOU) which was quadrilaterally executed in July 1979. During negotiation of this MOU, it became clear that the Europeans desired to fully participate in the management of a future development of a Terminally Guided Warhead if one should be required. The MOU was followed by a quadrilaterally developed Material Equipment Characteristics Document which was signed in May 1980, and a Declaration of Intent on the part of the four nations to negotiate an MOU supplement that provided for joint development of the TCW. The Declaration, which was signed in July 1980, provides for:

1. (U) Conduct of joint studies for Concept Definition
2. (U) Development of a quadrilaterally approved Request for Proposal
3. (U) Joint evaluation of contractor proposals on the basis of the following consideration:
 - (a) (U) Cost
 - (b) (U) Schedule
 - (c) (U) Technical
 - (d) (U) Multinational work-sharing arrangements
 - (e) (U) Management
4. (U) Joint funding for Concept Definition not to exceed \$2 million per nation (subject to availability of nationally authorized/appropriated funds).

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Program Element: #6.33.03.A

Title: MLRS Terminal Guidance Warhead (TGW) formerly
Surface-to-Surface Missile Rocket System

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

5. (U) Right of each nation to own the studies when completed.

6. (U) Mutually agreeable contracts administered by the US Government.

7. (U) Source selection procedures that provide for multinational participation. Although it is the expressed desire of all participants to jointly enter a development phase at a later date, provisions of the MOU are limited to Concept Definition. Accordingly, after completion of Concept Definition, each participant is free to unilaterally pursue his own program alternative, or two or more of the partners may agree to proceed as a consortium. Since the basic MOU, validated by the Under Secretary of Defense for Research and Engineering in July 1979, commits the US to perform joint studies, the Army is pursuing that course of action. By so doing, it can be determined which companies are interested, how they intend to team internationally, and which technical approach provides the best possibility for developing a cost-effective system.

G. (U) RELATED ACTIVITIES: The Under Secretary of Defense for Research and Engineering directed the Defense Advanced Research Projects Agency (DARPA) to develop the emerging technologies and demonstrate the potential of a long-range antitank capability. The resulting DARPA technology demonstration, known as "Assault Breaker," will use a long-range Army carrier missile with midcourse correction capabilities, an Air Force radar system to locate/track targets, and provide guidance to the carrier missile, submissiles with infrared terminal homing TGSM (Terminally Guided Submunitions), and nonhoming target-sensing submunitions called SKEET. The demonstration is to be conducted from January to November 1981. The Army, through its Missile Command, has been directly involved as the contracting and coordinating agency for DARPA to obtain and test the carrier missiles, submissiles, and submunitions. Although Assault Breaker was not initiated to validate MLRS-TGW, MLRS has influenced how DARPA has proceeded through the initial stages of its demonstrations. The most significant MLRS influence is the sizing of the TGSM. DARPA's TGSM was sized 4" x 25" so that six of them could be packaged into the MLRS warhead. At this juncture, no incompatibilities have been found between Assault Breaker and the seeker requirements that are visualized for the MLRS TGSM. The MLRS-TGW program schedule was also established so that the Concept Definition studies would begin just as the Phase III Assault Breaker demonstrations terminated. This plan will assure the availability of a maximum amount of data, both to contractor and government representatives. These data will also be available to the team that will evaluate the Concept Definition studies. The Assault Breaker seeker technology will provide the baseline for the MLRS-TGW. Day-to-day involvement of the Army Missile Command's Advanced Systems Concepts Office in the Assault Breaker demonstrations assures that the potential for duplication between Assault Breaker and MLRS-TGW is minimized.

H. (U) WORK PERFORMED BY: This program is managed by the MLRS Project Manager. A contractor has not been selected. The Vought Corporation of Dallas, Texas, prime contractor for the MLRS, will integrate the TGW with the basic MLRS system.

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Program Element: #6.33.33.A

Title: MLRS Terminal Guidance Warhead (TGW) formerly
Surface-to-Surface Missile Rocket System

DOD Mission Area: #211 - Fire Support

Budget Activity: #4 - Tactical Programs

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: No funds were appropriated for TGW from FY 1976 through FY 1979, but the Army Missile Command participated in forums and conducted studies to determine the applicability of a TGW to the MLRS. These efforts included: (a) General Support Rocket System Special Study Group - 1976, (b) Department of the Army Terminal Guidance Symposium - 1978, (c) General Support Rocket System Terminal Guidance Warhead Development Plan - 1978, (d) Continued studies by the Advanced Systems Concept Office - 1979.

2. (U) FY 1981 Program: Continuation of Pre-Concept Definition planning and evaluation efforts by the Army Missile Laboratory, Ballistics Research Laboratory, Harry Diamond Laboratories, Vought Corporation, Multinational Source Selection Board, and the Project Office.

3. (U) FY 1982 Planned Program: Approximately four contracts will be awarded for performance of Concept Definition studies.

4. (U) FY 1983 Planned Program: A Validation Phase R&D contract will be awarded and R&D efforts will be initiated.

5. (U) Program to Completion: Tentative IOC planned for FY 1990. This date must be reviewed after accomplishment of concept definition studies.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.33.07.A
DOD Mission Area: #211 - Close Combat

Title: Short-Range Air Defense Self-Protect Weapon
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	0	6842	0	0	0	0
							15
D053	Air-To-Air STINGER	0	6842	0	0	0	0
DB60	Air Defense Supression System	0	0	0	0	0	0

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program was intended to provide a Multipurpose Lightweight Missile (MLM) System required by Army attack/scout helicopter teams for self-protection against armed hostile aircraft. The MLM system would enable friendly scout helicopters during their normal employment to effectively engage aerial threat aircraft at ranges which allow minimum exposure and high probability of survival. Current aircraft weapon systems were not designed to counter the air-to-air threat and are not effective against that threat. Full-scale development of the MLM System would be based upon the STINGER/STINGER-POST manportable missile and a launcher assembly and would be common to a future air defense suppression version of the MLM system. This was originally planned for a 1983 start. The STINGER missile is in production and possesses the proper combination of weight, range, and lethality for these applications. It would be a cost-effective insurance investment for the survivability of these aircraft.

C. (U) EXPLANATION OF CANCELLATION OR DEFERRAL: The Army did not fund the MLM system during the 1982 budget process. This program may be reinstated based on the results of an Army-directed analysis to determine the optimum, cost-effective measures to neutralize the armed aircraft threat to the scout/helicopter team.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.11.16.A

Title: Advanced Rocket Control System

DDO Mission Area: #213 Ground Air Defense

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	26038	15000	To Be Determined		
D692	Advanced Rocket Control System	0	26038	15000	To Be Determined		

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Program content is SECRET "Limited Distribution - Special Access Required," precluding further description in this summary. Access to information is controlled by the Deputy Chief of Staff for Research, Development, and Acquisition, Department of the Army.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Continue RDTE effort.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands):

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	0	26038	15000	To Be Determined		
Funds (as shown in FY 1981 submission)	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Details on Funding changes are available upon request in accordance with paragraph 8 above.

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Program Element: #6.33.16.A

DOD Mission Area: #213 Ground Air Defense

Title: Advanced Rocket Control System

Budget Activity: #4 - Tactical Programs

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>To Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
Missile Procurement, Army	0	0	0	To Be Determined		
Funds (current requirements)						
Funds (as shown in FY 1981	Not	Not	Not	Not	Not	Not
submission)	Applicable	Applicable	Applicable	Applicable	Applicable	Applicable

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Program Element: 86.33.16.A

Title: Advanced Rocket Control System

DDO Mission Area: #213 Ground Air Defense

Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: Details may be provided in accordance with paragraph B above.

G. (U) RELATED ACTIVITIES: This project is related to work in other Army technology programs. Duplication of effort is avoided due to access to the project being strictly controlled and limited to specific Department of Defense individuals involved in managing related technologies.

H. (U) WORK PERFORMED BY: Government in-house laboratories and contractors.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS: Details may be provided in accordance with paragraph B above.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.11.20.A

Title: Corps Support Weapon System (CSWS)
(Formerly Assault Breaker)

DOD Mission Area: F22 - Close Air Support/Battlefield Interdiction Budget Activity: 14 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	9400	14294	11762	TBD	Continuing	Not Applicable To Be Determined
D302	Corps Support Weapon System	9400	14294	11762	TBD	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: *There is a requirement at corps to interdict and destroy second-echelon enemy forces at ranges beyond the capabilities of cannons and rockets. The Army plans to evaluate the integration of the Assault Breaker technologies, LANCE nuclear and antipersonnel/antimateriel replacement requirements, and chemical warhead considerations together into a total Corps Support Weapon System (CSWS) program.*

C. (U) BASIS FOR FY 1982 RDTE REQUEST: FY 1982 funds will be used for continuation of development/evaluation of concept definition packages, selection of best technical approach, preparation of request for proposal for the validation phase, preparation/completion of ASARC/DSARC, and early resolution of design/packaging issues concerning various subsystems to reduce development risk. This effort will lead either to a validation and demonstration or full-scale engineering development phase in the FY 1982/1983 timeframe.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Begin Assault Breaker Technology Demonstration	April 1978	April 1978
Mission Element Need Statement (MENS) Approval	March 1981	May 1980
Begin Special Task Force	March 1981	None

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Program Element: #6.33.20.A

Title: Corps Support Weapon System (CSWS)
(Formerly Assault Breaker)

DOD Mission Area: #222 - Close Air Support/Battlefield Interdiction Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Complete Assault Breaker Technology Demonstration	October 1981	September 1981
Army Systems Acquisition Review Council	August 1982	November 1981
Defense Systems Acquisition Review Council	September 1982	December 1981

(U) Previous dates reflected were those anticipated in the Defense Advanced Research Projects Agency (DARPA) Assault Breaker milestone schedules. As the Army progressed in planning of the program, the above adjustments have been made. Should it be decided during the concept formulation to proceed with an improvement to a system already demonstrated, the Army can proceed to an ASARC II. Should it be decided to recommend alternatives which will require advanced development, the Army will proceed with an ASARC I.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	9400	14294	11762	Continuing	Not applicable
Funds (as shown in FY 1980 submission)	9200	7619	26126	Continuing	Not applicable

(U) Adjustments for inflation were made to the FY80 program. Congress provided the additional funds in FY81 to support a LANCE missile variant in the Assault Breaker Technology demonstration. Competing program priorities and TOA limitations precluded funding the FY 1982 total shown in the FY 1981 RDTE request.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

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Program Element: #6.33.20.A

Title: Corps Support Weapon System (CSWS)
(Formerly Assault Breaker)

DOD Mission Area: #222 - Close Air Support/Battlefield Interdiction Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION:

1. (U) Description: LANCE will require replacement or modification in the 1990's. The Corps Support Weapon System (CSWS) would replace LANCE and provide improved range, accuracy, survivability, and responsiveness. The CSWS is envisioned as having nuclear, conventional (possibly antiarmor), and chemical roles. A Special Task Force (STF) has been established to manage the program during concept formulation. The STF will evaluate viable alternatives (e.g., Multiple Launch Rocket System (MLRS) derivatives, LANCE missile variants, PATRIOT missile variants, ground-launched cruise missile, wheeled-versus-tracked loader launchers, etc.) to insure the system selected best meets the needs described in the Mission Element Need Statement (MENS).

2. (U) Mission Element Need Statement (MENS): There is a need to attack targets at ranges beyond the capability of cannons and rockets with conventional, nuclear, and chemical weapons in order to destroy, neutralize, disrupt, or delay enemy forces (mobile, stationary, fixed). By slowing down the enemy's ability to reinforce and support the central battle, friendly forces can overcome the expected unfavorable force ratio.

3. (U) Assault Breaker: The Under Secretary of Defense for Research and Engineering directed the Defense Advanced Research Projects Agency (DARPA) to develop emerging technologies and demonstrate the potential of a long-range antiarmor capability. The resulting DARPA technology demonstration, known as Assault Breaker, will utilize a long-range Army carrier missile with midcourse correction capabilities, an Air Force radar system to locate/track targets and provide guidance to the carrier missile and submissiles with infrared terminal homing and nonhoming target-sensing submunitions. The demonstration is to be conducted during FY81. The Army Missile Command has been directly involved as the contracting and coordinating agency for DARPA to obtain and test the carrier missiles, submissiles, and submunitions. The Assault Breaker technology will provide the baseline for any CSWS antiarmor capability and the Multiple Launch Rocket System's Terminal Guidance Warhead.

4. (U) Program Summary: The Army plan is to evaluate the integration of the Assault Breaker technologies, LANCE nuclear and antipersonnel/antimateriel replacement requirements, and chemical warhead considerations together into a total CSWS program. A Special Task Force (STF) was established in 2Q81 to manage the program during concept formulation through initial ASARC/DSARC milestone. The STF will evaluate all viable alternative concept solutions (e.g., MLRS derivatives, LANCE missile variants, PATRIOT missile variants, ground-launched cruise missiles, wheeled versus tracked loader launchers, etc.) to insure the system selected best meets the needs described in the MENS.

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Program Element: #6.33.20.A

Title: Corps Support Weapon System (CSWS)
(Formerly Assault Breaker)

DOD Mission Area: #222 - Close Air Support/Battlefield Interdiction Budget Activity: #4 - Tactical Programs

C. (U) RELATED ACTIVITIES: The Corps Support Weapon System (CSWS) program will take advantage of ongoing Defense Advanced Research Projects Agency (DARPA) Tactical Technology Program Element (PE) 6.27.02.E; Missile Technology (PE 6.23.03.A); the Army Missile Command's Terminally Guided Submissile (TGS) and SKEET target-sensing submunition work; the Air Force's Wide Area Antiair Warfare (WAAM) Program, Air Force Activity 6.46.13.F; warhead technology associated with the LANCE Missile System; Multiple Launch Rocket System (MLRS), Terminal Guidance Warhead (TCW), Program Element 6.33.03. A, Project D216; target acquisition/surveillance technology associated with the Army's Standoff Target Acquisition System; and missile booster technology associated with the LANCE and PATRIOT missile systems. The technology from the Assault Breaker demonstration will provide a baseline for any CSWS antiair warhead and the MLRS/TCW. Overlapping of capabilities of the above systems will be complementary in nature.

II. (U) WORK PERFORMED BY: The Army's portion (booster, dispenser, seeker/sensor, submissiles/submunitions) of the Assault Breaker technology demonstration is managed by the Army's Missile Command, Huntsville, AL. The Air Force's target acquisition/tracking/update guidance system is managed by Air Force System Command's Rome Air Development Center, Griffiss Air Force Station, NY. The following contractors are associated with the Army/DARPA Assault Breaker Demonstration: Martin Marietta Corporation, Orlando, FL, for a T-16 booster (Patriot missile variant) and submissile dispenser; Vought Corporation, Dallas, TX, for a T-22 booster (Lance missile variant) and submissiles dispenser; General Dynamics (Pomona Division), Pomona, CA, for infrared terminally guided submissiles; AVCO, Wilmington, MA, for SKEET submunition; Science Applications, Inc., Huntsville, AL, for Assault Breaker systems and test coordination.

(U) Approval of the FY 1981 funds permitted Vought Corp., Dallas, TX, to continue work on the T-22 booster (Lance missile variant) and associated dispenser. Chemical System Laboratory, Aberdeen, MD, is doing limited warhead work. Armament Research and Development Command (ARRADCOM), Picatinny Arsenal, Dover, NJ, is conducting nuclear and nonnuclear studies for the CSWS.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Awarded eight Assault Breaker Technology Demonstration contracts to develop competitive submunition, dispenser, and munitions; conducted infrared and millimeter wave seeker flight tests. Prepared Draft Mission Element Need Statement (MENS) for Corps Support Weapon System, conducted free-flight drop tests of unguided submissiles, smartlets and SKEETS, conducted wind tunnel and sled tests of a submissile dispenser, provided lethality assessments of appropriately sized warheads. Awarded five Tactical Application Concept Definition Study Contracts to look at alternative concepts. Procured and tested the T-22 booster (Lance missile variant) and associated dispenser which will be a competitor in FY81 flight tests.

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Program Element: #6.33.20.A

Title: Corps Support Weapon System (CSWS)
(Formerly Assault Breaker)

DOD Mission Area: #222 - Close Air Support/Battlefield Interdiction Budget Activity: #4 - Tactical Programs

2. (U) FY 1981 Program: Flight test of an integrated Army/Air Force antiarmor system will be conducted under the DARPA technology demonstration program. Coordination for the scheduling of Standoff Target Acquisition System update guidance demonstration will be pursued. Major activities will include OSD approval of the MENS and establishment of a Special Task Force (STF) to prepare a concept formulation package, cost/performance analyses, engineering estimates, system integration simulation model, Request for Proposals, and other documentation leading to a development decision.

3. (U) FY 1982 Planned Program: Activities of the STF will continue on the development/evaluation of concept definition packages, selection of best technical approach, preparation of request for proposal for the validation phase, preparation/completion of ASARC/DSARC, and early resolution of design/packaging issues concerning various subsystems to reduce development risk. This effort will lead either to a validation and demonstration or full-scale development phase in the FY 1982/1983 timeframe.

4. (U) FY 1983 Planned Program: Begin validation and demonstration or full-scale development phase, as appropriate, of the system concept that is decided upon as a result of the STF efforts.

5. (U) Program to Completion: To be determined based upon results of the STF.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.35.36.A

DOD Mission Area: #213 Ground Air Defense

Title: Army Standoff Jammer Suppression

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	0	4,000	6,000	30,000	40,000
D219	Army Standoff Jammer Suppression System (SOJS)	0	0	4,000	6,000	30,000	40,000

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: A Standoff Jammer Suppression (SOJS) capability is required to defeat standoff jammers (SOJ) which

This SOJS capability will significantly enhance the capabilities of all our friendly electronic systems by destroying the large airborne SOJ's which degrade our systems.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Previous studies and analyses of proposed system configurations will be reviewed for potential application to joint Army-Navy requirements for a surface-launched weapon. Engineering design and simulation of proposed system capabilities will be initiated.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST (\$ in thousands): Not applicable.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Cost
Missile Procurement, Army Funds (current requirements)			0	0	1/	1/
Funds (as shown in FY 1981 submission)	Not Applicable					

Program Element: #6.35.36.A
DOD Mission Area: #213 Ground Air Defense

Title: Army Standoff Jammer Suppression
Budget Activity: #4 - Tactical Programs

1/ Procurement funding requirements will not be available until the first phase of the development program is completed in 1982.

Program Element: #6.35.36.A
DOD Mission Area: #213 Ground Air Defense

Title: Army Standoff Jammer Suppression
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The requirement for a counter to the standoff jammer has been under study for several years. These studies have continued efforts to produce a viable Standoff Jammer Suppression system.

G. (U) RELATED ACTIVITIES: The Navy portion of this program PE #63536N, Project #50854AA, will also be examining potential solutions to this task using surface-launched weapons.

H. (U) WORK PERFORMED BY: New contracts to initiate work would be let in FY82. The US Army Missile Command will manage the Army portion of this joint program.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Not applicable.
2. (U) FY 1981 Program: Not applicable.
3. (U) FY 1982 Planned Program: Conceptual design, initial definition of performance trade-offs, and initial design will begin. Emphasis will be on specific hardware and software requirements so that detailed design and evaluation can begin. Development of system-level performance simulations will also be initiated.
4. (U) FY 1983 Planned Program: Continue design and evaluation of performance trade-offs. Complete detailed definition of requirements and evaluation of operational concepts. Initial testing of prototype components will also be started.
5. (U) Program to Completion: Identify common (Army-Navy) technological solutions to meet the requirements for a surface-launched standoff jammer suppression weapon. Complete trade-off studies to select the weapon system (new or modified existing system) best suited to perform the required mission. Complete development and testing of specific components required, and initiate procurement of required hardware and software.

FY 1982 ROTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.04.A

Title: Nuclear Munitions and Radiacs

DOD Mission Area: #241 - Battlefield Theater
Nuclear Warfare

Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion Continuing	Total Estimated Cost Not Applicable
	<u>TOTAL FOR PROGRAM ELEMENT QUANTITIES</u>	<u>1677</u>	<u>1724</u>				
D135	Nuclear Weapon Development Support	495	560	733	843	Continuing	Not Applicable
D148	Atomic Demolition Munition (ADM) Firing and Control System	0	216				
D153	Nuclear Effects Support Team (NEST)	673	732	979	1137	Continuing	Not Applicable
D390	Tactical Earth Penetrator (TEP)	0	0				
D443	Nuclear Projectiles Advanced Development	0	216			Continuing	Not Applicable
D433	Radiac Equipment Advanced Development	509	0	775	2088	Continuing	Not Applicable

*Prototype hardware is not procured in all these projects. For those where prototype hardware would be procured, program definition has not progressed to the point where quantities have been defined.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Tactical nuclear weapons have the potential to be the deciding factor on the modern battlefield. It is thus absolutely essential for the Army to have modern, effective, and safe nuclear weapon systems. The Army must also be able to effectively defend against the effects of the enemy's nuclear weapons.

Program Element: 06.36.04.A
DOD Mission Area: 0241 - Battlefield Theater
Nuclear Warfare

Title: Nuclear Munitions and Radiacs
Budget Activity: 04 - Tactical Programs

Effective defense in a nuclear environment requires modern radiation detection and measurement devices. Finally, whether in an offensive or defensive posture, critical fielded systems must be survivable in a nuclear environment. The projects in this program comprise the Army's nuclear system Advanced Development efforts and also fund the management and engineering support structure required to interface with the Department of Energy and other weapon system developers.

(U) D135 - Nuclear Weapon Development Support. The Project manager for Nuclear Munitions has the responsibility to provide the nuclear engineering interface for Project Managers of systems having a nuclear capability with the Department of Energy, Army laboratories, and the Department of Army Staff. He must also provide support to development efforts that pertain to generic nuclear programs (as opposed to a specific weapon system), and must fulfill life cycle management responsibilities for stockpiled Army weapons.

D148 - Atomic Demolition Munition (ADM) Firing and Control System - Modernization of the Army's ADM is required to

Development of a versatile, high-reliability firing and control system for fielded ADM will improve military utility and enhance safety. Current ADM's represent the technology of the early 1960's.

(U) D153 - Nuclear Effects Support Team (NEST) - Critical Army systems must be survivable in a nuclear environment. Nuclear hardening should be applied during the development process. This program supports the transfer of a cumulated system hardening technology from the Army laboratories to the system developer.

D190 - Tactical Earth Penetrator (TEP) - The development of a Tactical Earth Penetrator to must be pursued. This effort, separate and distinct from the earth penetrator effort associated with the Pershing II System (6.43.11A), will provide the Advanced Development effort required for development of a second generation TEP for delivery systems other than Pershing (e.g., the Corps Support Weapons System (CSWS)).

(U) D443 - Nuclear Projectile Advanced Development - This project supports the development of improved safing, arming, and fuzing components urgently required to meet modern nuclear safety standards. The top priority task is to develop power sources which dissipate energy in a safe and predictable way when an environment other than the intended mode firing environment is experienced. Current-generation nuclear weapons use battery power sources and shunts-to-ground.

Program Element: #6.16.04.A
DOD Mission Area: #241 - Battlefield Theater
Nuclear Warfare

Title: Nuclear Munitions and Radiacs
Budget Activity: #4 - Tactical Programs

(U) D483 - Radiac Equipment Advanced Development - There is an urgent requirement to develop technology to upgrade Army radiation detection equipment which is old and bulky, has limited response capability, and cannot be efficiently employed from ground vehicles or aircraft. Successful development efforts will be transmitted to the Army's continuing engineering development line.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: The Project Manager for Nuclear Munitions will continue nonsystem-related RDTE to fulfill Army-wide requirements as directed. Support of the Joint DOE-DOD Phase 2 Nuclear Weapon Feasibility Study for the Low-Altitude Air Defense System will continue. Analysis of the military requirements for ADM product improvement will be completed. If a decision is made to improve the ADM, advanced development will start in FY82. Support for various project managers in the area of nuclear survivability will be expanded as part of the Army Nuclear Survivability Program. Developers of government-furnished equipment will be integrated into the Army Nuclear Survivability Program. Advanced development of a quick-response, failsafe power source (turboalternator) together with associated environmental sensing devices will be initiated. Development of the Miniature Multipurpose Radiac Device (MIRD) and a radiac for employment on the remotely piloted vehicle will be initiated. Total development costs are moderate high-risk assessments because of uncertainties in the technologies involved.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Atomic Demolition Munition (ADM)		
Firing and Control System		
Feasibility Assessment Completed	FY81	FY80
Initiation of Advanced Development	FY82	FY81
Tactical Earth Penetrator		
Requirements Documents Completed	FY84	FY82
Feasibility Studies Completed	FY84	FY82
Advanced Development Initiated	FY85	FY83

The ADM Improvement and Tactical Earth Penetrator Programs have been delayed to provide time for the Army to reevaluate the role of nuclear munitions in barrier planning.

Program Element: #6.36.04.A
DOD Mission Area: #241 - Battlefield Theater
Nuclear Warfare

Title: Nuclear Munitions and Radiacs
Budget Activity: #4 - Tactical Programs

D. COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	1677	1724		Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	1958	1852		Continuing	Not Applicable

(U) The \$281 thousand decrease in FY80 occurred because:

(U) D089, the Nuclear Burst Detection System, was eliminated as a project. The user need could not be established (-\$500 thousand).

(U) D153, Nuclear Effects Support, was increased to provide the required level of nuclear survivability technical assistance to an expanded group of materiel developers (+\$180 thousand).

(U) D443, Nuclear Projectile Advanced Development, was decremented to provide funds for higher priority Army requirements (-\$173 thousand).

(U) D483, Radiac Equipment Advanced Development, was increased so that Advanced Development of the digital radiac could be accelerated in 1980 (+\$212 thousand).

(U) The \$128 thousand decrease in FY81 for the PE reflects the application of general Congressional reductions. The \$1978 thousand increase in FY82 occurs because:

(U) D135 is incremented to account for inflation and increased civilian pay pricing indices (+\$28 thousand).

Program Element: #6.36.04.A

DOD Mission Area: #241 - Battlefield Theater
Nuclear Warfare

Title: Nuclear Munitions and Radiacs

Budget Activity: #4 - Tactical Programs

(U) D148 is funded to initiate ADM product improvement (+\$411 thousand).

(U) D153 is incremented to account for inflation and increased civilian pay pricing indices (+45 thousand).

(U) D443 is funded to initiate turboalternator power sources advanced development (+\$719 thousand).

(U) D483 is funded to initiate advanced development of the Miniature Multipurpose Radiac Device and the Remotely Piloted Vehicle Radiac (+\$775 thousand)

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands): Not Applicable.

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Program Element: 86.16.04.A
DOD Mission Area: 0241 - Battlefield Theater
Nuclear Warfare

Title: Nuclear Munitions and Radiacs
Budget Activity: 04 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: Emphasis on the advanced development (AD) of nuclear artillery projectiles is to modernize stockpile weapons, develop new warhead proposals which reduce collateral damage, and improve safety, security, and command and control. Modernizing fielded nuclear weapons provides a cost-effective approach to meet changing requirements which ensue from the Army's maturing tactical warfare concepts (D148). The reduced collateral damage efforts enhance deterrence by making the effective use of the nuclear forces more credible. Artillery applications of earth penetrator technology offer the potential for cost-effective standoff atomic demolition munitions and for attack of hardened structures with reduced collateral damage (D390). Improved safing and arming technology facilitates operational employment of the Theater Nuclear Force while reducing the probability of an unintended nuclear detonation. The family of radiological detection, measurement, and alarm devices will be improved through application of technology developed in this program. The objective is to apply such improvements as "large-scale integration" technology to electronics in radio equipment and to transition such improvements directly to production without further engineering development. Potential cost savings in applying this technology are substantial (D493). R&D support for nonsystem-related functions such as overall command, control, and security of the nuclear stockpile will be provided by the Project Manager (PM) for Nuclear Munitions (D175). A Nuclear Effects Support Team will provide technical support to system PM's in the area of nuclear survivability and hardening. This effort is essential because the survivability program is embryonic and requires expert liaison to facilitate technology transfer to the materiel developer community. This is a key element of the Army Nuclear Survivability Program (D153).

G. (U) RELATED ACTIVITIES: This program complements and is closely coordinated with Department of Energy (DOE) advanced development efforts. The outputs of exploratory development efforts in PE 6.26.03.A, Large Caliber and Nuclear Technology, are utilized. Tactical Earth penetration programs under Pershing II auspices, PE 6.43.11.A, and those being accomplished by the Defense Nuclear Agency also are incorporated. Tri-Service radiological detection programs are coordinated and integrated.

H. (U) WORK PERFORMED BY: US Army Armament Research and Development Command, Dover, NJ; Harry Diamond Laboratories, Adelphi, MD; US Army Materials and Mechanics Research Center, Watertown, MA; and US Army Electronics Research and Development Command, Fort Monmouth, NJ. Principal contractors include Bendix Corporation, South Bend, IN, and Sandia Laboratories, Albuquerque, NM.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

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Program Element: #6.36.04.A
DOD Mission Area: #241 - Battlefield Theater
Nuclear Warfare

Title: Nuclear Munitions and Radiacs
Budget Activity: #4 - Tactical Programs

1. (U) FY 1980 and Prior Accomplishments: The Project Manager for nuclear munitions continued to provide assistance in identifying improvements required in the nuclear weapon stockpile, provided support to the Tri-Service Emergency Disablement Systems program, managed the nuclear warhead development effort for Pershing II, and the 8-inch and 155mm nuclear projectiles. Development of various artillery projectiles, atomic demolition munitions and surface-to-surface missile adaption kits was completed in the 1970's. Monitoring these stockpile weapons continues within appropriate engineering sections of the Project Manager for Nuclear Munitions. Current efforts are focusing on technology for modern power sources and improved safety for nuclear artillery projectiles. The Nuclear Effects Support Team provided substantial support to system project managers in the area of Nuclear Survivability. Digital Radiac advanced development was accelerated with a view toward advanced development completion in FY81.

2. (U) FY 1981 Program: The Low-Altitude Air Defense System (LOADS) Joint DOD/DOE Feasibility Study will be initiated. Analysis in support of the Corps Supports Weapons System (CSWS) warhead concept formulation will continue. The Atomic Demolition Munition modernization study will be completed improvement options selected, and hardware development initiated. Support to Project Managers will be continued in the area of nuclear survivability. Advanced development of the digital radiac will be completed.

3. (U) FY 1982 Planned Program: The Project Manager for Nuclear munitions will continue RDTE support for the LOADS and CSWS weapon systems. Development of improved safing, arming, and command and control features will continue for the ADM. Development of the quick-response turboalternator power source will be initiated. Advanced development of the Miniature Multipurpose Radiac Device (MMRD) and Remotely Piloted Vehicle (RPV) Radiac will be initiated. The Nuclear Effects Support Team will continue to support project managers in the area of nuclear survivability.

4. (U) FY 1983 Planned Program: The Project Manager for Nuclear Munitions will continue RDTE support for the Low-Altitude Air Defense System and the Corps Support Weapon System nuclear warhead development programs. AIM improved firing system development will continue. Development will continue on the enhanced safety turboalternator power supply. The Nuclear Effects Support Team will continue to support Project Managers in the area of survivability. Nuclear weapons extended range projectile and arming and firing system improvements will be continued. Miniature Multipurpose Radiac Device and Remotely Piloted Vehicle radiac advanced development will be continued.

5. (U) Program to Completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.16.07A

Title: Joint Service Small Arms Program (JSSAP)

DOD Mission Area: #216 - Advanced Technology Demonstration Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion Continual	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	700	0	3600	0		
D540	Crew Served Weapon Dev.	700	0	0	0		Not Applicable
D627	Joint Service Small Arms Prog.	0	0	3600	0	Continual	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This effort provides a coordinated program for the advanced development of the small arms weapon systems required by the joint services to meet the threat on the battlefield of the foreseeable future. The associated technology advancement in small arms will provide a capability to respond to present and projected requirements to insure that the US fighting man will be adequately armed on the modern battlefield.

C. (U) BASIS FOR THE FY 1982 RDTE REQUEST: Current small arms weapon systems are aging and are based on outdated technology. Increased capability must be pursued because of the high probability of a threat numerical advantage and because of continuous advances in threat equipment and continual changes in operational modes; i.e., Rapid Deployment Force, Military Operations in Built-Up Areas, armored battlefield, and improvements in personal protection. The Joint Service Small Arms Program Management Committee provides the mechanism to assure overall harmonization coordination, and control of this effort. The program facilitates consideration of diverse joint service needs, optimum utilization of limited resources (funds, facilities, and small arms expertise in government and industry), and accurate prioritization of tasks to best counter threat advances and changes in operation modes. The funds will support advanced development of six high-priority joint service items transitioning from exploratory development (6.2). These are: General Purpose Heavy Machine Gun System (both weapon and advanced ammunition to meet the modern threat), Individual Semi-Automatic Grenade Launcher, Submachine Gun, "Combat Shotgun System," Saboted Light Armor Penetrator, and Tubular Ammunition for Personal Defense Weapon and Submachine Gun.

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Program Element: #6.36.02A

Title: Joint Service Small Arms Program (JSSAP)

DOD Mission Area: #216 - Advanced Technology Demonstration Budget Activity: #4 - Tactical Programs

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands): Not Applicable. This is the first descriptive summary for this effort.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

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Program Element: #6.36.02A

Title: Joint Service Small Arms Program (JSSAP)

DOD Mission Area: #216 - Advanced Technology Demonstration Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The Joint Service Small Arms Program Management Committee was chartered as directed by a memorandum from the Deputy Under Secretary of Defense for Research and Engineering (Research and Advanced Technology) designating the Army as Executive Agent to establish exploratory development/nonsystem advanced development (6.2/6.3A) program elements and program funds. The Management Committee, chaired by the Army, has a voting member from each of the Military Services (Army, Navy, Air Force, Marine Corps) and a representative of the Coast Guard (Department of Transportation). This joint service program was created to provide the means to assure that there is no duplication of effort within the Department of Defense. The basic approach is to use: Joint Service Memorandum of Agreement, Joint Service Operational Requirements, frequent meetings, and continuing liaison to assure complete interservice awareness of the total research and development program in the area of small arms and related technology, and also provide a focal point for contact with the private sector. This effort provides advanced development of enhanced performance weapon systems for small operating units and individual combatants of all services in concert with the demands of the modern and projected battlefield. Weapon systems involved are all types of small arms to include individual and crew-served weapon systems used to defeat existing and projected improvements in body armor and related hard targets expected on the modern battlefield. Also under this project is the development of low signature weapons, improved individual fire control for effective target acquisition and engagement, application of modern lightweight/high-strength materials, high-performance light armor penetrators, and application of newly developed weapon technologies. The work contributes to modernization of this class of weapon system leading toward the immediate objectives of significant gains in individual firepower and in battlefield sustainability and survivability. Projects transitioning to 6.3A evolve from exploratory development conducted under a memorandum of agreement executed by the Joint Service Small Arms Program Management Committee. The program addresses deficiencies and shortcomings in current small arms weapon systems being identified in ongoing user mission analyses.

G. (U) RELATED ACTIVITIES: The technical areas in the program are related primarily to Program Element #6.26.17.A, Fire Control and Small Caliber Armaments Technology, Project #AH19A, Small Caliber and Fire Control Technology.

H. (U) WORK PERFORMED BY: This program is a new start of 6.3A, Non-System Advanced Development, under the management of the Joint Service Small Arms Program. The prime in-house developing organization responsible for the program is the US Army Armament Research and Development Command, Dover, NJ, with other major efforts at: the Naval Weapon Support Center, Crane, IN; Naval Surface Weapons Center, Dahlgren, VA; Air Force Armament Technology Laboratory, Eglin AFB, FL.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: The result of the Squad Automatic Weapon (SAW) program under D640, Crew Served Weapon Development, not managed under the Joint Service Small Arms Program, was selection of FN MINIMI (XM249)

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Program Element: #6.36.02A

Title: Joint Service Small Arms Program (JSSAP)

DOD Mission Area: #216 - Advanced Technology Demonstration Budget Activity: #4 - Tactical Programs

manufactured by Fabrique Nationale, Herstal, Belgium (from among four competing light machine guns), as the weapon to be matured for future production. This one-man machine gun, weighing about 21 pounds with 200 rounds of ammunition, is capable of delivering sustained automatic fire to 1000-meter effective range. This weapon fires the heavy bullet 5.56mm ammunition recommended for selection as the second NATO standard caliber. The combination of XM249 and heavy bullet ammunition will provide a significant increase in firepower, range, and effectiveness in the rifle squad.

2. (U) FY 1981 Program: Not Applicable. No FY81 RDTE request was submitted.

3. (U) FY 1982 Planned Program: The items entering 6.3A, Advance Development, as new starts will be:

(a)(u)General Purpose Heavy Machinegun System: This caliber .50 class system provides a replacement for the current M2 and M85 weapons systems which are ineffective against modern threat targets. The new weapon is significantly lighter, has fewer parts, and is more producible at a lower cost than the M2 or M85 machine guns. It is not limited to current low impulse munitions of World War II vintage, but can utilize, through its selective dual-feed system, any combination of ammunition (such as standard ball ammunition and improved penetrator rounds to defeat threat light armor at extended range). The system is planned to transition to Engineering Development (6.4) in FY84.

(b)(u)Individual Semi-Automatic Grenade Launcher: Provides substantial increase in volume of fire and hit probability over the current single-shot capability. Planned transition to Engineering Development (6.4) is FY85.

(c)(u)Submachine Gun: Replaces the current M3A1 with a lighter system providing burst control, greater effective range/hit probability, and silent capability plus improved reliability and compactness. Planned transition to Engineering Development (6.4) is FY85.

(d)(u)Combat Shotgun System: This multipurpose individual weapon system alternative replaces current converted commercial shotguns with a militarized system providing improved controllability, box magazine for rapid reload/increased firepower, and improved ammunition for increased effectiveness over current military loads. Planned transition to Engineering Development (6.4) is FY85.

(e)(u)Saboted Light Armor Penetrator (SLAP): Provide capability against threat light armor, not available with current 7.62mm and Caliber .50 ammo, substantially improving the capability of currently fielded weapons in the near term. Planned transition to Engineering Development (6.4) is FY84.

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Program Element: #6.36.07A

Title: Joint Service Small Arms Program (JSSAP)

DOD Mission Area: #216 - Advanced Technology Demonstration Budget Activity: #4 - Tactical Programs

(f)(u) Tubular Ammunition for Personal Defense Weapon and Submachine Gun: Provide capability against modern body armor, not available with current ammunition, while providing reduced impulse, increased range and higher hit probability than is currently available. Planned transition to Engineering Development (6.4) is FY84.

4. (U)(u) FY 1983 Planned Program: The items entering 6.3A, Early Advanced Development, as new starts will be a fully integrated man/weapon Sniper Rifle System, and a modern, crew-served, automatic, high-velocity grenade launcher.

(a)(u) The General Purpose Heavy Machine Gun System, the Saboted Light Armor Penetrator and the Tubular Ammunition for Personal Defense Weapon and Submachine Gun will transition from 6.3A to 6.3B, Advanced Development.

(b)(u) The Individual Semi-Automatic Grenade Launcher, the Submachine Gun, and the Combat Shotgun System programs will continue in 6.3A.

5. (U) Program to Completion: This is a continuing program.

FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.12.A Title: Infantry Manportable Antiarmor/Assault Weapon System (IMAAWS)
DOD Mission Area: #211 - Close Combat Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	2000	19506	23106	To Be Determined		
	QUANTITIES						350
D311	IMAAWS	2000	19506	23106	To Be Determined		451466

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Infantry must have the capability to combat numerically superior armored forces. This need has been met by the TOW, DRAGON, and LAW, respectively long-, medium-, and short-range weapons systems. This weapons mix allows the Infantry to kill tanks at long range and still afford the numbers of weapons necessary to deal with the high intensity of close combat with superior forces. The medium weapon provides the primary tank-killing firepower of light forces. The DRAGON system is deficient in

The Infantry Manportable Antiarmor/Assault Weapon System (IMAAWS) will replace the DRAGON system in the late 1980's. The IMAAWS will be a manportable weapon designed to correct the DRAGON system deficiencies and defeat armored vehicles and engage other hardpoint targets, and as such, will play a key role in the light Infantry and Rapid Deployment Force (RDF) contingency missions.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: FY 1982 funds will continue the program begun in FY81 of competitive flight demonstrations of critical hardware components for two moderate-risk system concepts. These funds will be used for engineering design, fabrication, assembly, and test of prototypes of proposed systems. This includes testing the propulsion, warhead, launcher, and acquisition/guidance subsystems culminating in a competitive "fly-off" at the end of FY83 between the alternatives funded in this effort and the high-risk technology program (Tank Breaker) being pursued by the Defense Advanced Research Projects Agency (DARPA) in a separately funded effort.

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Program Element: #6.36.12.A
DOD Mission Area: #211 - Close Combat

Title: Infantry Manportable Antitank/Assault Weapon System (INAAWS)
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Army Decision	4th Qtr 80	4th Qtr 80
Second Army Decision Review	4th Qtr 81	--
Army/DOD Decision Review	1st Qtr 84	4th Qtr 82

The 4th quarter 1980 decision was subsequently reviewed in October 1980. This review determined that the concepts selected were insufficiently suited to the light infantry need and that the current effort should be terminated pending further refinement of the requirement description. The Second Army Decision Review will review concepts selected for competitive development and shoot-off at the end of FY83.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	2000	19506	23106	To Be Determined	
Funds (as shown in FY 1981 submission)	2000	21190	51222	393900	469312

The decrease in FY81 is attributable to the application of general Congressional reductions. The decrease in FY82 estimated funding requirements was caused by slipping the initial development effort one year and a willingness to accept greater schedule/cost risk in program planning. Since program cost estimates were made prior to selecting the weapon concept, they involve some approximations. The estimates are based on parametric and technical analyses of the various possible concepts and judgment as to the most likely course of events. Funding requirements are Army estimates as no contracts were in force when made. The Army is reasonably confident that the full development can be accomplished with these resources; however, the program plan is recognized as having high schedule/cost risk. Adjustments to reduce overall program life-cycle costs could make increasing resources for development a desirable option.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

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11-43 C1, 31 Mar 81

Program Element: #6.36.12.A
DOD Mission Area: #211 - Close Combat

Title: Infantry Manportable Antiarmor/Assault Weapon System (IMAAWS)
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: Analyses of the current and projected threat indicate that the current infantry antiarmor systems (TOW and DRAGON) are assessment (in agreement with the assessments of the United Kingdom, France, and the Federal Republic of Germany) and the major shortcomings in the current infantry antiarmor weapons, the Army has accelerated efforts to provide our infantry with adequate antiarmor firepower to combat the increasing quality of the numerically superior Soviet threat. These efforts include improving the current long-range antiarmor missile (see TOW Program Element 2.37.24.A) and developing a medium man-portable system to begin replacing the current DRAGON system in the late 1980's. System concepts will be developed through flight demonstration in parallel with the Defense Advanced Research Projects Agency (DARPA) high-risk technology efforts for a focal plane array terminal homing system. Early in FY84 the most promising concept will be further advanced through engineering development to a production decision in FY87. The IMAAWS will provide a manportable precision weapon to defeat armored vehicles and engage other point targets with high first-round accuracy. As such, this weapon will greatly increase the antiarmor firepower of the light infantry and the Rapid Deployment Forces (RDF) and provide the capability to engage numerically superior mechanized forces for potential worldwide contingency missions. This weapon will complement the heavy (250 pounds), long-range (3750 meters) improved TOW system and will complicate the threat countermeasures problem through the use of a different guidance mode and potentially different lethality technique (e.g., top attack).

G. (U) RELATED ACTIVITIES: TOW Missile System (PE 2.37.24.A), Advanced Munitions Project (PE 6.33.13.A), Defense Advanced Research Projects Agency (DARPA) Technology Investigations and Missile Technology (PE 6.23.03.A). The DARPA and Army efforts are being closely coordinated to preclude duplication of effort. The Army project office is also the contracting agent for the DARPA program.

H. (U) WORK PERFORMED BY: US Army Missile Command (MICOM), Redstone Arsenal, AL.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Evaluated the results of exploratory development tests of acquisition/guidance hardware, warheads, and propellants. Evaluated results of smoke and countermeasures tests and reports describing the operation of a number of acquisition/guidance techniques. Conducted a concept study and evaluated eight system proposals. Initiated discussion with NATO allies for a potential cooperative development effort, and reached a tentative agreement that the European trilateral group (UK, FR, GE) would assume development responsibilities for a vehicle-mounted system (TOW and HOT replacement), while the US would develop a manportable system (DRAGON replacement). Evaluated six IMAAWS proposals from industry and tentatively selected and contracted for the demonstration of Smart, Target-Activated, Fire-and-Forget (STAFF), and Laser Beamrider (LBR) concepts. Subsequent information cast doubt on the systems suitability

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Program Element: #6.36.12.A

DOD Mission Area: #211 - Close Combat

Title: Infantry Manportable Antiarmor/Assault Weapon System (IMAWS)

Budget Activity: #4 - Tactical Programs

(physical/performance characteristics) of the proposed demonstration hardware. The contracts were then canceled pending the results of a systems suitability study which will sufficiently define systems suitability parameters.

2. (U) FY 1981 Program: Continue technology development and initiate competitive system demonstrations. This will include hardware contracts for key components of maturing guidance and lethality technologies (target-sensing munitions, laser beamrider, millimeter wave, self-forging fragment and new geometry shaped charge warheads, etc.) that could provide the required performance improvement in a manportable system. Continue discussions with North Atlantic Treaty Organization (NATO) allies relative to exchange of technical information and parallel cooperative development of complementary antitank guided weapon systems.
3. (U) FY 1982 Planned Program: Continue competitive system concept development for validation/demonstration. Work to be accomplished in this year includes fabrication, assembly, and test of key components. Coordinate development work with NATO allies and reach agreement on a coordinated development plan for next generation antiarmor weapons.
4. (U) FY 1983 Planned Program: Complete competitive concept flight demonstrations. Select the best of the system concepts demonstrated in this program and the DARPA program for competitive engineering development to a production decision in FY87. Continue cooperation with NATO allies.
5. (U) Program to Completion: Complete development and begin production in the late 1980's for US and other NATO forces.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: # 6.36.15.A

Title: Lethal Chemical Munitions Concepts

DOD Mission Area: #215 - Land Combat Support

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1991 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	1047	1820	8347	9444	Continuing	Not Applicable
	QUANTITIES						
DE76	Lethal Chemical Materiel	1047	1820	8347	9444	Continuing	Not Applicable
DE77	Lethal Chemical Agent Process	0	0	0	0	0	0

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Union of Soviet Socialist Republics (USSR) has developed and continues to maintain a formidable offensive chemical warfare capability which presents a threat to survival of US and NATO forces. In contrast, the US has not produced any new chemical weapons since 1969. Consequently the stockpile is deteriorating and the number of useable munitions is decreasing. US policy requires a chemical weapons development program which will provide a credible deterrent/retaliatory capability. This project supports that need by providing for the transition of technology concepts into advanced development materiel. Additionally, the Department of Defense (DOD) has designated the Army Executive Agent for development of all Services' chemical warfare requirements. There is no other DOD program which satisfies these needs.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Advanced development will be continued on a binary lethal agent warhead for the Multiple Launch Rocket System (MLRS). A chemical warhead for the MLRS will significantly improve the effectiveness of the US deterrent/retaliatory capability in terms of range, rate of fire, and area coverage. Advanced development will be initiated on a chemical warhead for the Corps Support Weapon System and an 8-Inch Binary Intermediate Volatility Agent (IVA) Projectile. The IVA significantly increases both inhalation and percutaneous effects over the current lethal persistent nerve agents. Beginning in FY 1981, efforts on lethal chemical agent manufacturing processes will be transferred to PE 6.26.22.A, Chemical Munitions and Chemical Combat Support, and Project DE77 will be eliminated.

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Program Element: # 6.36.15.A
DOD Mission Area: #215 - Land Combat Support

Title: Lethal Chemical Munitions Concepts
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Initiate Engineering Development (ED) on 155mm Binary Intermediate Volatility Agent (IVA) Projectile	Engineering Development (ED) in FY 1981	FY 1981 to enter ED
Resume AD on MLRS Lethal Binary Warhead	4Q FY 1981	1Q FY 1981
Complete AD on MLRS Lethal Binary Warhead	4Q FY 1985	2Q FY 1983
Initiate AD on 8-inch Binary IVA Projectile	4Q FY 1984	Not Shown
Complete AD on 8-inch Binary IVA Projectile	4Q FY 1987	Not Shown
Initiate AD on Corps Support Weapon System	1Q FY 1982	Not Shown
Complete AD on Corps Support Weapon System	4Q FY 1983	Not Shown

Because of close similarities in munition configuration between the type classified M687 binary 155mm projectile and the new 155mm Intermediate Volatility Agent (IVA) projectile, it is possible to move the IVA development directly from Exploratory Development (6.2) to Engineering Development (6.4). The difference in FY 1981 and FY 1982 milestones for the 155mm IVA and MLRS is due to a delay in obtaining approved requirements documents. The necessary requirement documents are scheduled for approval in FY 1981. Continued funding and progress of the entire retaliatory weapons program is dependent upon national policy pronounced by the President and supported by the Congress. Maintenance of a credible retaliatory capability requires consistent support to provide desired progress.

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Program Element: # 6.16.15.A
DOD Mission Area: #215 - Land Combat Support

Title: Lethal Chemical Munitions Concepts
Budget Activity: #4 - Tactical Programs

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	1047	1820	8347	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	2328	2009	2018	Continuing	Not Applicable

In FY 1980, \$600 thousand was transferred to PE 6.26.22.A, Chemical Munitions and Chemical Combat Support, to support efforts on lethal chemical agent manufacturing processes which were previously conducted under Project DE77, Lethal Chemical Agent Process. An additional \$681 thousand was reprogramed to higher priority Army requirements. The Decrease of \$189 thousand in the FY 1981 funding level reflects application of general Congressional reductions. The significant increase in FY 1982 and beyond is a reflection of the increased interest and sense of urgency in the need to develop a credible deterrent/retaliatory capability. The increased funding will support Advanced Development on new agent/munitions concepts identified as feasible and effective means of modernizing the deteriorating US chemical stockpile.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands) Not Applicable.

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Program Element: # 6.36.15.A
DOD Mission Area: #215 - Land Combat Support

Title: Lethal Chemical Munitions Concepts
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is to conduct Advanced Development on binary lethal chemical agent munitions which have progressed from Exploratory Development and exhibit potential for casualty production through either the respiratory tract and/or penetration of environmental and protective clothing. Small-scale pilot units are designed and installed to obtain process engineering data for application to future production facilities. Chemical agent munitions concepts that employ the binary principle are evaluated. The program is essential to the development of a credible deterrent/retaliatory chemical warfare capability required by US national security policy and to counter the formidable CW threat posed by the Soviet Union.

G. (U) RELATED ACTIVITIES: As directed by Department of Defense (DOD) Directive 5160.5, the Army has executive agent responsibility for the development of all lethal chemical agents and common use munitions. Therefore, no comparable work is done by the other Services on lethal chemical munitions development and agent processes. Each of the other Services sponsors engineering development on lethal chemical agent weapons unique to its requirements. Information is exchanged and the efforts are coordinated through exchange of technical documents, liaison officers, and by joint technical coordinating groups. Exploratory work leading to this Advanced Development effort is conducted under program element (PE) 6.26.22.A, Chemical Munitions and Chemical Combat Support. Items successfully completing Advanced Development are transferred to Engineering Development under PE 6.46.10.A, Lethal Chemical Munitions.

H. (U) WORK PERFORMED BY: US Army Chemical Systems Laboratory, Edgewood, MD, which is the in-house Army developer for lethal chemical agent munitions; the US Army Test and Evaluation Command (TECOM), Aberdeen Proving Ground, MD; and Dugway Proving Ground, Dugway, UT. The Chemical Systems Laboratory performs all toxic chemical agent development work for the Department of Defense. Vought Corporation, Dallas, TX, the MLRS developer, has a contract to investigate chemical warhead interface problems.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Numerous concepts for weaponization of lethal chemical agents have been investigated and developed into prototype systems under this program. Since FY 1970 advanced development has been completed on a 155mm binary nonpersistent lethal chemical projectile and a binary 8-inch persistent lethal agent projectile, prototypes of chemical submunitions and chemical warheads for rockets and missiles have been evaluated. Design criteria and feasibility studies for development of a chemical warhead for the Multiple Launch Rocket System (MLRS) was the primary effort for FY 1980.

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Program Element: 6.36.15.A

Title: Lethal Chemical Munitions Concepts

DOD Mission Area: #215 - Land Combat Support

Budget Activity: 14 - Tactical Programs

2. (U) FY 1981 Program: Resume Advanced Development of the binary warhead for the MLRS by preparing the Concept Demonstration Test Plan and procure materiel and equipment required for the test.

3. (U) FY 1982 Planned Program: Advanced Development (AD) on the binary warhead for the MLRS will continue. The Concept Demonstration test will be completed and evaluated. Munition and agent concepts for the Corps Support Weapon System (CSWS) and an 8-inch binary intermediate volatility agent (IVA) projectile will enter Advanced Development. Initial AD design and the Development Test I/Operational Test I (DT I/OT I) plans will be prepared. Fabrication of munitions and associated material required for the test will be initiated.

4. (U) FY 1983 Planned Program: The agent fill (IVA vs more persistent lethal nerve agent) for the MLRS will be selected and the validation phase of testing will be initiated. Munition fabrication will be completed and DT I/OT I will be conducted for the CSWS and 8-inch IVA projectile.

5. (U) Program to Completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.19.A

DOD Mission Area: #214 - Mine Warfare

Title: Landmine/Barrier Systems

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	3981	4471	6182	8728	Continuing	Not Applicable
	QUANTITIES						Not Applicable
D005	Landmine Systems	1800	3570	4259	4403	Continuing	Not Applicable
D606	Countermines and Barrier Systems	2181	901	1923	4325	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The objectives of this program are to improve Army countermines capabilities and provide for advanced development of new mine systems. Countermines equipment prototypes which aid in the maintenance of battlefield mobility and techniques to reduce the logistic burden normally associated with barrier systems are being investigated. Improved field fortification techniques, combat shelters, are being devised and evaluated to improve battlefield survivability of friendly forces. Soviet and Warsaw Pact doctrine advocates the large-scale use of landmines in both offensive and defensive operations. In support of this doctrine, the Soviets have developed mechanized devices which rapidly lay minefields having a variety of complex mine fuzes. Mutually supporting countermines devices and techniques are required to meet this threat. New mine systems are being developed and tested under this program element by prototyping advanced development components, sensors, fuzes, logic networks, and power sources, into complete mine systems. Mines provide a formidable obstacles to the massive tank threat posed by the Warsaw Pact and are required to fortify natural obstacles such as defiles, woods, rivers and builtup areas in order to delay, canalize, and interdict attacking forces and enhance the performance of direct and indirect fire weapons.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Complete advanced development of a portable mine neutralization system (POMINS) to counter antipersonnel minefields and barbed wire, and a vehicle magnetic signature duplicator (VEMSID) to counter magnetic influence fuzes. Complete advanced development of the horizontal action off-route antitank/antivehicular mine system. Initiate advanced development of the universal mine-dispensing system and a family of improved combat shelters.

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Program Element: #6.16.19.A

Title: Landmine/Barrier Systems

DOD Mission Area: #214 - Mine Warfare

Budget Activity: #4 - Tactical Programs

D. (U) COMPARISON WITH FY81 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	3981	4471	6182	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	4372	6692	8723	Continuing	Not Applicable

Program decreases in FY80 and FY81 reflect restructuring within the program element and reprogramming to higher priority Army programs. Reductions in FY82 are consistent with changing Army priorities and delays in advanced development of CANETIP mine neutralization system and the Cleared Lane Marking System (CLAMS).

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands) Not Applicable.

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Program Element: #6.36.19.A
DOD Mission Area: #214 - Mine Warfare

Title: Landmine/Barrier Systems
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: This program element provides for prototype testing of countermine concepts developed in Program Elements 6.27.33.A, Mobility Equipment Technology, and 6.36.06.A, Landmine Warfare Barrier Developments. The goal is to provide the Army with a family of mutually supporting countermine devices and techniques to meet the identified threat. The challenge of mine detection and neutralization has proven to be highly complex in the pursuit of maintaining the momentum of the attack. Detection must be accomplished rapidly and remotely, if possible. Neutralization must be highly reliable and, in many instances, from a standoff position. Field fortification efforts are concentrating on a family of Improved Combat Shelters consisting of metal frames with fabric covers to support earth protection. The Army has also been in the process of developing and fielding a family of scatterable mines (FASCAM) for some years. These small, highly lethal mines are configured for delivery by various means including helicopters, artillery, ground dispensers, and manportable modular packs. Development on new mines begins by addressing the components which make up the mine, i.e., lethal mechanisms, fuze, logic network, power sources, and potential configuration. Once these components can be configured into a prototype, the mine is then treated as a system and is transferred from Program Element 6.36.06.A, Landmine Warfare Development, to this program element. Three mines are currently included in this category: a horizontal action off-route mine for use along roads and trails to enhance other obstacles, an improved conventional mine for hand emplacement which takes advantage of the features associated with the scatterable mines, and a universal mine-dispensing system which will provide a mine launcher which can be used on a variety of vehicles.

G. (U) RELATED ACTIVITIES: Component work and exploratory development for this program are conducted in Program Elements 6.27.33.A, Mobility Equipment Technology, and 6.36.06.A, Landmine Warfare/Barrier Development. Engineering development efforts which result from this program are accomplished in Program Elements 6.46.12.A, Countermine & Barriers, and 6.46.19.A, Landmine Warfare. Mine and countermine efforts are closely coordinated to incorporate counter-countermeasures as applicable. Development information on mines is coordinated and exchanged between the services by the tri-Service Joint Technical Coordinating Group for Bombs, Mines, and Clusters. The Department of Defense Armaments Initiatives Requirements and Development Committee monitors the scatterable mine program with a view to avoiding service duplication.

H. (U) WORK PERFORMED BY: The US Army Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, VA, is assigned countermine and barrier development responsibility. The Development Project Officer for Selected Ammunition, US Army Armaments Research and Development Command (ARRADCOM), Dover, NJ, is assigned responsibility for landmine systems. Contractors include: Honeywell Incorporated, Hopkins, MN; Martin Marietta, Orlando, FL; Hughes Aircraft, Fullerton, CA; and Aircraft Ordnance and Manufacturing Company, Downey, CA.

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Program Element: #6.36.19.A
DOD Mission Area: #214 - Mine Warfare

Title: Landmine/Barrier Systems
Budget Activity: #4 - Tactical Programs

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Advanced development (AD) was completed on the Surface-launched Unit, Fuel-Air Explosive (SLUFAX) mine neutralization system, the vehicle mounted road mine detector, the mine-clearing roller, and the mine-clearing plow. Initiated AD on portable mine neutralization systems (POMINS), a vehicle magnetic signature duplicator (VEMASID) to counter magnetic influence fuzes, and the horizontal action off-route antivehicular/antitank mine.
2. (U) FY 1981 Program: Continue Advanced Development on POMINS, VEMASID, and a horizontal action off-route anti-tank/antivehicular mine.
3. (U) FY 1982 Planned Program: Complete Advanced Development (AD) on POMINS, VEMASID, and a horizontal action off-route antitank antivehicular mine and continue AD on improved combat shelters. Initiate AD on the universal mine dispenser system, and develop combat shelters for other than antitank weapons.
4. (U) FY 1983 Planned Program: Continue Advanced Development (AD) on improved combat shelters and the universal mine dispenser system. Initiate AD on an Improved Conventional Mine System (ICOMS) and a dedicated counterobstacle vehicle.
5. (U) Program to Completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.27.A

DOD Mission Area: #215 - Land Combat Support

Title: Combat Support Munitions

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	2815	2334	6275	4029	Continuing	Not Applicable Not Applicable
DE82	Smoke Munitions and Material	2815	2334	6275	4029	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program is required for advanced development, investigation, and evaluation of smoke material and munitions. New and significantly improved smoke/obscurant systems are required to protect United States (US) forces from advanced Soviet electro-optical devices which operate across the electromagnetic spectrum (from visible to the radar region). The currently fielded US Army smoke systems were developed before and during World War II and are not capable of rapidly providing the broadband screening for the required length of time for our armored vehicles, critical installations, assembling forces, and logistical complexes to survive on the modern battlefield.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Funds are needed to complete Advanced Development (AD) of prototype large area screening systems. Funds are also needed to continue AD of promising combat vehicle rapid smoke systems that will screen/obscure in the far infrared portion of the electromagnetic spectrum. These efforts are necessary to provide for armored vehicle survivability and for timely and effective large force, installation, and logistical complex screening on a modern battlefield.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

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Program Element: #6.36.27.A
DOD Mission Area: #215 - Land Combat Support

Title: Combat Support Munitions
Budget Activity: #4 - Tactical Programs

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	2815	2334	6275	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	2615	2486	6956	Continuing	Not Applicable

The FY 1980 increase of \$200 thousand dollars was required to support the comparative trials of the 81mm mortar prototypes. The FY 1981 decrease reflects the application of general Congressional reductions. The \$681 thousand decrease in FY 1982 is the result of the termination of the requirement for development of a smoke projectile for the 4.2-inch mortar.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands): Not applicable.

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Program Element: #6.36.27.A
DOD Mission Area: #215 - Land Combat Support

Title: Combat Support Munitions
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is to conduct Advanced Development (AD) of new and improved smoke munitions and material. Current emphasis is on the Advanced Development of improved smoke systems that screen in the infrared as well as the visible spectrum, and on large-area screening systems. Developmental systems will increase survivability of armored vehicles, weapons, command and control systems, and personnel.

G. (U) RELATED ACTIVITIES: This program is supported by Program Element: 6.26.22.A, Chemical Munitions and Chemical Combat Support; 6.46.01.A, Infantry Support Weapons; and 6.46.09.A, Combat Support Systems. In order to meet other Service needs and to prevent unnecessary duplication of effort, liaison personnel from each Service monitor the developing agency's programs, and a Joint Services Smoke Steering Committee meets regularly.

H. (U) WORK PERFORMED BY: In-house work is conducted by United States (US) Army Armaments Research and Development Command, Dover, NJ. Contractors are Battelle Corporation, Columbus, OH; AAI Corporation, Cockeysville, MD; and others to be determined.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Under Program Element 6.26.22.A, Chemical Munitions and Chemical Combat Support, a concept of screening materials and munitions was developed and demonstrated in August 1975. As a result, interest was generated, and the smoke/aerosol program received renewed emphasis. The concept of embedding wicks in white and red phosphorus significantly increased the burning characteristics and smoke generation capability of the 155mm smoke projectiles. Advanced Development (AD) on the XM825 155mm smoke projectile was completed in FY 1978. The technology gained has been utilized in the development of an improved 81mm mortar smoke cartridge. In FY 1979 AD was initiated on a manportable large-area screening smoke system (LASS) and an infrared defeating smoke grenade to be utilized for large-area screening and protection of armored vehicles respectively. During FY 1980, competitive testing of the "Ballistic Hatch" versus "Maximum Screening" prototype of the 81mm mortar cartridge was completed. The "Maximum Screening" prototype was selected for continued AD. Procurement of hardware for Development Test I/Operational Test (DT I/OT I) was initiated. Prototype design was selected and fabrication initiated on DT I/OT I hardware for the manportable smoke/obscurants generating system. AD continued on an infrared (IR) defeating grenade.

2. (U) FY 1981 Program: Advanced Development (AD) will continue on the manportable large-area smoke/obscurants generating system (LASS), and the infrared (IR)-defeating grenade system. DT I/OT I will be completed for both systems. The 81mm mortar smoke cartridge will complete AD and enter Engineering Development (ED).

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Program Element: #6.16.27.A

Title: Combat Support Munitions

DOD Mission Area: #215 - Land Combat Support

Budget Activity: #4 - Tactical Programs

3. (U) FY 1982 Planned Program: Advanced Development (AD) will be completed on the manportable large-area smoke/obscurants generating system (LASS) and the IR defeating grenade. AD will be initiated on the development of an infrared-defeating smoke pot and vehicle engine exhaust smoke system (VEESS) and a family of safe training smokes.

4. (U) FY 1983 Planned Program: The IR-defeating VEES will complete AD and the transfer to Engineering Development (ED). The IR-defeating smoke pot and training smokes will continue AD, and work will be initiated on an IR-defeating 155mm smoke projectile.

5. (U) Program to Completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.28.A

DOD Mission Area: #212 - Fire Support

Title: Field Artillery Ammunition Development

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	4581	12398	25190	28777	Continuing	Not Applicable
D007	Field Artillery Ammunition	2997	4736	6399	11645	Continuing	Not Applicable
D276	SADARM	1584	7662	18791	12938	Continuing	Not Applicable
D277	Smart Munitions	-	-	-	4194	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports the design and development of more effective propelling charges, munitions, and fuzing for field artillery systems to offset the advantages in range and numbers currently enjoyed by Warsaw Pact artillery and armor forces. A principal objective is to develop improved approaches to cannon propelling charge and projectile design in the gun propulsion technology program that will provide significantly increased range capability and enable US artillery to compete with and survive against Warsaw Pact forces. Also included is the Advanced Development Program for the Sense and Destroy Armor Artillery Munition (SADARM). The SADARM will provide a fire-and-forget antiarmor capability in the indirect fire role which significantly increases the lethality of field artillery against an armored threat. The fuze efforts encompassed by the program are focused on increasing the operational effectiveness of present munitions. Wireless data transmission techniques are being developed to remotely set fuzes, thereby improving response and reducing human error. A major objective is the development of new fuzes to meet the requirements of advanced weapons systems. Efforts are continuing to reduce annual training costs by developing low-cost training projectiles for the 60mm and 81mm mortar.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: To provide for: continued development of inexpensive indirect fire mortar training projectiles; continue fuze development programs; continue the gun propulsion technology program initiated in FY 1978; and continue advanced development of the Sense and Destroy Armor Munition (SADARM). An increase in FY82 funding above that projected in FY81 is required to accelerate completion of engineering development of SADARM by 1 year.

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Program Element: #6.16.28.A
 DOD Mission Area: #212 - Fire Support

Title: Field Artillery Ammunition Development
 Budget Activity: #4 - Tactical Programs

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	4581	12198	25190	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	5131	8053	17246	Continuing	Not Applicable

Reduction in FY80 funds reflects reprogramming from project D007 to higher priority Army requirements. Increase in FY81 is attributable to a Congressional increase to the Army request to accelerate development of SADARM. Major increases in FY82 reflect funding to accelerate the advanced development of SADARM project in D276 and the XM762 fuze in project D007.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

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Program Element: #6.36.28.A
DOD Mission Area: #212 - Fire Support

Title: Field Artillery Ammunition Development
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: This program supports two projects in munitions advanced development. Project D007, Field Artillery Ammunition, provides for: Development of low-cost concrete-filled plastic mortar training projectiles to provide realistic training and significant avoidance of training ammunition costs; a gun propulsion technology program which will develop improved approaches to the design of ammunition through integration of the component technologies of propellant development, to include development of stick propelling charges and a combustible cartridge case for advanced field artillery weapons systems, and utilization of nonmetallic rotating bands, projectile/tube interactions and cannon tube wear and erosion. A fuze development program focused on increasing the operational effectiveness of present munitions: including a high-burst artillery proximity fuze to assure capability for improved conventional munitions, extended range terminally guided projectiles and smoke and illuminating mortar/artillery applications. Advances in electronic fuze technology now offer the opportunity to realize both hand-set and remote-set capability in electronic fuzing for artillery. This program is exploiting the technology for the next generation 200-second, hand-set, electronic time artillery fuze. Project D276, SADARM, will continue to support advanced development of the Sense and Destroy Armor (SADARM) to provide a fire-and-forget antitank capability to the Field Artillery. The SADARM is a carrier projectile containing three submunitions each of which is affixed to a parachute and has a sensor and lethal mechanism. Upon ejection from the artillery projectile, the parachute stabilizes the submunition and imparts a spin to provide a scanning capability for the sensor, which activates the lethal mechanism when a target is sensed at an appropriate range.

G. (U) RELATED ACTIVITIES: The development items in this program are directly related to exploratory research being done in Program Element 6.26.03.A, Large Caliber & Nuclear Technology. Follow-on engineering development is conducted in Program Element 6.46.31, SADARM. Developments in this program element are compatible with US Marine Corps requirements and are coordinated to preclude duplication of effort. Prior to FY 1979, work now done under project D008, in Program Element 6.36.29.A, Field Artillery Cannon System, was conducted in this program element. Ammunition development conducted in this PE continues to be closely coordinated with all developments in PE 6.36.29.A. Fuze development work was accomplished in Program Element 636.13.A, Advanced Fuze Design, prior to FY 1981.

H. (U) WORK PERFORMED BY: US Army Armament Research & Development Command (ARRADCOM), Dover, NJ; Watervliet, NY; and Aberdeen, MD; Army Materiel Systems Analysis Agency, Aberdeen, MD; Harry Diamond Laboratories and US Army Electronics Research and Development Command, Adelphi, MD; US Army Armament Readiness Command, Rock Island, IL; and US Army Test and Evaluation Command, Aberdeen Proving Ground, MD. Contractors include General Electric Company, Burlington, VT, and Syracuse, NY; Chamberlain Corporation, Waterloo IA; and Aerojet Electro Systems, Azusa, CA; Honeywell Aerospace and Defense Group, Hopkins, MN.

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Program Element: #6.36.28.A
DOD Mission Area: #212 - Fire Support

Title: Field Artillery Ammunition Development
Budget Activity: #4 - Tactical Programs

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: The qualification of alternate explosive fill in artillery projectiles was completed in 1977, and surveillance monitoring of climatically conditioned munitions to establish storage characteristics continued through 1978. The XM711, 8-inch High Explosive (HE) projectile development was initiated in 1976 and was terminated in FY 1978 as not providing sufficient improvement over the standard M106 projectile to justify further development. In FY 1977 work was initiated on an inert 155mm artillery training projectile and a concrete-filled plastic 81mm mortar training projectile, and expanded in FY 1978 to include 60mm mortars. Fuze and spotting signatures were evaluated, low-cost packaging design was conducted, and 81mm concrete rounds were fabricated and tested for cartridge integrity. In FY79 advanced development of the training projectiles was completed and transitioned to engineering development in Program Element 646.28, Indirect Fire Training Munitions. The gun propulsion program was initiated in FY 1978 with major technical efforts to investigate improved high-energy igniters and propelling charges using high-force, cool-burning stick propellants. In FY79 efforts were expended to fabricate a variety of propelling charges which will be tested against tube wear requirements. Fuze development accomplishments were achieved in Program Element 6.36.13.A, Advanced Fuze Design. In FY80 the gun propulsion program was continued with investigations of refractory metal liners and coatings in 105mm and 155mm gun tubes, to determine liner retention and effectiveness in improving tube wear and erosion. Development of combustible cases for improved handling was begun. Testing of plastic rotating bands and thin-walled projectiles, and advanced development of the Sense and Destroy Armor Munition (SADARM) were initiated.

2. (U) FY 1981 Program: Concentrate on the design, fabrication, and evaluation of new propelling charges such as consolidated charges which permit the use of cool-burning propellant at higher loading densities and modular charges for zone simplification. Complete combustible case charge design and conduct evaluations in larger caliber cannon. Conduct high zone firings of chemically bonded plastic rotating bands. Continue development of the 200-second artillery electronic time fuzes, and high-burst artillery proximity fuzes initiated in PE 6.36.13.A, Advanced Fuze Design. Continue advanced development of the Sense and Destroy Armor Munition (SADARM).

3. (U) FY 1982 Planned Program: Continue development of cool-propellant, high-loading-density propelling charges and modular charges. Test combustible cartridge case configurations. Initiate development of a 4.2-inch, 1/10-range mortar training projectile and a dummy ICM/submunition training projectile. Complete AD of 200-second artillery electronic time fuze. Continue accelerated advanced development of the Sense and Destroy Armor Munition (SADARM).

4. (U) FY 1983 Planned Program: Advanced development of SADARM will continue through the 2QFY82 followed by award of the engineering development contract to the contractor providing the best design as determined by a competitive shootoff. SADARM transitions to engineering development in PE 64631. Gun Hardened, improved sensors developed in PE 6.26.03 AH-18 will

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Program Element: #6.36.28.A
DOD Mission Area: #212 - Fire Support

Title: Field Artillery Ammunition Development
Budget Activity: #6 - Tactical Projects

be integrated with projectiles employing precision guidance and extended range capabilities in project B277, Smart Munitions.

5. (U) Program to completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project D007

Program Element: 6.36.28.A

DOD Mission Area: #212 - Fire Support

Title: Field Artillery Ammunition and Fuzes

Title: Field Artillery Ammunition Development

Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: This project provides for: Development of concrete-filled plastic mortar training projectiles for low cost, realistic training and significant avoidance of training ammunition costs; a gun propulsion technology program which will develop improved approaches to the design of ammunition through integration of the component technologies of propellant development, ignition, utilization of nonmetallic rotating bands, projectile/tube interactions and cannon tube wear and erosion; and a fuze development program focused on increasing the operational effectiveness of present munitions, including a high-burst artillery proximity fuze to assure capability for improved conventional munitions, extended range terminally guided projectiles, and for smoke and illuminating mortar/artillery applications. Advances in electronic fuze technology now offer the opportunity to realize both hand-set and remote-set capability in electronic fuzing for artillery and exploit the technology for the next generation 200-second, hand set, electronic time artillery fuze.

B. (U) RELATED ACTIVITIES: The development items in this program are directly related to exploratory research being done in Program Element 6.26.03.A, Large Caliber & Nuclear Technology. Follow-on engineering development is conducted in Program Elements: 6.46.31, Field Artillery Ammunition, and 6.46.28.A, Indirect Fire Training Munitions. Development in this program element are compatible with US Marine Corps requirements and are coordinated to preclude duplication of effort. The fuze development work to be accomplished in this project was formerly done in Program Element 6.36.13.A, Advanced Fuze Design.

C. (U) WORK PERFORMED BY: US Army Armament Research & Development Command (ARRADCOM), Dover, NJ; Watervliet, NY; and Aberdeen, MD; Army Materiel Systems Analysis Agency, Aberdeen, MD; Harry Diamond Laboratories and US Army Electronics Research and Development Command, Adelphi, MD; US Army Armament Readiness Command, Rock Island, IL; and US Army Test and Evaluation Command, Aberdeen Proving Grounds, MD. Contractors include General Electric Company, Burlington, VT, and Syracuse, NY; Chamberlain Corporation, Waterloo IA.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: The qualification of alternate explosive fill in artillery projectiles was completed in 1977, and surveillance monitoring of climatically conditioned munitions to establish storage characteristics continued through 1978. The XM711, 3-Inch High Explosive (HE) projectile development was initiated in 1976 and was terminated in FY 1978 as not providing sufficient improvement over the standard M106 projectile to justify further development. In FY 1977 work was initiated on an inert 155mm artillery training projectile and a concrete-filled plastic 81mm mortar training projectile, and continued in FY 1978 to include 60mm mortars. Fuze and spotting signatures were evaluated, low-cost packaging design

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Project #D007

Program Element: #6.36.28.A

DOD Mission Area: #212 - Fire Support

Title: Field Artillery Ammunition and Fuze

Title: Field Artillery Ammunition Development

Budget Activity: #4 - Tactical Programs

was conducted, and 81mm concrete rounds were fabricated and tested for cartridge integrity. In FY79 advanced development of the training projectiles was completed and transitioned to engineering development in Program Element 6.46.28, Indirect Fire Training Munitions. The gun propulsion program was initiated in FY 1978 with major technical efforts to investigate improved high-energy igniters and propelling charges using high-force, cool-burning propellants. In FY79 efforts were expended to fabricate a variety of propelling charges which will be tested against tube wear requirements. Fuze development accomplishments were achieved in Program Element 6.36.13.A, Advanced Fuze Design. In FY80 the gun propulsion program was continued with investigations of refractory metal liners and coatings in 105mm and 155mm gun tubes to determine liner retention and effectiveness in improving tube wear and erosion, and develop combustible cases for improved handling. Testing of plastic rotating bands and thin-walled projectiles was initiated.

2. (U) FY 1981 Program: Concentrate on the design, fabrication, and evaluation of new propelling charges such as consolidated charges which permit the use of cool propellant at higher loading densities and modular charges for zone simplification. Complete combustible case charge design and conduct evaluations in larger caliber cannon. Conduct high zone firings of chemically bonded plastic rotating bands. Continue development of the 200-second artillery electronic time fuzes and high-burst artillery proximity fuzes initiated in PE 6.36.13.A, Advanced Fuze Design.

3. (U) FY 1982 Planned Program: Continue development of cool-propellant high-loading-density propelling charges and modular charges. Test combustible cartridge cases configurations. Initiate development of a 4.2-inch 1/10 range mortar training projectile and a dummy ICM/submunition training projectile. Complete AD of 200-second artillery electronic time fuze, NM762, and transition to Engineering Development in PE 6.46.31.A.

4. (U) FY 1983 Planned Program: Extended range propelling charge and propulsion concepts will be explored. Advanced designs in high-loading-density charges, solventless propellants, base bleed and ramjet combustion will be evaluated. A range increase of 10% to 30% will be sought. A refractory metal-coated liner approach will be used on 155mm systems to achieve gun tube wear improvements of 100 to 200%.

5. (U) Program to Completion: This is a continuing program.

6. (U) Major Milestones: Not Applicable.

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Project #D007

Program Element: #6.36.28.A

DOD Mission Area: #12 - Fire Support

Title: Field Artillery Ammunition and Fuzes

Title: Field Artillery Ammunition Development

Budget Activity: #4 - Tactical Programs

7. (U) Resources (in thousands):

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>to Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
RDPE						
Funds (current requirements)	2997	4736	6399	11645	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	3047	5138	7972	Not Shown	Continuing	Not Applicable

Reduced FY 1980 funding reflects reprogramming actions to support higher priority efforts. Decrease in FY 1981 is attributable to a general Congressional reduction. FY82 figure reflects program restructuring.

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FY 1982 RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D276
Program Element: #6.36.28.A
DOD Mission Area: # 212 - Fire Support

Title: Sense and Destroy Armor (SADARM)
Title: Field Artillery Ammunition Development
Budget Activity: #6 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: Threat studies indicate that massive armor attack is the principal ground threat in Europe. Artillery will be required to perform a key role in responding to massed armored assaults since it has the capability to bring extensive fire power from distant standoff, protected positions. The Sense and Destroy Armor (SADARM) round will be part of the 8-inch Artillery Weapon Systems family which will provide the capability to attack armored targets that are beyond the direct observation of friendly forces. It is intended that the system will be deployed and fired using current and future fire delivery and target acquisition techniques. SADARM will provide a fire-and-forget, near all-weather antiarmor projectile, carrying self-contained target-sensing submunitions. Using volley fire, it can attack areas containing self-propelled field artillery, air defense and/or massed armored units that are well beyond the FEBA and beyond the range of direct fire systems. Employment concepts including the use of SADARM in combination with artillery-delivered antiarmor and antipersonnel personnel mines would combine to keep such units in double jeopardy by killing targets if they moved (mines) or if they remained stationary (SADARM). The excellent system accuracies of the artillery-locating radars and other target acquisition devices together with the 8-inch howitzer combine to make this a most effective counterfire weapon. Additionally, employment concepts would feature the SADARM 8-inch munition in preplanned fires against hardened targets such as defense positions and assembly areas. Such targets, containing both armored and unarmored vehicles, are very vulnerable to SADARM's lethality. SADARM's high terminal effectiveness will greatly reduce the number of projectiles required to defeat the target. Its self-contained target-seeking capability will eliminate the need for the forward observer to track individual targets, thus reducing forward observer exposure time. Since multiple submunitions are carried into the target area by one carrier, the potential exists for attacking many targets simultaneously. SADARM attacks from above; therefore, it will be difficult for the enemy to hide or resort to defilade tactics.

B. (U) RELATED ACTIVITIES: This project follows from exploratory development Program Element 6.26.03.A AH-18 (Large caliber and nuclear technology), where a prototype submunition design was fabricated and successfully demonstrated.

C. (U) WORK PERFORMED BY: Principal Army Management Agency is the Development Project Office for Selected Ammunition, ARRADCOM, Dover, NJ. In-house support is provided by the Large Caliber Weapon Systems Laboratory, ARRADCOM; Ballistics Research Laboratory, ARRADCOM, Aberdeen, MD; US Army Test and Evaluation Command Activity, Aberdeen, MD. Principal contractors are: Aerojet Electro Systems, Azusa, CA, and Honeywell Defense Systems Division, Hopkins, MN.

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Project: #D276

Program Element: #6.36.28.A

DOD Mission Area: # 212 - Fire Support

Title: Sense and Destroy Armor (SADARM)

Title: Field Artillery Ammunition Development

Budget Activity: #4 - Tactical Programs

D. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Conducted conceptual design of submunition including sensor, warhead, and parachute. Procured prototype hardware and successfully demonstrated feasibility of a Sense and Destroy Armor (SADARM) submunition. Letter of Agreement (LOA) was approved, and two contracts were placed to conduct competing advanced development programs with the most successful contractor to be awarded the follow-on engineering development phase.

2. (U) FY 1981 Program: Contractors will complete program documentation, test, and evaluation of their respective SADARM components. Follow-on prototype hardware fabrication will be completed. In-house engineering support and contractor evaluation will be pursued.

3. (U) FY 1982 Planned Program: The advanced development of the Sense and Destroy Armor (SADARM) projectile will be continued. Contractors will pursue subsystem evolution, system integration, and conduct static and ballistic testing. The design of the SADARM submunition will be completed and incorporated into the M509 shell body carrier. Full-up projectiles will be fabricated for evaluation and support of DT I/OT I. Projectiles will incorporate a dual sensor approach to minimize vulnerability to weather, battlefield dust and smoke and active and passive countermeasures.

4. (U) FY 1983 Planned Program: Conduct DT I/OT I evaluation of the competing contractor designs. Initiate procurement of long-leadtime components for use during the Engineering Development (ED) phase. Conduct validation In-Process Review, select ED contractor, and initiate ED in PE 64631.

5. (U) Program to Completion: This is a continuing program.

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Project: #D276
 Program Element: #6.36.28.A
 DOD Mission Area: # 212 - Fire Support

Title: Sense and Destroy Armor (SADARM)
 Title: Field Artillery Ammunition Development
 Budget Activity: #6 Tactical Problems

6. (U) Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Development Testing I	2Q FY83	None Shown
Validation In-Process Review	2Q FY83	None Shown
Development Testing II and Type Classification-Limited Production Release	2Q FY85	None Shown
Development Acceptance In-Process Review and Type Classify Standard	1Q FY86	None Shown
Full-Scale Production	4Q FY86	None Shown

7. (U) Resources (\$ in thousands):

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	1584	7662	18791	12938	33226*	4400*
Funds (as shown in FY 1981 submission)	2084	2915	9274	None Shown	Continuing	Not applicable

*Includes Engineering Development in PE #6.46.31.A, Project D369. Total estimated costs are based on a preliminary baseline cost estimate only. FY80 funds reprogrammed to other Army requirements. Increases in FY81 and 82 reflect Congressional and OSD acceleration of the program.

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FY 1982 RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.29.A

DDO Mission Area: #212 - Fire Support

Title: Field Artillery Cannon Systems

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion Continuing	Total Estimated Cost Not Applicable
	TOTAL FOR PROGRAM ELEMENT	3646	5862	2074	15556		
D008	Division Support Weapon System	3646	5862	2074	15556	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Heavy Brigade/Division Field Artillery Fire Support Weapon System provides indirect fire support to the maneuver forces of Armored and Mechanized Divisions/Brigades. Indirect Fire Support provided by this system includes the destruction, neutralization, and suppression of target elements within the maneuver commander's area of responsibility. The purpose of the Heavy Brigade/Division Program is to ensure that the US Army maintains a responsive, survivable, and lethal Heavy Brigade/Division System through improvement of the currently fielded system, development of a new system, adaptation of a foreign system or components, or a combination of these approaches as required.

C. (U) BASIS FOR THE FY 1982 RDT&E REQUEST: FY 1982 funds are required to support the concept formulation phase of the Heavy Brigade/Division Fire Support Weapon System Program. The Heavy Brigade/Division Field Artillery Fire Support Mission Element Need Statement has been approved by the Secretary of Defense. A Special Task Force (STF) will be formed in 1981. The Special Task Force will manage the program during the concept formulation phase and will evaluate alternative system concepts. Results of Concept Generation Contracts executed in FY 1980 indicated that additional in-depth analyses in specific areas must be initiated in 1981 to include terminally guided munitions; command, communications, and control; and ammunition packaging and resupply. Detailed preparation for 3QFY1982 Army Systems Acquisition Review Council Decision will also be initiated in FY 1981. The FY 1982 funds are required to complete the work initiated in FY 1981.

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Program Element: #6.16.29.A
DOD Mission Area: #212 - Fire Support

Title: Field Artillery Cannon Systems
Budget Activity: #4 - Tactical Programs

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	1646	5862	2074	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	2269	6775	19117	Continuing	Not Applicable

The change in FY 1980 funding was due to an increase of \$400 thousand to complete the 109/M203 propellant charge program, and an increase of \$977 thousand for the Heavy Brigade/Division Field Artillery Weapons System Program. The decrease in FY 1981 funding is due to a reprogramming to a higher priority Army requirement. The difference in the FY 1982 figures is because of funding constraints due to higher Army priorities that prevented the Heavy Brigade/Division Field Artillery Weapons System Program from entering Advanced Development in FY 1982 as was originally planned.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

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Program Element: #6.36.29.A
DOD Mission Area: #212 - Fire Support

Title: Field Artillery Cannon Systems
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is to determine, and then develop, the optimum approach for a responsive, lethal, and survivable Field Artillery System to provide indirect fire support to the Heavy Brigade/Division in the 1990-2010 timeframe. A Mission Element Need Statement for a Heavy Brigade/Division Field Artillery Fire Support System has been approved by the Secretary of Defense. A Letter of Instruction is being prepared by the Office of the Deputy Chief of Staff for Operations and Plans that directs formation of a Special Task Force to consider alternative approaches for satisfying the stated need. Apparent alternatives include cannon, rocket, or missile solutions. Preparation for a comprehensive analysis and evaluation of alternative system approaches by the Special Task Force, leading to a 3d Quarter FY1982 decision by the Army Systems Acquisition Review Council, has been initiated. In FY 1979, FY 1980, and 1QFY 1981, the Army conducted a detailed assessment of technology available to improve the Heavy Brigade/Division Field Artillery Fire Support Weapon System. During this time system concepts implementing the available technologies were generated and evaluated. Specific areas such as terminally guided munitions; command, communications, control; and ammunition packaging and resupply that require more detailed analysis have been identified; these analyses will be conducted during FY 1981 and FY 1982 and the results provided to the special task force. The technology survey and concept generation effort was executed with extensive participation by industry. Two industrial teams, headed by FMC Corporation and Pacific Car and Foundry Corporation, generated concepts for new cannon systems. A third industrial team headed by Norden Systems conducted a comprehensive evaluation of the M109 155mm Cannon System and has developed concepts and proposals for improvements to be applied to that system. A government team submitted a concept for a modified Multiple Launch Rocket System that will be considered as an alternative by the Special Task Force. A government team also solicited, compiled, and evaluated information on foreign systems and components that would contribute to solving the deficiencies in the M109A2/A3 system. The technology survey and system concept generation effort was completed by a General Officer's Review, during which decisions were made as to the completeness and quality of work accomplished and additional work that is required to support a Special Task Force.

G. (U) RELATED ACTIVITIES: The projects in this program are related to Program Elements 6.26.03.A, Large Caliber and Nuclear Technology, where weapons exploratory work is performed; 6.27.02.E Tactical Technology, where the Defense Advanced Research Projects Agency is investigating extended range ammunition and advanced seeker technology; 6.36.28.A, Improved Conventional Ammunition, where Field Artillery Ammunition Development is accomplished; 6.33.06.A Dual Mode Seeker, where new seeker technology with potential application to Artillery Systems is being investigated; 6.36.21.A, Combat Vehicle Engine, where Combat Vehicle Propulsion Systems are being investigated; 6.37.07A Army Data Distribution System; 6.46.21. A, Copperhead, now entering production; 6.46.03A, Improved 155mm Nuclear Projectile, where engineering development of an Improved 155mm Nuclear Projectile is underway; 6.51.1A Foreign Weapons Evaluation, where evaluation of foreign weapon systems is conducted; 6.47.27A, Division Artillery and Battalion Fire Direction Centers; 6.46.31.A, Ammunition 155mm, where field artillery ammunition engineering efforts are being pursued. Activities of related programs will be monitored, and reviews will be conducted to preclude duplication of efforts.

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Program Element: #6.36.29.A
DOD Mission Area: #212 - Fire Support

Title: Field Artillery Cannon Systems
Budget Activity: #4 - Tactical Programs

II. (U) WORK PERFORMED BY: Contracts for system concept studies were executed by Food, Machinery and Chemical Corp (FMC) San Jose, CA, Pacific Car and Foundry Corporation, Renton, WA, and Norden Systems, Norwalk, CT, as prime contractors. In-house developing organizations participating in the program are: US Army Armament Research and Development Command (ARRADCOM), Dover, NJ, Edgewood, MD, Aberdeen, MD, and Watervliet, NY; Army Materiel Systems Analysis Agency (AMSAA), Aberdeen, MD; Defense Advanced Research Projects Agency (DARPA), Arlington, VA; US Army Test and Evaluation Command (TECOM), Aberdeen MD; US Army Operational Test and Evaluation Agency (OTEA), Falls Church, VA; US Army Field Artillery Board (USAFAB), Ft Sill, OK; US Army Field Artillery School (USAFAS), Ft Sill, OK; US Army Training and Doctrine Command (TRADOC), Ft Monroe, VA; US Army Tank Automotive Research and Development Command (TARADCOM), Warren, MI; US Army Armament Materiel Readiness Command (ARRCOM), Rock Island, IL; US Army Communications Research and Development Command, Ft Monmouth, NJ; US Army Electronics Research and Development Command, Adelphi, MD; US Army Missile Command, Redstone, AL; US Army Mobility Equipment Research and Development Command, Ft Belvoir, VA; US Army Human Engineering Laboratory, Aberdeen, MD.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: From FY 1976 to FY 1979, the bulk of this program funding was used to determine the feasibility of using the M203 propelling charge to provide an extended range capability for the M109 series 155mm Self-Propelled Howitzers. Although analysis and testing have shown that the range of the M109 can be increased using the M203 propelling charge, the adverse impact of higher overpressure on personnel and the degradation of reliability of the howitzer led to a decision that the M203 will not be type classified for use in the M109. Funding was also provided through 1979 to support updating of the Field Artillery Digital Automatic Computer software in consonance with the fielding of new weapons and munitions. In FY 1979, a Request for Proposal was issued and proposals from 7 prime contractors were evaluated for system concept studies of an enhanced 155mm Self-Propelled (SP) Artillery Weapon System. Contracts were awarded to FMC Corporation and Pacific Car and Foundry Corporation to survey technology and generate concepts for a new system that could be fielded in the 1990-2010 timeframe. A contract was also awarded to Norden Systems to determine improvements that could be made to maintain or increase the capabilities of the currently fielded M109A2/A3 system. The information gained from these contracts was evaluated by a government team in the fall of 1980 and the results presented to a General Officer's Review in December 1980.

2. (U) FY 1981 Program: The concept generation contracts awarded during the first quarter of FY 1980 were completed during the first quarter of FY 1981. The results were presented to a General Officer's Review by a government evaluation team, with the conclusion that dramatic increases in Heavy Brigade/Division System capabilities can be achieved. The areas of Command, Communications, Control, Operation in Nuclear Biological, Chemical Environment; handling, packaging, and ammunition and resupply were determined to require more in-depth analyses. These analyses are to be initiated in

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Program Element: #6.30.29.A
DOD Mission Area: #217 - Fire Support

Title: Field Artillery Cannon Systems
Budget Activity: #4 - Tactical Programs

2QFY 1981. A letter of instruction for formation of a Special Task Force that will evaluate alternative concepts is being drafted. Administrative preparation for an Army Systems Acquisition Review Council Decision has been initiated.

3. (U) FY1982 Planned Program: The work in FY 1982 will be to complete the work initiated in FY 1981. Final preparations for 3QFY 1982 Army Systems Acquisition Review Council Decision will be completed. Preparation for entering Advanced Development during 1QFY1983 will be completed.

4. (U) FY 1983 Planned Program: A competitive Advanced Development Phase is planned to be initiated in 1QFY 1983 should the decision be made to develop a new system.

5. (U) Program to Completion: Should the decision be made to develop a new system, the program is projected to enter Engineering Development in 2QFY 1986. The Production Decision is planned for 1QFY 1990 with the initial fielding being planned for 4QFY 1990.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: 95.36.32.A

DDO Mission Area: #216 - Land Combat Service Support

Title: Armored Combat Support Vehicle Family
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	3700	3224	103	-	13931	20958 Not Applicable
D154	Armored Forward Area Rearm Vehicle	1000	600	-	-	13931	15531
D109	Field Artillery Ammunition Support Vehicle	2700	2624	103	-	-	5427

(U) NOTE: D154 (Armored Combat Support Vehicle Family) project is changed to the Armored Forward Area Rearm Vehicle as shown above. Prior to FY82, the Armored Combat Support Vehicle Family Project was used to fund both the Armored Forward Area Rearm Vehicle and the Field Artillery Ammunition Support Vehicle now in D154 and D109 respectively. The Maintenance Assist Vehicle and Medical Evacuation Vehicle listed under the D154 project in FY81 used no funds and will not be listed under the D154 project in the future. They are not funded in FY82.

B) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Supports Army needs for armored combat support vehicles to meet two critical logistics roles and missions. The principal requirement of each role and mission is:

1. (U) Armored Forward Area Rearm Vehicle (AFARV): Resupplies tank and infantry fighting vehicle ammunition to forward deployed tank and mechanized forces in an environment of suppressive enemy artillery fires. This vehicle will provide protection for ammunition thereby allowing them to remain in the main battle area where they are needed a much larger percent of the time to supply combat vehicles in or near their fighting positions.

2. (U) Field Artillery Ammunition Support Vehicle (FAASV): Provides protection of artillery ammunition during resupply of self-propelled artillery weapons in their firing positions that are subject to counterbattery fires from enemy rocket and cannon. This vehicle will replace the unprotected M548 tracked resupply vehicle, and provide armored protection for the

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Program Element: #6.36.32.A
 DOD Mission Area: #216 - Land Combat Service Support

Title: Armored Combat Support Vehicle Family
 Budget Activity: #4 - Tactical Programs

ammunition and crew. The vehicle will have new ammunition-handling equipment permitting faster and less man-intensive ammunition resupply.

C. (U) BASIS FOR FY 1982 RDTE REQUEST:

1. (U) The Armored Forward Area Recon Vehicle (D154) is unfunded in FY82. This will result in at least a one-year delay of this project.

2. (U) The Field Artillery Ammunition Support Vehicle completes its development program in FY82. The Army will procure five Field Artillery Ammunition Support Vehicle prototypes for an FY82 Operational Development Test II evaluation to determine their suitability for artillery ammunition support for armored and mechanized divisions or separate brigades. These prototypes will be produced using the M109 self-propelled 155mm howitzer chassis.

3. (U) As stated in paragraph C1 above, there is no FY82 funding to continue the Armored Forward Area Recon Vehicle project. The Field Artillery Ammunition Support Vehicle project is funded for development which will be completed in FY82. Funding level for the Field Artillery Ammunition Support Vehicle program is considered adequate and valid by the Army. This project is considered a low-risk effort since the chassis (M109) has been in use by the field artillery for fifteen years.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
<u>Armored Forward Area Recon Vehicle</u>		
Award Testbed Contract:	4QFY1980	2QFY1980
Conduct Operational Evaluation:	2QFY1981	1QFY1981
Award Engineering Development Contract:	4QFY1981	2QFY1981
Complete Operational Testing:	4QFY1982	4QFY1982
Type Classify:	1QFY1982	1QFY1982

Field Artillery Ammunition Support Vehicle:

Release Request for Proposal:	4QFY1980	2QFY1980

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Program Element: 06.36.32.A Title: Armored Combat Support Vehicle Family
 DOD Mission Area: 0216 - Land Combat Service Support Budget Activity: 04 - Tactical Programs

<u>Major Milestones</u>	<u>Current Milestone Dates</u>	<u>Milestone Dates Shown in FY 1981 Submission</u>
<u>Armored Forward Area Rearm Vehicle</u>		
Armored Contract:	Delay was caused by late release of funds in FY80 to this project. 2QFY1981	3QFY1980
Complete Operational Testing:	Same as Above 3QFY1982	3QFY1981
Type Classify:	Same as above 4QFY1982	4QFY1981
	Same as above	

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional to Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	3700	3224	103	13931	20958
Funds (as shown in FY 1981 submission)	4400	3516	1513	20000	29429

The Armored Combat Support Vehicle Family project is an outgrowth of the Program Element 6.36.24A/h154, Vehicle Rearm System Project. Differences reflect a restructuring of the project. The FY 1980 decrease of \$700K was caused by these funds being used by the Army for a classified project. The reduction of \$1410K in FY 1982 was caused by the Armored Forward Area Rearm Vehicle project not being funded. The decrease in additional to completion funds was caused by the Maintenance Assist Vehicle and Medical Evacuation Vehicle being removed from this project.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands) Not Applicable.

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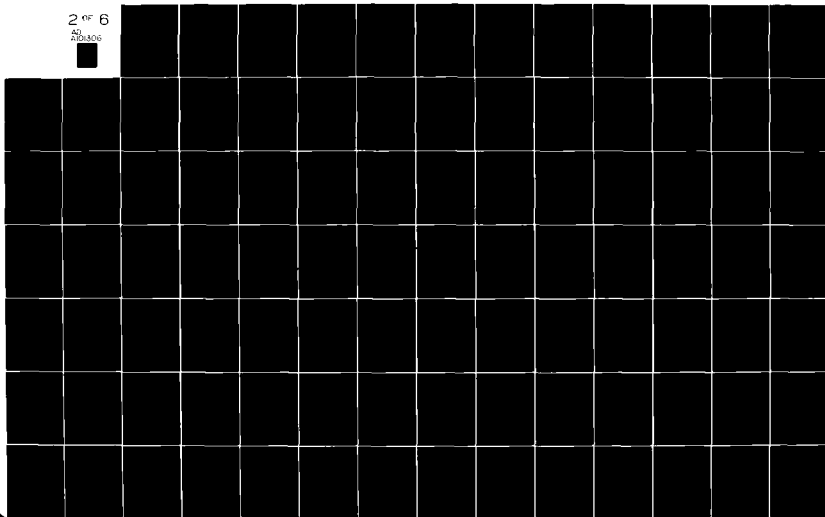
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Program Element: #6.36.12.A
DOD Mission Area: #216 - Land Combat Service Support

Title: Armored Combat Support Vehicle Family
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: In order to win in ground combat against enemy mechanized forces which are numerically superior, US tanks, artillery, and other fighting vehicles must sustain combat at higher intensities for longer periods than ever before. Frontline logistical support becomes the buttress of sustaining these combat operations. Vehicles required for this support must have protection against small arms and overhead artillery fires and cross-country mobility comparable to the tracked combat vehicles they support. Resupply of tank, infantry fighting vehicle, and artillery ammunition to the combat site for on-position resupply is essential to satisfying the increased logistical demand. There are two current combat systems which demand increased logistical capabilities. A priority development is an armored resupply vehicle designed specifically to resupply tanks and infantry fighting vehicles which are engaged in close combat in the forward battle area. The other priority development is a Field Artillery Ammunition Support Vehicle designed to couple with self-propelled howitzers for sustained firing engagements in a counterbattery environment. The Army initiated the development of these two priority programs in FY 1980. There is no intent in this program to develop a new tracked combat vehicle. The Armored Forward Area Rearm Vehicle program will develop an armored module in which to carry tank and infantry-type ammunition, and attendant on-board material handling equipment. It will use the Multiple Launch Rocket System (MLRS) chassis as the basic carrier, thus providing cross-country mobility and protection from small arms and splintering munitions. The M109 chassis (Field Artillery Ammunition Support Vehicle) is desired by the user as the carrier for field artillery ammunition. This chassis is the basic system for the M109A1/A2/A3, 155mm howitzer weapon system now organic to all armored and mechanized infantry artillery units. Using this chassis, the Field Artillery Ammunition Support Vehicle will be as mobile as the system it supports, cause very little training impact on deployed units and enjoy commonality of many spare parts.

G. (U) RELATED ACTIVITIES: This program is related to all of the Army's research and development programs connected with tactical and special purpose vehicles. Programs of primary interest are: Program Element (PE) 6.26.01.A, Tank and Automotive Technology; PE 6.11.02.A, Project AF22, Research in Vehicle Mobility; PE 6.21.05.A, Materiel; PE 6.36.21.A, Combat Vehicle Propulsion System Development; and PE 6.33.03A, Project 216, GSRS. Duplication of effort is avoided by review and coordination of programs at Headquarters, Tank Automotive Command.

H. (U) WORK PERFORMED BY: US Army Tank and Automotive Command, Warren, MI, has the responsibility for implementation of this program. Contractors for the Field Artillery Ammunition Support Vehicle will be selected in FY 1981.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: An engineering evaluation was conducted on several configurations of ammunition-carrying modules and ammunition materiel-handling equipment to support the development of the Armored Forward Area

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Program Element: #6.36.32.A

Title: Armored Combat Support Vehicle Family

DOD Mission Area: #216 - Land Combat Service Support

Budget Activity: #4 - Tactical Programs

Rearm Vehicle and the Field Artillery Ammunition Support Vehicle. A contract was awarded to develop an ammunition module for the Armored Forward Area Rearm Vehicle. A request for proposal was made to produce five Field Artillery Ammunition Support Vehicles. An Army decision was made to reevaluate the requirements for the Maintenance Assist Vehicle and the Medical Evacuation Vehicle.

2. (U) FY 1981 Program: The Armor Center will evaluate one technology demonstrator module to support the Armored Forward Area Rearm Vehicle project using an MLRS chassis. The Army will contract for five prototype Field Artillery Ammunition Support Vehicles to be used for operational and developmental testing in FY82.

3. (U) FY 1982 Planned Program: There is no planned FY 1982 Armored Forward Area Rearm Vehicle program. It is anticipated that this program will be continued in the future, once the Army clarifies the requirement and the concept. Complete development of the five prototype Field Artillery Ammunition Support Vehicles and conduct operational and developmental testing. Type classify this support vehicle to allow production in FY 1983.

4. (U) FY 1983 Planned Program: Prepare for procurement of the Field Artillery Ammunition Support Vehicle.

5. (U) Program to Completion: Begin procurement of 1293 Field Artillery Ammunition Support Vehicles to fill a critical need in Europe. Begin engineering development of an Armored Forward Area Rearm Vehicle when funded. Complete operational and developmental testing and type classify this system to allow future procurement.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6,36,35.A

Title: Advanced Multi-Purpose Armament System

DOD Mission Area: #211 - Close Combat

Budget Activity: #4 - Tactical Programs

THIS DESCRIPTIVE SUMMARY WILL BE SUBMITTED UNDER A SEPARATE COVER.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: 6.37.05.A

DOD Mission Area: 216 - Land Combat Service Support

Title: Physical Security

Budget Activity: 4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	3375	3100	3887	5556	Continuing	Not Applicable
DK82	Physical Security	3375	3100	3887	5556	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The objective of this program element is to conduct advanced development of physical security equipment used to provide protection for critical areas, installations, and the rear area of deployed forces. The need is to use physical security equipment to enhance all DOD security to the maximum extent possible and decrease manpower (guard) requirements to a minimum.

C. (U) BASIS FOR FY 1982 RDTE REQUEST:

1. (U) Funds are required to accomplish advanced development of: (1) components to provide additional capabilities for the Facility Intrusion Detection System (FIDS) in full-scale development under Program Element 6.47.18.A, Physical Security, (2) exterior lighting and barrier systems, and (3) security locks and containers. Advanced development will continue on the following FIDS components: Adaptive and discriminative strain and radio frequency (RF) motion sensor; fiber optic, RF, and extended range data links; and the fog-deterrent response device. Advanced development will be initiated for a low-light-level TV suitable for FIDS, and a strain-sensitive cable for use as a combination sensor and data link. Advanced development of optimized security lighting and barrier systems will continue, and a validation In-Process Review (IPR) will be conducted for the lighting and barrier components that will satisfy the DOD security requirements. Advanced development will be initiated for security locks and containers.

2. (U) FIDS development costs have been validated in the FIDS Baseline Cost Estimate (BCE). Validation IPR for both the Security Lighting and Barrier Systems and the contrasting Ground Cover System has been delayed because of a delay in having an approved requirements document. The Military Police School has drafted a Letter of Agreement (LOA) which was forwarded to Headquarters, Training and Doctrine Command (TRADOC), and to the other services for staffing on 1 December 1980. TRADOC approval is anticipated 2Q81.

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Program Element: #6.37.05.A

Title: Physical Security

DOD Mission Area: #216 - Land Combat Service Support

Budget Activity: #4 - Tactical Programs

<u>Major Milestones</u>	<u>Current Milestone Dates</u>	<u>Milestone Dates Shown in FY 1981 Submission</u>
Special IPR - Electronic Altering System	2Q81	Not Shown
VAL-IPR - Security Lighting & Barrier Systems (Originally Group I Components)	2Q82*	1Q81
VAL-IPR-Advanced FIDS Group II	4Q81	4Q81
VAL-IPR-Security Locks and Containers	FY83**	FY82
VAL-IPR-Contrasting Ground Cover System (Originally Group II Lighting and Barrier Components)	FY83*	FY82
VAL-IPR-Advanced FIDS Group III	FY93	FY83

* Validation IPR has been delayed pending approval of requirements document.

** Validation IPR has been delayed because available Military Police School manpower resources have been devoted to the priority FIDS and Lighting and Barrier Systems.

D. (U) COMPARISON WITH FY 1981 ROTE REQUEST: (\$ in thousands)

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Program Element: #6.37.05.A

Title: Physical Security

DOD Mission Area: #216 - Land Combat Service Support

Budget Activity: #4 - Tactical Programs

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	3375	3100	3887	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	3500	3281	5817	Continuing	Not Applicable

In FY80 the \$125K was reprogramed to 6.47.18.A to fund a cost growth on the interim FIDS contract. Decrease in FY81 is attributable to the application of general Congressional reductions. Reduction in FY82 is due to total obligational authority constraint.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

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Program Element: #6.37.05.A

DOD Mission Area: #216 - Land Combat Service Support

Title: Physical Security

Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: Developments will be directed towards satisfying the Army, Air Force, and Navy material need for an interior security system (Facility Intrusion Detection System (FIDS)) and their requirement for a Physical Security Lighting and Barrier System. Development will include the following: (1) sensors, including penetration, motion, item removal, duress, and contraband; (2) electronic data links, data link security supervisory components, and centralized data processing components; (3) alarm display, monitoring, and readout components; (4) physiological and/or psychological deterrent devices; (5) devices to protect cargo in depots or in transit by truck or ship; (6) devices to provide physical security for the rear area of deployed forces; (7) standardized security equipment and locking hardware; and (8) exterior lighting and barrier systems. Interfaces necessary to integrate exterior sensors developed by the Air Force and potential shipboard security equipment components adopted by the Navy will also be developed in consonance with the direction from the Under Secretary of Defense (Research and Engineering) (Memo of 26 July 1979) for the Army to "develop the command, control, and display subsystem (CCDS) of the DOD standardized physical security equipment system; ensure that the CCDS has the capacity and design to manage all segments of the entire military/commercial security equipment land based systems." In addition, there will be a continuing evaluation of commercial physical security equipment as well as those items that might be developed by other government agencies.

G. (U) RELATED ACTIVITIES: The exploratory development for physical security equipment is conducted under PE 6.27.31.A, project AII27, Mobility Equipment Technology. The improved processing technique effort and the fiber optic data link, which entered advanced development in FY80, are outgrowths of these projects. This program supports the engineering development Program Element 6.47.18.A, Physical Security, in which the major item is the Interim Facility Intrusion Detection System (FIDS). Related are the Army's Remotely Monitored Battlefield Sensor System (REMBASS) tactical sensor program and the Air Force's Base and Installation Security System (BISS) exterior physical security program. Close coordination with REMBASS, BISS, and the Navy is being accomplished to assure utilization of related technologies and developments and to prevent duplication of effort. Coordination is accomplished by joint working groups and attendance at other Service and department meetings. The DOD Physical Security Equipment Action Group monitors and coordinates the development and acquisition of physical security equipment by all services. The Department of the Army's single point of contact is the Project Officer for Physical Security Equipment (POPSE), who monitors and coordinates the development, acquisition, integrated logistic support, and installation of physical security systems.

H. (U) WORK PERFORMED BY: The United States (US) Army Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, VA, is assigned responsibility for Physical Security Research, Development, Test and Evaluation (RDTE). Other government agencies currently involved are the US Army Test and Evaluation Command, Aberdeen, MD. Major contractors are GTE Sylvania, Mountainview, CA; Southwest Research, San Antonio, TX; General Instruments Corporation, Hicksville, NY; Tetra Tech, Incorporated, Pasadena, CA; and ENSCO Incorporated, Springfield, VA.

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Program Element: #6.37.05.A
DOD Mission Area: #215 - Land Combat Service Support

Title: Physical Security
Budget Activity: #4 - Tactical Programs

1. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments:

a. (U) Facility Intrusion Detection System: Advanced development in pursuance of the approved Materiel Need for the Facility Intrusion Detection System (FIDS) was initiated during FY 1974 under Program Element (PE) 6.37.19.A, Special Purpose Detectors. During FY79 an Acquisition Plan was prepared and a Validation In-Process Review approved entering into full-scale development of Advanced FIDS Group I components. Advanced Development was initiated and contracts were awarded for Advanced FIDS Group II components. During FY80, advanced development (AD) continued for Advanced FIDS Group II components and the RF Data Link. AD was initiated for a strain sensor, the RF motion sensor, improved signal-processing techniques, a combination light and sound response device and secure fiber optic links.

b. (U) Security Lighting and Barriers System: During FY77 a review of Commander in Chief, Europe (CINCEUR), lighting requirements was conducted, concentrating on horizontal and vertical illumination requirements 30 feet from the perimeter fence, quick start-up (5" second) lights and noninterruptible power sources. In FY78 the lighting and barriers task was begun, and points of contact for lighting were established at the Defense Nuclear Agency (DNA), National Bureau of Standards (NBS), Energy Resources Defense Administration (ERDA), Base and Installation Security System Project Office (BISSPO), and Sandia Laboratories. In FY79 contracts were awarded for fence components, luminaires, trailer-mounted light towers, lighting control system, a lighting and barrier composite system analysis program, models of a high-pressure sodium luminaires, personnel barriers, vehicle barriers, contrasting ground covers, and construction of a test site. In FY80, a test site was completed and various lighting systems were evaluated to determine the probability of making a correct target assessment. Personnel barriers were constructed and evaluated to determine their delay and deterrent characteristics. Contrasting ground covers were installed and evaluated in terms of improving the sentry's target assessment.

c. (U) Electronic Alerting System: A contract was awarded in FY79 to initiate development of an Electronic Alerting System (EAS) for use in certain installations in Europe. The EAS is to alert local security forces and, through existing organic communication systems, alert higher headquarters.

2. (U) FY 1981 Program:

a. (U) Facility Intrusion Detection System: The development of adaptive and discriminative sensors, improved processing and decision logic will continue under contract. In-house effort will be required to prepare, award, and monitor the contract and evaluate the improved processing techniques. Advanced development of Secure Fiber Optic Data and

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Program Element: #6.37.05.A

Title: Physical Security

DOD Mission Area: #216 - Land Combat Service Support

Budget Activity: #6 - Tactical Programs

Surveillance Links will be continued. In-house evaluation of a secure internal surveillance link, a strain sensor which will detect the removal of a protected item and structural stress changes within a protected area caused by the movement of an intruder, an extended range internal data transmission system, and the Advanced Development Models of the RF Motion Sensor and the combination Light and Sound Response Device procured in FY80 will be initiated. A contract will be awarded for Advanced Development Models of Fog-Deterrent Response Devices. A Validation In-Process Review (IPR) will be convened for the Advanced FIDS Group II components.

b. (U) Security Lighting and Barriers System: The contractual effort for testing lighting systems to determine the quantity of illumination and illumination distribution will continue. Personnel barriers will be developed and evaluated to determine their effectiveness in delaying and deterring intruders. The physiological and psychological effects of the lighting and barrier components on both the sentry and the intruder will be evaluated. The MERADCOM in-house effort will be directed towards contract preparation, award, and monitoring; providing assistance in the generation of a Required Operational Capability (ROC) for lighting and barriers; and revising the lighting and barriers Acquisition Plan.

c. (U) Electronic Alerting System: A Special In-Process Review (SIPR) will be conducted to present the results of in-house testing, formalize the quantitative requirements, and obtain approval of the planned approach. If the SIPR approves the approach, a contract will be awarded for test hardware for evaluation in Europe in FY82.

3. (U) FY 1982 Planned Program:

a. (U) Facility Intrusion Detection System: Advance development contracts for the Adaptive/Discriminative Sensor and the Fiber Optic Links will be modified and development continued in FY82. In-house effort will consist of providing technical guidance to the contractor and completion of the evaluations initiated in FY81. The evaluations of the Strain Sensor, the RF Motion Sensor, the Combination Light and Sound Response Device, and the Secure Internal Surveillance Link initiated in FY81 will be completed, and any changes required will be incorporated in the equipment. Advanced Development Models of the Extended Range Internal Data Transmission System will be delivered and an evaluation initiated. Advanced Development of the RF Data Link will be continued and Advanced Development of an Low-Light-Level TV suitable for FIDS will be initiated. The Advanced Development models of the Fog-Deterrent Response Devices contracted for in FY81 will be delivered, and both types of fog deterrents will be installed in a magazine and undergo test and evaluation. An investigation of a strain-sensitive cable for use as a combination Sensor and Secure Data Link will be initiated.

b. (U) Security Lighting and Barriers Systems: Advanced Development Validation Tests will be completed, and a Validation IPR will be conducted in the 2Q for the lighting and barrier components that will satisfy the DOD security requirements.

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Program Element: #6.17.05.A

DOD Mission Area: #216 - Land Combat Service Support

Title: Physical Security

Budget Activity: #4 - Tactical Programs

c. (U) Security Locks and Containers: Advanced Development of high-security locking systems for nuclear and chemical storage magazines will be initiated.

4. (U) FY 1983 Planned Program:

a. (U) Facility Intrusion Detection System: A Validation In-Process Review will be conducted for the Strain Sensor, RF Data Link, and selected Rear Area Security Devices. Advanced Development of Transit Security, Rear Area Security Devices, Fiber Optic Security Links, Response Devices, Low-Light-Level TV, Adaptive and Discriminative Sensor, Strain-Sensitive Cable, and the Extended Range Internal Data Link will continue. Advanced Development of new transducers and smart sensors will be initiated. New threat information will be generated and evaluated to identify any system or equipment deficiencies.

b. (U) Security Locks and Containers: The Security Locks and Containers Program will continue with the following potential programs: (1) Development of a lock that is an integrated part of an Intrusion Detection System, and (2) the development of a one-time key that may be a combination of an Identification (ID) badge and key, using electrically programmed solid state read-only memory.

5. (U) Program to Completion: This is a continuing program. In FY84 and the outyears, there will be a continuing effort to develop physical security hardware which is capable of countering the ever-increasing sophistication of the threat to military personnel and property. Coordinated efforts with the other services will be directed towards integrating components/subsystems/systems developed under this Program Element into a completely integrated interior/exterior physical security system for the Department of Defense.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: # 6.37.06.A

DDO Mission Area: #254 - Tactical Command & Control

Title: Identification Friend-or-Foe (IFF) Developments

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	4045	402	9496	4143	Continuing	Not Applicable
D243	IFF Developments	350	402	3595	4143	Continuing	Not Applicable
D297	IFF NATO	3695	0	5901	0	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The ability to detect and engage targets has advanced faster than the ability to positively identify them, with the likely result that either weapons will not be used at their maximum range, or high levels of fratricide will occur. This program is directed toward the development of techniques and equipment to identify aircraft and ground combat vehicles with high reliability. Programs include (1) improvement of current Mark XII air defense IFF interrogators and transponders, (2) development of noncooperative IFF signal processors for major Army air defense system (Hawk, Patriot) and combat surveillance systems (SOTAS, AN/APS-94, STARTLE), and (3) development of a new, cooperative IFF system in coordination with NATO, for both air defense and battlefield applications, called the NATO Identification System (NIS). The air defense portion of NIS is referred to as Mark (), while the ground combat portion is termed Battlefield IFF (BIFF). NIS hardware will be fabricated by US firms, but the hardware will be compatible with NATO systems. Dollars required for Advanced Development for MK () IFF NATO for FY83 are currently being identified.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Under IFF Developments (D243), complete test and evaluation of a noncooperative IFF signal processor for Hawk, and award a contract for a design study to apply the same technique to Patriot; begin development of noncooperative IFF techniques to identify ground combat vehicles. Start Tri-Service Mark XII Technical Improvement Program (TIIP). Under NATO IFF program (D297), complete system specification for the air defense applications and award a contract for advanced development; complete requirements study for battlefield applications, as well as system definition.

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Program Element: # 6.37 06.A
DoD Mission Area: #254 - Tactical Command & Control

Title: Identification Friend-or-Foe (IFF) Developments
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Test NCIFF (noncooperative IFF) for Hawk	FY81	FY81
Award Contract, Patriot		
NCIFF Design	FY82	-
Confirm NIS Draft STANAG	FY81	-
Award Contract, Mark ()		
Adv. Dev.	FY82	-
Award Contract, BIFF Adv. Dev.	FY83	FY81

Contract for construction of advanced development models of BIFF has been deferred to FY-83 to allow time for the Army to thoroughly analyze operational requirements for the system before proceeding with hardware.

D. (U) COMPARISON WITH FY 1981 RDT&E REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDT&E					
Funds (current requirements)	4045	402	9496	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	4045	5017	13140	Continuing	Not Applicable

Part of the FY81 funds were allocated to higher priority projects. Remaining FY81 funds were decreased to \$400,000 by Congressional action. Project D243 has decreased in FY82 to reflect that Patriot NCIFF effort will begin with a design study, rather than hardware. Project D268, Combat Reconnaissance Surveillance Target Acquisition Data Link (CRSTADL), has decreased from \$4705 to zero in FY82. Project D297 has increased from \$3734 to \$5901 in FY82 to cover initiation of advanced development for the Mark () portion of NIS.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

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Program Element: # 6.37.06.A
DOD Mission Area: #254 - Tactical Command & Control

Title: Identification Friend-or-Foe (IFF) Developments
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: Projections of future conflicts in Central Europe depict a Warsaw Pact assault involving numerically superior ground and air forces. It is forecast that battle lines will not be clearly drawn and that friendly and enemy ground combat vehicles and aircraft will be intermingled. The battle will be characterized by equipment (weapons and electronics) that is technologically advanced, resulting in devastating firepower delivered at extended ranges. In this scenario, existing methods of identification will be inadequate. The effectiveness of command and control links (if not jammed) will be severely reduced by the intermingling of friendly and enemy forces, while the existing MK XII air defense IFF system may suffer from electronic countermeasures. For ground targets, visual observation will not provide capabilities consistent with the ranges of modern target acquisition and weapon systems. For these and other reasons the Under Secretary of Defense Research and Engineering (USDRE) issued a memorandum on 19 January 1979 establishing a Joint Service IFF Program, with the primary objective being the timely definition and introduction of the NATO Identification System (NIS). Project D297, IFF NATO, is directed toward participating in this program to conduct the necessary design and hardware efforts to determine the most cost-effective design, and obtain agreement with our NATO allies. Project D243, IFF Developments, is directed toward developing special signal processing techniques for noncooperative (passive) identification, to enable positive identification of hostiles and friends with malfunctioning transponders. Additionally, the US has a significant investment in the current air defense identification system, the Mark XII. Project D243 includes the development of improvements to equipment within the system, so that its useful life can be extended to the time when the air defense portion of NIS is ready for implementation.

G. (U) RELATED ACTIVITIES: The efforts of this program are planned and accomplished in close coordination with the work under P.E. 6.37.25.F, Combat Identification Technology; PE 6.35.15.N, Advanced Identification Techniques; PE 6.32.67.N, NATO Identification System; and PE 6.47.25.F, Combat Identification Systems. The Air Force is the lead service in this Tri-Service effort. Programs are coordinated by the Air Force Systems Program Office (SPO) under the Tri-Service Charter. The Mission Elements Needs Statement (MENS) was approved in October 1980. A Trilateral Memorandum of Understanding to exchange technical information on the design and development of the NATO Identification System (NIS) was signed in May 1980 with the United Kingdom and the Federal Republic of Germany.

H. (U) WORK PERFORMED BY: Army IFF activities are managed by the Combat Surveillance and Target Acquisition Laboratory at Ft Monmouth, NJ. The MIT Lincoln Laboratory of Lexington, MA, is the system engineering contractor for NIS. The non-cooperative IFF work for Hawk is being performed by Scope Electronics of Reston, VA. Work on Mark XII improvements has been performed by Hazeltine Corporation of Greenlawn, NY, and Teledyne Electronics of Newbury Park, CA.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

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Program Element: # 6.37.06.A
DOD Mission Area: #254 - Tactical Command & Control

Title: Identification Friend-or-Foe (IFF) Developments
Budget Activity: #4 - Tactical Programs

1. (U) FY 1980 and Prior Accomplishments:

a. (U) Completed a draft Standardization Agreement (STANAG) for the NATO Identification System (NIS) in the NATO Working Group. Completed preliminary system definition at the M.I.T. Lincoln Laboratory and delivered a strawman US design to UK and FRG. Constructed experimental version of modulator and processor for the NIS waveform at Lincoln Laboratory.

b. (U) Successfully completed contract for design and computer simulation of a noncooperative IFF signal processor for Improved Hawk. Awarded contract for advanced development model.

c. (U) Completed Mark XII ECM vulnerability measurements on interrogators for AN/TPX-46 (Hawk, Patriot), AN/TPX-50 (Forward Area Alerting Radar), AN/PPX-3 (Stinger), and MSR-400/5 (US Roland). Completed design of circuit improvements for AN/TPX-50.

2. (U) FY 1981 Program:

a. (U) IFF NATO (D297): Continue system definition of NIS at M.I.T. Lincoln Laboratory. Complete initial phase of the Training and Doctrine Command (TRADOC) study to determine potential operational utility of battlefield portion of NIS (study utilizes computer simulation of combined arms engagement). Construct and test experimental versions of proposed IFF waveforms to test performance. Conduct multipath tests to assess signal environment. Initiate study to determine potential for utilizing existing IFF band for new system. Attend NATO Working Group and trilateral meetings to obtain agreement on major frequency and waveform parameters.

b. (U) IFF Developments (D243): Complete construction of a noncooperative IFF signal processor for Improved Hawk, and begin Force Development Test and Evaluation (FDTE).

3. (U) FY 1982 Planned Program:

a. (U) IFF NATO (D297) Continue system definition of NIS. Complete trade-off studies on optimum frequency band for Mark (). Award contract for advanced development models of air defense portion of NIS, Mark (), for Army-peculiar applications. Start Tri-Service Mark XII Technical Improvement Program (TIP). Complete study on effectiveness of Battlefield IFF and system specification. Continue participation in trilateral forum and NATO Working Group.

b. (U) IFF Developments (D243): Complete testing and evaluation of noncooperative IFF signal processor for

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Program Element: # 6.37.06.A
DDO Mission Area: #254 - Tactical Command & Control

Title: Identification Friend-or-Foe (IFF) Developments
Budget Activity: #4 - Tactical Programs

Improved Hawk. Begin design effort and computer simulation to apply technique to other Army air defense systems (Patriot, Roland, etc.). Develop improvements for Mark XII interrogators on Stinger and Roland, and initiate development of non-cooperative techniques for ground combat applications.

4. (U) FY 1983 Planned Program:

a. (U) IFF NATO (D297): Award contract for advanced development models of Battlefield IFF (BIFF) portion of NIS, for identification of tanks by other tanks, attack helicopters, etc. Continue contract for construction of advanced development models of air defense portion of NIS Mark (). Continue NATO and trilateral interfaces.

b. (U) IFF Developments (D243): Award contract for advanced development model of noncooperative IFF signal processor for Patriot. Continue design efforts for other Army applications (Roland, etc.). Continue development of Mark XII improvements for Army interrogators, and noncooperative techniques to identify ground combat vehicles.

5. (U) Program to Completion: This is a continuing program. Future efforts will include completion of development and test of the Mark () and BIFF systems and extension of noncooperative techniques to ground combat applications.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: D297

Title: Identification Friend or Foe NATO

Program Element: #6.37.06.A

Title: Identification Friend or Foe Developments

DOD Mission Area: #254 - Tactical Command and Control

Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: Projections of future conflicts in Central Europe depict a Warsaw Pact assault involving numerically superior ground and air forces. It is forecast that battle lines will not be clearly drawn and that friendly and enemy ground combat vehicles will be intermingled. The battle will be characterized by equipment (weapons and electronics) that is technologically advanced, resulting in devastating firepower delivered at extended ranges. In this scenario, existing methods of identification will be inadequate. The effectiveness of command and control links (if not jammed) will be severely reduced by the intermingling of friendly and enemy forces, while the existing Mark XII air defense IFF system may suffer from electronic countermeasures. For ground targets, visual observation will not provide capabilities commensurate with the ranges of modern target acquisition and weapon systems. For these reasons, and the lack of a NATO standardized IFF system, the Under Secretary of Defense for Research and Engineering issued a memo on 19 Jan 79 establishing a Joint Service IFF Program to develop the US Identification System (USIS), with the primary objective being the timely definition and introduction of the NATO Identification System (NIS). Project D297 is directed toward participating in this program to conduct the necessary design and hardware efforts to determine the most cost-effective design, and obtain agreement with our NATO allies.

B. (U) RELATED ACTIVITIES: The efforts of this program are planned and accomplished in close coordination with the work under PE 6.37.25.F, Combat Identification Technology; PE 6.35.15.N, Advanced Identification Techniques; PE 6.32.67.N, NATO Identification System, and PE 6.47.25.F, Combat Identification Systems. The Air Force is the lead service, in the Tri-Service effort. Programs are coordinated by the Air Force Systems Program Office (SPO) under the Tri-Service Charter dated 26 September 1980. The Mission Elements Need Statement (MENS) was signed in October 1980. A trilateral memorandum of understanding to exchange technical information on the design and development of the NATO Identification System (NIS) was signed in May 1980 with the United Kingdom and the Federal Republic of Germany.

C. (U) WORK PERFORMED BY: Army NATO IFF activities are managed by the Combat Surveillance and Target Acquisition Laboratory at Fort Monmouth, NJ. The Massachusetts Institute of Technology (MIT) Lincoln Laboratory of Lexington, MA, is the system engineering contractor for NIS.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Completed a draft Standardization Agreement (STANAG) for the NATO Identification System in the NATO Working Group. Completed preliminary system definition at the MIT Lincoln Laboratory and

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Project: #D297 Title: Identification Friend or Foe NATO
 Program Element: #6.37.06.A Title: Identification Friend or Foe Developments
 DOD Mission Area: #54 - Tactical Command and Control Budget Activity: #4 - Tactical Programs

delivered a Strawnman US Design to UK and FRG. Constructed experimental version of modulator and processor for the NIS waveform at Lincoln Laboratory.

2. (U) FY 1981 Program: Continue system definition of NIS at MIT Lincoln Laboratory. Complete initial phase of TRADOC study to determine potential operational utility of battlefield portion of NIS (study utilizes computer simulation of combined arms engagement). Construct and test experimental versions of proposed NIS waveforms to test performance. Conduct multipath tests to assess signal environment. Initiate study to determine potential for utilizing existing IFF band for new system. Attend NATO Working Group and trilateral meetings to obtain agreement on major frequency and waveform parameters.

3. (U) FY 1982 Planned Program: Continue system definition NIS. Complete trade-off studies on optimum frequency band for Mark (). Award contract for advanced development models of air defense portion of NIS, Mark (), for Army-peculiar applications. Complete study on effectiveness of Battlefield IFF, and system specification. Continue participation in trilateral forum and NATO Working Group.

4. (U) FY 1983 Planned Program: Award contract for advanced development models of Battlefield IFF (BIFF) portion of NIS, for identification of tanks by other tanks, attack helicopters, etc. Continue contract for construction of advanced development models of air defense portion of NIS, Mark (). Continue NATO and trilateral interfaces.

5. (U) Program to Completion: This is a continuing program. Future efforts will include completion of development and test of the Mark () and BIFF systems and extension of noncooperative techniques to ground combat applications.

6. (U) Major Milestones: NATO IFF program for FY82 includes complete system specification for the air defense applications and award a contract for advanced development; complete requirements study for battlefield, as well as system definition.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1990 Submission
Confirm NIS Draft STANAG	FY81	-
Award Contract, Mark () Adv. Dev.	FY82	-
Award Contract, BIFF Adv. Dev.	FY83	FY81

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Project: #D297 Title: Identification Friend or Foe NATO
 Program Element: #6.37.06.A Title: Identification Friend or Foe Developments
 DOD Mission Area: #254 - Tactical Command and Control Budget Activity: #4 - Tactical Programs

Contract for construction of advanced development models of BIFF has been deferred to FY83 to allow time for the Army to thoroughly analyze operational requirements for the system before proceeding with hardware.

7. (U) Resources (\$ in thousands):

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	3695	0	6020	0	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	3700	4611	3734	-	Continuing	Not Applicable
Quantities (current requirements)	Not Applicable					
Quantities (as shown in FY 1980 submission)	Not Applicable					

Decrease in funding in FY81 is due to allocation of funds to higher priority projects during the programing and budgeting cycle, and to Congressional cuts. Funding was increased in FY82 to fund the Army share of advanced development of the Tri-Service NATO Identification System, Mark (). FY83 funding for MK() is currently being determined.

Other Appropriations: Not Applicable

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.07.A

DOD Mission Area: #256 - Tactical Communications

Title: Communications Development

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	2315	4075	6451	8870	Continuing	Not Applicable
D246	Tactical Communications Development	1495	2151	4075	4954	Continuing	Not Applicable
D437	Tactical Rapid Communications	820	1924	2376	3911	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT: This program exploits the most advanced technology of fiber optics, millimeter and microwave transmission characteristics, and microprocessor control of antenna systems, high-frequency radio systems, and signal hiding systems. The program applies the technology to develop working feasibility models for advanced communications systems. Present Army tactical communications systems suffer from a lack of mobility, vulnerability to electronic countermeasures, radio frequency signal congestion, and a lack of signal hiding capability. The objective of this program is to apply the results of exploratory development to overcome existing deficiencies. Specific areas of exploitation include millimeter wave transmission, fiber optics cable systems, antenna systems, and high-frequency communication systems.

C. (U) BASIS FOR FY 1982 REQUEST: Complete the fiber optic (FO) missile payout system and millimeter wave (MMW) multichannel command post radios (MCPR) contracts and conduct testing in coordination with the users. Start new contracts for an intrusion-resistant FO cable system, an extended range FO missile payout system, an improved tactical area FO distribution system, mobile intercept-resistant radios (MISR) and HF radio communications program (a new task). Project D437 funds are requested to start the Electromagnetic Compatibility/Vulnerability (EMC/EMV) analysis for Phase III of the Single-Channel Ground and Airborne Radio System (SINGARS). In addition, technical efforts on bit error detection and correction techniques for quasi-analog and digital single-channel radio systems will be continued. The Survivable Low-Profile Antenna (SLPA) for combat tracked vehicles, advanced development models, will be delivered and tested at the Armor Center.

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Program Element: #6.37.07.A
DOD Mission Area: #256 - Tactical Communications

Title: Communications Development
Budget Activity: #4 - Tactical Program

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	2315	4075	6451	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	2990	4349	9073	Continuing	Not Applicable

The funding difference in FY80 is due to higher priority Army requirements. The decrease in FY82 was the result of general Congressional reductions.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

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Program Element: #6.37.07.A

Title: Communications Development

DOD Mission Area: #256 - Tactical Communications

Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: In millimeter wave transmission, new techniques of microwave millimeter wave power amplification will be applied to line-of-sight and troposcatter radio systems in an effort to provide a signal hiding capability. In fiber optics, the technology will be applied to develop a less costly, more flexible, and jamming-resistant cable system, and to incorporate the technology into existing Army tactical communications systems. In antenna systems, new microprocessor techniques will be applied to achieving desired radiation patterns by controlling antenna radiating elements. In addition, current antenna deficiencies such as high physical profile, low physical survivability and compromised electrical efficiency will be evaluated. By applying new technology, these deficiencies may be overcome. In high-frequency systems, technology will be applied to developing systems for strategic communications and vulnerable satellite systems.

G. (U) RELATED ACTIVITIES: Program Element 6.11.02.A (Research); Program Element 6.27.01.A (Communications Engineering Development); Program Element 2.80.10.A (Tri-Service Tactical Communications Program). Related research and studies performed by the Air Force and Navy. Coordination is accomplished by Department of the Army reviews, through exchange of technical reports and attendance at scientific meetings and conferences.

H. (U) WORK PERFORMED BY: Norden Systems, Norwalk, CT; Hughes Aircraft Co., Tucson, AZ, and five additional contracts whose total FY 1982 cost is \$2,570,000. Contract monitoring and in-house development are the responsibility of the US Army Communications Research and Development Command, Fort Monmouth, NJ.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishment: Started and completed contractual development of a local Distribution Fiber Optic (FO) Cable Communications System for the interconnect/interface and message-processing shelters of the AN/TYC-39 message switch; the program was transitioned for incorporation into the AN/TYC-39 production contract. Started contracts for an FO missile payout system and FO distribution system and Millimeter Wave (MMW) multichannel command post radios. Continued engineering support and evaluation for the family of quick-erect antenna masts. Awarded contract for the Survivable Low-Profile Antenna (SLPA).

2. (U) FY 1981 Program: Complete the area FO distribution system contract and conduct revaluation tests. Continued contracts for the FO missile payout system and MMW multichannel radio (MCPR). Process procurement actions (D&F) for an intrusion-resistant FO cable system, an extended range FO missile payment system, and an improved Army Tactical Communications Systems (ATACS) area distribution system. Continue Advanced Development (AD) efforts on SLPA. Award AD contracts for high-power amplifier and broadband vehicular antenna.

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Program Element: #6.37.07.A

Title: Communications Development

DOD Mission Area: #256 - Tactical Communications

Budget Activity: #4 - Tactical Programs

3. (U) FY 1982 Planned Program: Complete the FO missile payout system and conduct Development and Operational (DT/OT-1) tests with NITCOM and TRADOC. This system provides communications for an antiarmor weapons system capable of defillade-to-defillade operation. Start contracts for an intrusion-resistant FO cable system which will not require use of COMSEC components, an extended range FO missile payout system and the improved ATACS area FO distribution system. Complete advanced development of the MMW, using results of the program to start engineering development in FY 1982; start specifications for a two-year contract to develop mobile intercept-resistant radios (MISR) for tracked vehicles and for handheld use; start HF Communications system technology. Project D437 will continue technical support on the High-Power Amplifier, Survivable Low-Profile Antenna and Broadband Vehicular Antenna. Complete Advanced Development (AD) efforts on the Quick Erect Antenna masts (QEAM) and transition to Engineering Development into Project Element (PE) 6.47.01.A, Engineering Development for Single-Channel Ground and Airborne Radio System (SINCGARS), Project D488.

4. (U) FY 1983 Planned Program: Complete contract and conduct tests for the Improved Army Tactical Communications System (ATACS) area Fiber Optic (FO) distribution system; Continue contracts for an intrusion resistant FO cable system, extended range FO missile payout system, MMW mobile intercept-resistant radios and HF Communications. Start contract for a multiple access FO data buss system. Continue development of efforts to support single-channel tactical communications.

5. (U) Program to Completion: This is a continuing program. Funding for HF Communications will start in FY 1982 and in FY 1983 for Antenna Development.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.11.A Title: Aircraft Electronic Warfare (EW) Self-Protection Equipment
DOD Mission Area: #257 - Electronic Warfare/Counter-C3I Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	6975	7315	12428	20103	Continuing	Not Applicable
DB52	Scout/Attack Helicopter Survivability Equipment	2655	5244	7723	11298	Continuing	Not Applicable
D653	Special Electronic Mission Aircraft (SEMA) Survivability Equipment	4320	2071	4705	8805	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides the advanced development efforts which are required to provide the US and allied aircraft with protection against enemy infrared, optical, laser and/or radar-directed threats. The program is the continuation of efforts to achieve the survivability required to accomplish the Army attack, assault, and special electronic mission aircraft (SEMA) mission requirements. The program is structured to preclude Service duplication and reflects the Army's responsibility for the implementation of a Tri-Service Memorandum of Agreement reached in 1977. This program responds to the Required Operational Capability (ROC) for Aircraft Survivability Equipment (ASE). ASE is needed for both currently fielded and future Army aircraft in order to survive to accomplish combat missions and reduce combat attrition to acceptable levels.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: FY82 funds are required for advanced developments which address the current and future threat to Army aviation as represented by the SA-13, SA-8, SA-6, SA-4, and future variants and by newly enhanced capabilities of the ZSU-23-4, SA-7, and SA-9. The three most serious threats are in air defense fire control systems employing (1) TV and optical systems which enhance low-altitude kill capability, (2) radars operating at millimeter wave frequencies, and (3) radars employing monopulse and pulse doppler signal processing. The FY82 program provides the following major hardware threats: (1) the continued development of the AN/ALQ-169 optical warning location/detection (OWL/D) system, (2) millimeter wave countermeasures, (3) tri-Service program of monopulse countermeasures development and testing, and (4) a vulnerability reduction program to provide ballistic hardening/fire protection for tactical helicopters.

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Program Element: #6.37.11.A Title: Aircraft Electronic Warfare (EW) Self-Protection Equipment
DOD Mission Area: #257 - Electronic Warfare/Counter-C3I Budget Activity: #4 - Tactical Programs

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	6975	7315	12428	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	6975	7324	13938	Continuing	Not Applicable

Differences between current requirements and the FY 1982 submission reflect the results of more definitive information on the funds required for several of the tasks.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands): Not Applicable.

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Program Element: #6.37.11.A Title: Aircraft Electronic Warfare (EW) Self-Protection Equipment
DOD Mission Area: #251 - Electronic Warfare/Counter-C3I Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: This program combines two advanced development (AD) projects managed by the Army Project Manager for Aircraft Survivability Equipment (PM-ASE): PE #6.37.11.A/DB52, Scout/Attack Helicopter Survivability Equipment, and PE #6.37.11.A/D653, Special Electronic Mission Aircraft (SEMA) Survivability Equipment. Both projects were initiated after the Soviets introduced the SA-7 shoulder-fired, surface-to-air missile (SAM) in the Mideast. The objectives of DB52 are systems engineering, signature reduction, infrared (IR) suppression, effectiveness measurements and evaluations, and ballistic hardening and/or vulnerability reduction. The objectives of Project D653, Special Electronic Mission Aircraft Survivability Equipment, are the development of warning devices and active infrared (IR), optical and radar countermeasures. In 1972, the SA-7 was used against Army helicopters in Vietnam. Army helicopters were quickly equipped with IR suppressors and low-reflectance paint. The success of the suppressors provided credible evidence of the tactical ability of helicopters to operate against surface-to-air missiles. This success coupled with demonstrations of the ability to jam IR threat missiles and the development of a successful radar warning receiver formed the nucleus of the ASE program. In 1973 a Joint US Army Training and Doctrine Command/US Army Materiel Development and Readiness Command (TRADOC/DARCOM) Working Group was formed to determine requirements for ASE and address current and future threats to Army aviation. An extensive analysis of the survivability of Army aircraft in a number of combat scenarios with and without ASE was performed. The analysis provided survivability benefits as a function of cost, penalty, and development risk which led to the development of specific requirements for ASE to address the IR, radar, and optical threats. This analysis by the TRADOC/DARCOM Joint Working Group defined the tasks within this program. Periodic updates maintain a viable program to address the changing threat.

G. (U) RELATED ACTIVITIES: This program is conducted in conjunction with PE 6.47.11.A, Aircraft Electronic Warfare (EW) Self-Protection System, also managed by the Project Manager for Aircraft Survivability Equipment (PM-ASE), and PE 6.32.15.A, Joint Survivability Investigations, of which PM-ASE is the Senior Army Representative. In 1977, the Services signed a Memorandum of Agreement outlining the responsibilities for tri-Service development and production of the aircraft EW self-protection (AEWSP) systems for helicopters and selected fixed-wing aircraft. The Army is responsible for radar and laser warning receivers for most helicopters and selected fixed-wing aircraft, radar jammers for attack and other selected helicopters/fixed-wing aircraft, infrared (IR) jammers for small helicopters and designated low/slow fixed-wing aircraft, and pulse doppler missile warning detectors for helicopters and selected fixed-wing aircraft. The Navy is responsible for IR jammers for large helicopters, continuous wave (CW) radar jammers for selected Navy aircraft and Army special electronic mission aircraft (SEMA), and ultraviolet (UV) missile warning detectors for selected helicopters and fixed-wing aircraft. The Air Force is responsible for IR missile warning detectors for fixed-wing aircraft and selected helicopters. International coordination is achieved through North Atlantic Treaty Organization (NATO) NATO Army Armaments Group (NAAG), and Quadripartite Working Groups.

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Program Element: #6.37.11.A

DOD Mission Area: #257 - Electronic Warfare/Counter-C3I

Title: Aircraft Electronic Warfare (EW) Self Protection Equipment

Budget Activity: #4 - Tactical Programs

H. (U) WORK PERFORMED BY: US Army Aviation Research and Development Command (AVRADCOM), St. Louis, MO; US Army Electronics Research and Development Command (ERADCOM), Electronic Warfare Laboratory (EWL), Ft Monmouth, NJ; US Army Armament Research and Development Command (ARRADCOM), Dover, NJ. Contractors: Sanders Associates, Inc., Nashua, NH; ITT Corporation, Hatley, NJ; TRACOR, Inc., Austin, TX; Hughes Helicopter, Culver City, CA; Calspan Corporation, Buffalo, NY; Perkin Elmer, Norwalk, CT; Applied Technology, Inc., Mountain View, CA; Tasker Systems, Chatsworth, CA; Martin Marietta, Orlando, FL; Hughes Aircraft, Culver City, CA; Honeywell Inc., Lexington, MN; Bell Helicopter, Hurst, TX.

1. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: In 1976, improved versions of the infrared (IR) suppressors, used to defeat the SA-7 missile in the Republic of Vietnam, were fielded to frontline US tactical aircraft in Germany, Korea, and the United States. Advanced Development (AD) was completed, and engineering development (ED) was initiated for IR suppressors for growth threats on the following aircraft: OH-58 (FY 1975), OV-10HAWK (FY 1975), AH-1 COBRA (FY 1977), and RU-21 GUARDRAIL (FY 1977). Infrared jammers applicable to attack, observation, and utility helicopters, including AH-64 and UH-60 BLACKHAWK, completed AD in FY 1976. A pulse doppler missile detector, AN/ALQ-136 for AH-1 COBRA A/C, completed advanced development (AD) in FY 1977. An advanced radar warning receiver, APR-39(V)2 for special electronic mission aircraft (SEMA), completed AD in FY 1976 as did a dual-purpose chaff and flare dispenser and tactical aircraft radar jammer. An optically designed flat plate canopy, which reduced sun glint, entered engineering development (ED) in 1975 for the AH-1 and OH-58 aircraft. An improved light shade of infrared (IR) paint modeled after an Air Force Development began ED in 1977 for SEMA. AD of the optical warning location/detection (OWL/D) system started in 1976 and continued thru FY79. AD was completed in FY 1978 for a laser warning receiver for attack and scout aircraft and a continuous wave radar jammer for SEMA aircraft. Developments of countermeasures against millimeter wave radars were initiated with the development of a millimeter wave capability for the APR-39 radar warning receiver (RWR). A feasibility study of USN/USAF advanced self-protection radar jammer (ASPJ) was initiated to assess suitability/adaptability for Army use. Self-Protection Radar Jammer (ASPJ) Study was initiated to assess suitability/adaptability for Army use. Army participation in a Tri-Service development and test program was initiated to define technology and hardware modifications to upgrade Aircraft Survivability Equipment with monopulse capabilities. First-phase advanced development flight testing of the AN/ALQ-169 Optical Warning Location/Detection System, and flight testing of the Tri-Service AN-ARR-46 ultraviolet missile detector were completed. Infrared signature measurements of AH-1S and UH-60A were completed. Advanced development of AH-1S fire-retardant system for in-flight fuel fires was continued. Development efforts were initiated for millimeter-wave frequency extension of the AN/ALQ-136 radar jammer.

2. (U) FY 1981 Program: The advanced Self-Protection Radar Jammer (ASPJ) feasibility study will be completed.

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Program Element: #6.37.11.A Title: Aircraft Electronic Warfare (EW) Self-Protection Equipment
DOD Mission Area: #257 - Electronic Warfare/Counter-C3I Budget Activity: #4 - Tactical Programs

Participation in the Tri-Service monopulse countermeasure efforts will continue, and the millimeter-wave radar warning receiver effort will be completed. Development will continue for the AN/ALQ-169 Optical Warning Location/Detection System; the AN/ALQ-136 millimeter-wave frequency extension, and the AH-1S fuel fire-retardant system. Advanced development will be initiated for millimeter-wave chaff cartridges and for low Radar Cross Section (RCS) rotor hub cover for the AH-1S.

3. (U) FY 1982 Planned Program: Advanced development efforts will be initiated for Directed-Energy countermeasures; advanced infrared jammer techniques to counter third-generation infrared missile systems, advanced passive radio frequency (RF) countermeasures; advanced radar warning receiver capabilities to address near-term threats; Optical (High Energy Laser) coatings and optical decoys; and to increase the Ground Emitter Trainer for Aviators (Greta) capability. Development will continue for the AN/ALQ-169 and AH-1S fuel fire-retardant system. Advanced development will be completed for monopulse countermeasures, AN/ALQ-136 millimeter-wave frequency extension, and the low Radar Cross Section rotor hub cover.

4. (U) FY 1983 Planned Program: Advanced development will be initiated for improved missile detector performance; advanced threat trainer demonstrations; advanced threat optical warning/optical jammer; and active optical countermeasures against antitank guided missiles. Development efforts will continue for Direct-Energy countermeasures, advanced infrared jammer, advanced passive radio frequency (RF) countermeasures, optical coatings/optical decoys, and capability extension of Ground Emitter Trainer for Aviators (Greta). The AN/ALQ-169 and the AH-1S fuel fire-retardant system advanced development efforts will be completed.

5. (U) Program to Completion: This is a continuing program. The aircraft survivability equipment and electronic warfare self-protection countermeasures advanced development programs respond to stated user requirements and threat documentation. The requirements and threats are reviewed on a continuing basis by the Aircraft Survivability Equipment (ASE) Permanent Steering Group (PSG) with broad representation from the US Army Training and Doctrine Command (TRADOC) and US Army Materiel Development and Readiness Command (DARCOM). Interservice review is accomplished in accordance with the Tri-Service Memorandum of Agreement by the Joint Technical Coordinating Group on Aircraft Survivability (JTCCG/AS).

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #DB52

Program Element: #6.37.11.A

DOD Mission Area: #257 - Electronic Warfare/Counter C³I

Title: Scout Attack Helicopter Survivability Equipment

Title: Aircraft Electronic Warfare (EW) Self-Protection Equipment

Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: The objective of this project is the advanced development and concept feasibility demonstration of aircraft survivability equipment required for the survival of scout and attack helicopters in a hostile air defense environment composed of infrared, radar, and optically directed weapon systems. The approach includes an analytical determination of equipment and specifications for development using US Army Training and Doctrine Command (TRADOC) battlefield scenarios, approved threats, and US Army Materiel Development and Readiness Command (DARCOM) equipment. The equipment selected for development is that with the potential to significantly enhance the staying power and combat effectiveness of the aircraft. The task includes signature suppression, threat warning and jamming equipment, as well as the ballistic hardening of aircraft components. Also covered are the development of measuring and evaluation techniques and equipment and necessary program management to support the Aircraft Survivability Equipment (ASE) program. Alternatives are determined by the DARCOM/TRADOC Permanent Steering Group requirements analysis. Foreign state-of-the-art and enemy threat intelligence is considered throughout the project.

B. (U) RELATED ACTIVITIES: Related Aircraft Electronic Warfare Self-Protection (AEWSP) developments are conducted by the Air Force and Navy for their specific needs. To preclude duplication of effort, these developments are coordinated through reviews conducted by the Office of the Under Secretary of Defense for Research and Engineering (USDRE), subgroups and working panels of the Technical Cooperation Program, the Joint Tri-Service Electronic Warfare Panel, and the Joint Technical Coordinating Group on Aircraft Survivability (JTCSG/AS). Formal requirements documents submitted by each Service are also reviewed by the other Services. Tasks in this project are coordinated with those in Project D653, Special Electronic Mission Aircraft (SEMA) Equipment, also in Program Element #6.37.11.A, to preclude internal duplication of effort. Tasks which successfully complete advanced development (AD) in this project progress to engineering development (ED) in Program Element #6.47.11.A, Aircraft Electronic Warfare (EW) Self-Protection Systems.

C. (U) WORK PERFORMED BY: US Army Aviation Research and Development Command (AVRADCOM), St. Louis, MO; US Army Electronics Research and Development Command (ERADCOM), Electronic Warfare Laboratory, Ft. Monmouth, NJ; US Army Armament Research and Development Command (ARRADCOM), Dover, NJ. Contractors: Sanders Associates, Inc., Nashua, NH; ITT Corporation, Nutley, NJ; TRACOR, Inc., Austin, TX; Calspan Corporation, Buffalo, NY; Loral, Inc., Yonkers, NJ; American Electronics Laboratory, Lansdale, PA; Bell Helicopter International, Ft. Worth, TX; Garrett Air Research, Los Angeles, CA; Perlin-Elmer, Norwalk, CT; Honeywell Inc., Lexington, MN; Science Applications, Inc., Huntsville, AL; General Dynamics Corp., Pomona Division, Pomona, CA.

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Project: #0852 Title: Scout Attack Helicopter Survivability Equipment
Program Element: #6.37.11.A Title: Aircraft Electronic Warfare (EW) Self-Protection Equipment
DOD Mission Area: #257 - Electronic Warfare/Counter C I Budget Activity: #6 - Tactical Programs

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: In 1976, improved versions of the infrared (IR) suppressors, used to defeat the effectiveness of the SA-7 missile in the Republic of Vietnam, were fielded to frontline US tactical aircraft in Germany, Korea, and the United States. Advanced development (AD) was completed, and engineering development (ED) was initiated for IR suppressors for growth threats on the following aircraft: OH-58 (FY 1975), OV-1 MOHAWK (FY 1975), AH-1 COBRA (FY 1977), RU-21 GUARDRAIL (FY 1977). Infrared jammers applicable to attack, observation, and utility helicopters, including the AH-64 advanced attack helicopter and the UH-60 Blackhawk helicopter, completed AD in FY 1976. An optically designed flat-plate canopy, which reduced sun glint, entered engineering development (ED) in 1975 for the AH-1 and OH-58 aircraft. An improved light shade of IR paint modeled after an Air Force development began ED in 1977 for Special Electronic Mission Aircraft (SEMA). First-phase advanced development flight testing of the AN/ALQ-169 Optical Warning Location/Detection System was completed, and the system requirements for second phase were defined. Flight testing of the Tri-Service AN/AAR-46 ultra-violet missile detector was completed with the Army conducting missile firings at Sandia Base, NM. Advanced development of AH-1S fire-retardant system for in-flight fuel fires was continued. Advanced threat demonstration efforts were initiated for millimeter-wave frequency extension of the AN/ALQ-136 radar jammer. Infrared signature measurements of AH-1S and UH-60A were completed.

2. (U) FY 1981 Program: The second phase of advanced development for the AN/ALQ-169 will be initiated with emphasis on aircraft integration and cost/complexity reduction. Development efforts will continue for the AN/ALQ-136 Millimeter-Wave frequency extension and for the AH-1S fuel fire-retardant system. Advanced development will be initiated for Millimeter-Wave chaff cartridges for M130 chaff/flare dispenser system. Advanced development of a low Radar Cross-Section rotor hub cover for the AH-1S will be initiated based upon exploratory development efforts.

3. (U) FY 1982 Planned Program: The AN/ALQ-136 Millimeter-Wave frequency and the low Radar Cross Section rotor hub cover advanced development efforts will be completed. Advanced development for the AN/ALQ-169 and AH-1S fuel fire retardant system will continue. Advanced threat demonstration efforts will be initiated for optical (High Energy Lasers) coatings and optical decoys. Development effort will be initiated to increase the Ground Emitter Trainer for Aviators (GRETA) capability to include features of the AN/AVR-2 Laser Warning Receiver.

4. (U) FY 1983 Planned Program: The AN/ALQ-169 and the AH-1S fuel fire-retardant system advanced development efforts

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Project: #DB52 Title: Scout Attack Helicopter Survivability Equipment
 Program Element: #6.37.11.A Title: Aircraft Electronic Warfare (EW) Self-Protection Equipment
 DOD Mission Area: #257 - Electronic Warfare/Counter C I Budget Activity: #4 - Tactical Programs

will be completed. Advanced development will continue for optical coatings, optical decoys, and capability extension of Ground Emitter Trainer for Aviators (Greta) for AN/AVR-2. Advanced threat demonstration efforts will be initiated for optical warning/optical jammer, and for active optical countermeasures against antitank guided missiles.

5. (U) Program to Completion: This is a continuing program. The survivability equipment and electronic warfare self-protection countermeasure advanced development programs respond to stated user requirements and threat documentation. The requirements and threats are reviewed on a continuing basis by the Aircraft Survivability Equipment (ASE) Permanent Steering Group (PSG) with broad representation from the US Army Training and Doctrine Command (TRADOC) and US Army Materiel Development and Readiness Command (DARCOM). Interservice review is accomplished in accordance with the tri-Service Memorandum of Agreement by the Joint Technical Coordinating Group on Aircraft Survivability (JTCG/AS).

6. (U) Major Milestones: Not Applicable.

7. (U) Resources (\$ in thousands):

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	2655	5244	7723	11,298	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	2665	5209	7445	-	Continuing	Not Applicable

Aircraft Procurement Army: Not Applicable

Differences in FY91 and FY82 reflect adjustments for inflation and minor subtask realignments.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.11-A

Title: Joint Tactical Information Distribution Systems (JTIDS)

DOD Mission Area: #256 - Tactical Communications

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	4388	20477	19087	41333	36153	121438
D370	Army Data Distribution System (ADDS)	0	17557	19087	41333	36153	115130
D137	JTIDS	4388	2920	0	0	0	7308

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The emerging battlefield automated systems of the mid- to late-1980's will require near-realtime, jam-resistant data communications. These communications are needed to support command and control, air defense, field artillery, intelligence and logistics systems. The effectiveness of current systems is limited by restricted data throughput, voice/data contention problems on FM radio nets, a lack of adequate automatic relay, and poor mobility. This effort will take advantage of two systems presently under development. PE 6.47.27.A, Command and Control, Project DC98, Position Location Reporting System (PLRS), is completing engineering development in FY 1981 and the Joint Tactical Information Distribution System (JTIDS), in PE 6.47.02.A, Joint Tactical Information Distribution Systems, is a joint Army/Air Force development entering engineering development in FY 1981. By taking advantage of the advanced state of these two projects, it will be possible to produce a system for the Army in the late 1980's which will satisfy the data distribution need. Without this program the Army's automated systems will have limited effectiveness in a full electronic warfare environment on the highly mobile battlefield of the future.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: In FY 1980 the concept of combining PLRS and JTIDS was studied, and a system definition was developed. During FY 1981 PLRS and JTIDS hardware will be integrated and the capability to pass data between the two systems will be proven. In FY 1982 interfaces with existing operational systems will be started. The capability of ADDS to support these systems will be tested in the testbed at the Hughes Aircraft Corporation, Fullerton, California, during FY 1982 and FY 1983. The total development costs are based on an independent government cost estimate done by the program manager's office. This estimate was validated by the cost analysis office of the Communications Research and Development Command. Cost estimate is supported by experience with both the PLRS and JTIDS programs.

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Program Element: #6.37.13.A

Title: Joint Tactical Information Distribution Systems

DOD Mission Area: #256 - Tactical Communications

Budget Activity: #4 - Tactical Programs

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	4388	20477	19087	77486	121448
Funds (as shown in FY 1981 submission)	0	21991	15682	16769	62530

D170 - Decrease in FY 1981 is attributable to the application of general Congressional reductions. Most of the FY 1982 and beyond increase was caused by two factors. First, completion of the design concept studies allowed for a government independent cost estimate based on a well-defined program. Second, the testbed JTIDS terminals were initially planned for OPA. However, because of the status of the JTIDS program their purchase has been moved to RDTE. Other increases for inflation are included in FY 1982 and beyond. D137 was restructured to this Program Element for FY 1982.

E. (U) OTHER APPROPRIATION FUNDS: Not applicable.

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Program Element: #6.37.13.A

Title: Joint Tactical Information Distribution System

DOD Mission Area: 256 - Tactical Communications

Budget Activity: 4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The Army Data Distribution System (ADDS) is an integration of the Position Location and Reporting System (PLRS), which is completing engineering development, and the Joint Tactical Information Distribution System (JTIDS), which has the tactical class 2 terminal ready for engineering development. This program was initiated by the Army in recognition of the potential of merging both systems to meet an early fielding of a critical Army operational need to improve data distribution and position location reporting in support of Army automated battlefield systems and operations. The ADDS system will satisfy requirements for realtime data distribution, position location, and identification. The heart of the system is the Net Control Unit/Master Unit (NCU/NCM) which performs the net management and control functions of the system. There will be five of these units in a typical division area. Enhanced PLRS user units (EPUU) will be furnished users that have limited data requirements such as Stinger and the Multiple Launch Rocket System. Combination (EPUU/JTIDS) terminals will be furnished those few users, such as Tacfire that need to send information to EPUU or JTIDS users. There will be JTIDS terminals for high data requirements such as those of Tacfire, Hawk Air Defense System, and Patriot Missile System. Without this data communications improvement, highly sophisticated and highly effective weapons systems will not operate to full potential, and the Air Defense community will not have a responsive means of providing early warning, cueing, aircraft identification, and weapons command/control information on a realtime basis to short-range Air Defense systems. The project was included under Program Element #6.37.07.A, Communications Development, on the FY 1981 RDT&E CDS.

G. (U) RELATED ACTIVITIES: PE 6.37.07.A, Communications Development, Project D137, Joint Tactical Information Distribution System (JTIDS), accomplished the Phase I concept definition and evaluation for this program. This program element will also be supported by PE 6.47.02.A Joint Tactical Information Distribution Systems, during the remaining phases of the program.

H. (U) WORK PERFORMED BY: In-house developing agencies are the United States (US) Army Communications Research and Development Command (CORADCOM), the US Army Electronics Research and Development Command (ERADCOM). Contractual efforts are provided by MITRE Corporation, Bedford, MA; Hughes Aircraft Company, Fullerton, CA; Litton Data Systems, Van Nuys, CA.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS: Efforts for this program began in FY 1980 under PE 6.37.07.A, Communications Development. A Letter of Agreement (LOA) for the Position Location Reporting System/Joint Tactical Information Distribution System Hybrid (ADDS) was approved by the Combat and Materiel Developers and on 6 July 1979 by the Department of the Army. The Army was authorized to proceed with the ADDS development by the Office of the Secretary of Defense on 8 August 1979. This program will be carried out in a series of evolutionary developments and four test phases using a building block approach. Integral to each phase is a test period to verify the design/development activities of the

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Program Element: #6.37.13.A

DOD Mission Area: #256 - Tactical Communications

Title: Joint Tactical Information Distribution Systems

Budget Activity: #4 - Tactical Programs

program. The establishment of a hybrid testbed will be initiated in FY 1981 integrating the engineering development models of Position Location Reporting System (PLRS) and JTIDS Class I equipment. Continuation of testbed activities in 1982 will carry over in FY 1983 when interface testing of potential user weapons systems will take place. Upgrading PLRS and JTIDS terminals will take place in FY 1984 to provide increased communication capability and current software/firmware. System test and evaluation is scheduled from FY 1984 through FY 1986 by exercising the system within a representative slice of a combat division.

1. (U) FY 1980 and Prior Accomplishments: During FY80 the Hughes Aircraft Company (HAC), Fullerton, California, completed the Definition and Evaluation (Phase 1) of the ADDS System. HAC developed the design concept for ADDS and analyzed division level data need lines to determine if the concept would satisfy the Army's data requirements. Results of the HAC effort supports entering Phase 2 of the ADDS development.

2. (U) FY 1981 Program: Phase 2 was initiated in July 1980. This phase will verify the interoperability of PLRS and JTIDS by exchanging data between the two systems. To do this the testbed being implemented at HAC includes five PLRS user units, a PLRS master unit, five JTIDS terminals (2 Hughes Class 1 "Alternate Waveform" terminals, 2 Singer-Kearfott Class 2 Advanced Development Model terminals, and one IBM Adaptable Surface Interface Terminal (ASIT) containing a Hughes Improved Terminal), and appropriate interfaces to allow a suitable representation of the ADDS system to be achieved. To illustrate battlefield operations, scenarios approved by the various Army schools will be exercised.

3. (U) FY 1982 Planned Program: Depending on the success of Phase 2, Phase 3 in FY82 will establish an interface capability with selected battlefield systems, complete the development of the enhanced Position Location Reporting System (PLRS) user unit, and provide an initial net management software capability for the Net Control Unit. Army devices with which the expanded testbed will interface include the Digital Message Device, Interactive Display Terminal (or Digital Communications Terminal - DCT), AN/TSQ-73 Radar, Battalion Fire Direction Center, Hawk missile fire unit and Firefinder Radar. Realistic scenarios will be exercised using all elements (hardware, software, and operations) of the Army Data Distribution System (ADDS).

4. (U) FY 1983 Planned Program: Completion of the exercise portions of Phase 3. Begin Phase 4 which will provide a complete prototype system to be tested at Hughes and sent to Fort Bliss, Texas, in FY84 for use with the Short-Range Air Defense Command and Control testbed. Complete technical testing and demonstrations will be conducted, including examination of continuity of operations.

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Program Element: #6.37.13.A

Title: Joint Tactical Information Distribution System

DOD Mission Area: #256 - Tactical Communications

Budget Activity: #4 - Tactical Programs

5. (U) Program to Completion: The ability to support air defense and its command and control requirements will be demonstrated in the field at Fort Bliss. In Phase 5 an essentially deliverable ADDS system to support one-half an Army division will be available for extensive operational testing at Fort Hood, Texas, with the 1st Cavalry Division. The development/testing of ADDS will be completed in FY86. IOC is planned for late FY86.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.21.A

DOD Mission Area: #215 - Land Combat Support

Title: Chemical Defense Materiel Concepts

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	14888	21231	20476	16956	Continuing	Not Applicable
	QUANTITIES						
DE80	Individual Cml Protection Materiel	0	3430	634	2636	Continuing	Not Applicable
DE81	Cml Decontamination Materiel	2128	5231	3169	2217	Continuing	Not Applicable
DJ30	Collective Protective Material for Armored Vehicles	5940	4380	5369	5556	Continuing	Not Applicable
D601	Cml Detection & Warning Materiel	6430	5724	10248	6063	Continuing	Not Applicable
D604	Collective Cml Protection Materiel	390	2466	1056	484	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: There is an urgent need to provide all Services with an improved rapid detection and warning system which will provide United States (US) Forces with early warning of an approaching chemical agent attack, and improved individual and collective protection materiel and other protective equipment to protect against chemical attack, whether in vapor or liquid/aerosol form. The Army has the Executive Agent responsibility for conducting chemical/biological defense research and development for the Department of Defense (DOD). This program covers defensive systems and equipment to protect individuals and groups from chemical agents by providing: protection for the respiratory system and body; manual and automatic detection, and warning devices that respond to toxic agents in all forms on all surfaces; means to decontaminate skin, clothing, equipment, and terrain; and the development of collective protection for shelters, armored vehicles, vans, and associated equipment. Failure to correct these Nuclear-Biological-Chemical (NBC) defense deficiencies would seriously jeopardize the survivability of US Forces in the event of a chemical attack.

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Program Element: #6.3/21.A
DOD Mission Area: #215 - Land Combat Support

Title: Chemical Defense Materiel Concepts
Budget Activity: #4 - Tactical Programs

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Advanced Development (AD) will be initiated on an aviation respirator system and continued on numerous items of collective protection equipment for shelters, vans, and tactical armored vehicles. In the chemical agent detection and alarm area, development will continue on a remote sensing and detection alarm, a detector kit for chemical agents in water, an automatic liquid agent alarm, an alarm training simulator, and a chemical attack warning and transmission system. Work will continue on the development of decontamination systems for clothing and a rapid decontamination system for tactical vehicles. These items are essential to meet the objectives of a totally integrated chemical-biological (CB) defense posture.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	14983	21231	20476	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	17230	23217	23678	Continuing	Not Applicable

DE80 - \$500 thousand in FY 1980 was reprogrammed to other chemical defense projects because of the lack of an approved requirements document for the aviation protection mask. This project was reduced by \$1241 thousand in FY 1982 to reflect a revised scope and funding requirement to initiate advanced development (AD) efforts on the aviation protective mask.

DE81 - The scope of this project was reduced by \$2857 thousand in FY 1980 and \$1381 thousand in FY 1982 because several decontamination requirement documents were not approved as anticipated.

DJ30 - This project was increased by \$1999 thousand in FY 1980 to support additional AD work on the hybrid collective protection equipment for armored vehicles. The \$144 thousand increase in FY 1982 is the result of refinement in program cost estimates.

D601 - This project was increased by \$1636 thousand in 1980 and \$3507 thousand in the FY 1982 to fund those detection and warning devices that are/will be supported by approved requirement documents and proven technology.

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Program Element: #6.37.21.A
DOD Mission Area: #215 - Land Combat Support

Title: Chemical Defense Materiel Concepts
Budget Activity: #4 - Tactical Programs

D604 - This project was decreased by \$2620 thousand in FY 1980 and by \$4231 thousand in FY 1982 to conform to a reduction in the scope of the program.

The FY 1981 funding decreases for projects DE80, DE81, DJ30, D601, and D604 reflect the application of general Congressional reductions.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands): Not applicable.

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Program Element: #6.37.21.A
DOD Mission Area: #215 - Land Combat Support

Title: Chemical Defense Materiel Concepts
Budget Activity: #6 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: After the 1973 Mideast War and the suspected use of chemical agents in Laos, intensive coordination between the materiel user and the materiel developer was begun to identify urgent field needs and translate them into requirements. The reported use of chemical agents in Afghanistan has intensified these efforts. The results of several general officer reviews by the Services and the Defense Science Board recommendations are implemented by this program. The objective of this program is to conduct advanced development for all Services on rapid detection and warning systems to warn of a chemical attack and to develop protective materials and equipment to provide protection. This program covers defensive systems and equipment to protect individuals from chemical agents by providing: protection for the respiratory system and all body surfaces; manual and automatic detection and warning devices that respond to toxic agents on all surfaces, in the atmosphere, and in food and water; and means to decontaminate skin, clothing, equipment, and terrain. It also provides for the development of collective protection equipment/materiel to provide rest and relief to personnel performing certain headquarters and communications functions, and for certain armored vehicle crews to relieve the stresses and restrictions inherent in wearing individual protective equipment while performing their mission in an active chemical environment.

G. (U) RELATED ACTIVITIES: Memorandum of Understanding (MOU) between the United States and Canada on the protective mask and canisters provides for the US developing protective masks and Canada developing filter canisters. The Army-approved Required Operational Capability (ROC) for the New Protective Mask has been converted to a Joint Service Operational Requirement for Joint-Service application. Companion Engineering Development work is being done under Program Element 6.47.25.A, Chemical Defense Materiel. Related Exploratory Development work is conducted under Program Element 6.27.06.A, Chemical Defense and General Investigations, Project A553, Chemical Biological Defense and General Investigations.

H. (U) WORK PERFORMED BY: In-house: Chemical Systems Laboratory, Aberdeen Proving Ground, MD; Human Engineering Laboratory, Aberdeen Proving Ground, MD; Arctic Test Center, Fort Greeley, AL; and Tropic Test Center, Panama. Contract: Calspan, Buffalo, NY; Honeywell, Orlando, FL; Bendix, Towson, MD; Donaldson, Minneapolis, MN; American Air Filter, Ellicott City, MD; and Brunswick, Marion, VA.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: A 1978 review of the Services' chemical decontamination capability resulted in the Army's decision to initiate an accelerated program to improve this capability. During FY 1979 the following were accomplished: (1) Advanced development (AD) of the remote sensing chemical agent alarm was reinitiated; (2) AD was continued on the 19-litter decontamination apparatus for vehicles and decontamination procedures for weapons systems; and (3) The information gap study program related to collective protection for armored vehicles was expanded to cover areas such as ventila-

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Program Element: #6.37.21.A
DOD Mission Area: #215 - Land Combat Support

Title: Chemical Defense Materiel Concepts
Budget Activity: #4 - Tactical Programs

tion parameters, liquid agent transport, agent transport due to personnel entry/reentry, and crew compartment decontamination. During FY 1980 the following were accomplished: (1) Phase I prototype tests and a Special In Process Review (IPR) were held on the Decontamination Apparatus Portable, XM13; (2) a Letter of Agreement (LOA) was approved and Advanced Development (AD) initiated on the Interior Surface Decontamination System; (3) AD was initiated on the Large-Scale Decontamination Device (Jet Exhaust System); (4) AD contract was awarded and concept feasibility IPR was conducted on the Testing Kit for Chemical Agents in Water, XM272; (5) AD was continued on the hybrid collective protection equipment for armored vehicles; and (6) the LOA was approved and AD initiated on the Automatic Liquid Agent Detector (ALAD), XM82. AD was continued on the Remote Sensing Chemical Agent Alarm, XM21.

2. (U) FY 1981 Program: This is a continuing program which supports AD of new/improved decontamination systems, detection and warning systems, collective protection equipment for shelters, armored vehicles, vans, and associated equipment. AD will continue on: (1) the Simplified Collective Protection Equipment, XM20; (2) the Rapid Decontamination Apparatus; (3) Clothing Decontamination System; and (4) the Automatic Liquid Agent Detector, XM82. AD will be completed on the Remote Sensing Chemical Agent Alarm, XM21. AD will be completed and type classification accomplished on the Portable Decontamination Apparatus, XM13. AD will continue on the Testing Kit for Chemical Agents in Water, XM272. Efforts on the water test kit will include the initiation of Development Test I/Operational Test I (DT I/OT I). AD efforts initiated in FY80 to develop and test a hybrid collective protection system for armored vehicles will continue. The hybrid method of protection offers the greatest operational flexibility by allowing operation as an overpressure system, a ventilated facepiece system, or simultaneous operation of both systems. AD will be initiated on the Advanced Chemical Agent Detector Alarm (ACADA).

3. (U) FY 1982 Planned Program: AD will be completed on the Testing Kit for Chemical Agents in Water, XM272, rapid decontamination, clothing decontamination, and interior surface decontamination systems, and the Advanced Chemical Agent Detector Alarm (ACADA). AD will continue on the Automatic Liquid Agent Detector (ALAD), XM82. AD will be initiated on the aviation respiratory system and the detection and alarm components of the NBC reconnaissance vehicle. The following will be accomplished on the Simplified Collective Protection Equipment, XM20: (1) complete DT I/OT I; (2) initiate DT II/OT II; and (3) conduct Validation In-Process Review (VAL IPR). AD will continue on the hybrid collective protection system for application to a variety of armored vehicles.

4. (U) FY 1983 Planned Program: AD will continue on the aviation respiratory system, the improved personnel decontamination kit, a universal decontaminant, and the decontamination station kit. AD will be completed on the Automatic Liquid Agent Detection, XM82; the Simplified Collective Protection System, XM20; the Detector Kit for Chemical Agents in Water, XM272; and the hybrid collective protection system.

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Program Element: #6.17.21.A
DOD Mission Area: #215 - Land Combat Support

Title: Chemical Defense Materiel Concepts
Budget Activity: #4 - Tactical Programs

5. (U) Program to Completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #DE81

Program Element: #6.37.21.A

DOD Mission Area: #215 - Land Combat Support

Title: Chemical Decontamination Materiel

Title: Chemical Defense Materiel Concepts

Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: The Union of Soviet Socialist Republics (USSR) and Warsaw Pact (WP) nations have a recognized technological advantage over the United States (US) in decontamination capabilities which significantly enhances their ability to conduct sustained operations in a toxic environment. An accelerated decontamination program was initiated by the Army in May 1978. The objectives of the program are to achieve at least parity with the USSR/WP and provide a survival and sustained operational capability for US forces on a chemically contaminated battlefield. An Army Science Board Ad Hoc committee reviewed the Army's decontamination program from October 1978 to March 1979. The Committee's report reemphasized the urgency for the accelerated program and made recommendations for improvement. The purpose of this project is to conduct Advanced Development on new systems designed to quickly and effectively decontaminate personnel and equipment in the field. This is the only project in the Department of Defense for Advanced Development of decontamination materiel.

B. (U) RELATED ACTIVITIES: Advanced Development is conducted on decontamination/contamination avoidance concepts completing Exploratory Development under Program Element 6.27.06.A, Chemical-Biological Defense and General Investigations. In accordance with Department of Defense (DOD) Directive S160.5, which designates the Army as Executive Agent for Chemical Warfare/Chemical-Biological Defense Research, Development, Test and Evaluation, work is planned and accomplished in response to requirements from all Services. Items or systems of Army and Joint service interest which complete Advanced Development progress to Engineering Development under Program Element 6.47.25.A, Chemical Defense Materiel, Project DP97, Chemical Decontamination Materiel.

C. (U) WORK PERFORMED BY: Contractors: Brunswick Corporation, Marion, VA; In-house developing organization is the United States Army Chemical Systems Laboratory, Aberdeen Proving Ground, MD.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Advanced Development on the XM13, Decontamination Apparatus, Portable, was initiated in FY78. The apparatus is to be carried on all tactical vehicles and will significantly improve the capability of crews to decontaminate their vehicles in the field and continue their mission. During FY 1979, two concepts were selected for further competitive development. Work continued on the technical report providing information on the decontamination of nuclear weapon systems. The program supported the initiation and development of the Army's polyurethane paint application pilot test program to evaluate the efficiency of polyurethane paint as a means of contamination avoidance or reducing decontamination effort. Data from the pilot program will also be used to conduct an operational cost-effectiveness analysis. The

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Project: #DE31
Program Element: #6 37.21.A
DOD Mission Area: #215 - Land Combat Support

Title: Chemical Decontamination Materiel
Title: Chemical Defense Materiel Concepts
Budget Activity: #4 - Tactical Programs

pilot test program will be completed in the 1Q FY 1981. During FY 1980, phase I of the prototype tests and a Special In-Process Review were held on the XM13 Portable Decontamination Apparatus. A Letter of Agreement requirements document was approved, and Advanced Development was initiated on an Interior Surface Decontamination System. A Large-Scale Rapid Decontamination Device (jet exhaust) entered Advanced Development. A report on the decontamination of nuclear weapons was completed.

2. (U) FY 1981 Program: The polyurethane paint pilot test program will be completed and the report published. Advanced Development will be completed on the XM13 Portable Decontamination Apparatus and the item type classified. The Large-Scale Decontamination Device and the Interior Surface Decontamination System will continue Advanced Development, and a Decontamination System for Clothing will enter this phase of development.

3. (U) FY 1982 Planned Program: Advanced Development will be completed on the Large-Scale Decontamination Device, the Interior Surface Decontamination System, and the Decontamination System for Clothing. Testing of prototype models of the systems will be completed to validate the feasibility of the design concepts to meet stated user requirements.

4. (U) FY 1983 Planned Program: Advanced Development will be initiated on a Decontamination Station Kit for decontamination of medical casualties and an Improved Personal Equipment Decontamination System that will provide the individual soldier a greater capability to reduce the level of immediate or residual hazards from contaminated personal equipment. Development Test I and Operational Test I (DT I/OT I) plans will be prepared, and construction will be initiated on prototype items for testing.

5. (U) Program to Completion: This is a continuing program.

6. (U) Major Milestones: Not applicable.

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Project: #DE81
 Program Element: #6.37.21.A
 DOD Mission Area: #215 - Land Combat Support

Title: Chemical Decontamination Materiel
 Title: Chemical Defense Materiel Concepts
 Budget Activity: #4 - Tactical Programs

7. (U) Resources (\$ in thousands):

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>to Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
RDTE						
Funds (current requirements)	2128	5231	3169	2217	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	4985	5720	4550	-	Continuing	Not Applicable

The \$2857 thousand decrease in FY 1980 expenditures was due to a lack of approved requirements necessary to transition items from Exploratory Development to Advanced Development. The funds were reprogramed to continue Exploratory Development on selected decontamination items. The \$489 thousand decrease in FY 1981 funding level is a result of general reductions by Congress. The decrease of \$1381 thousand estimated funding requirements for FY 1982 is based on a projected decrease in level of required effort to meet user needs (\$1287 thousand) and the result of program realignment to reflect incremental funding policies (\$94 thousand).

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #0130
Program Element: #6.37.21.A
DOD Mission Area: #215 - Land Combat Support

Title: Collective Protection Materiel Armored Vehicles
Title: Chemical Defense Materiel Concepts
Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: The Soviet Union continues to maintain a significant chemical warfare capability. The evidence is that they regard chemical weapons as an integral part of future tactical warfare. For example, they conduct extensive training exercises which stress operating proficiency in a chemical warfare protective posture, and they have equipped their armored vehicles with collective protection systems. Other Warsaw Pact nations are similarly trained and equipped. To meet this threat, Congress directed in the FY 1978 Department of Defense (DOD) Appropriations Act (PL 95-79) that the Army prepare a plan to provide nuclear-biological-chemical (NBC) protection for combat vehicles in development or procurement by 1981, which was done. Subsequently, enemy threat assessment and review of the Army's tactical doctrine for operating in a chemically contaminated environment resulted in an Army plan for providing NBC collective protection for fleet as well as developmental combat vehicles and their crews. This program is structured to support these specified needs to improve the Army's survivability on the battlefield in a contaminated environment. Specifically, this program provides Advanced Development of new and improved collective protection equipment for armored vehicles. This goal will be achieved through the development of an improved air purification system which can be used for positive pressurization of the vehicle, if it is assigned a rear area mission, or in providing ventilated facepiece protection if it is assigned a forward area mission. The provision of the improved collective protection system will enable the crews to perform combat duties without the encumbrance of complete individual protective equipment when operating in an NBC-contaminated environment.

B. (U) RELATED ACTIVITIES: This was a new start in FY 1980. Related work has been done in this area under Program Element 6.37.21.A, Chemical Defense Materiel Concepts, Project D604, Collective Chemical Protection Materiel; Program Element 6.47.25.A, Chemical Defense Materiel Concepts, Project D017, CB Collective Protection; and Program Element 6.47.25.A, Chemical Defense Materiel Concepts, Project D018, Collective Protection-Vehicles and Vans. Related exploratory development is conducted under Program Element 6.27.06.A, Chemical Biological and General Investigations, Project A553, Chemical Biological Defense and General Investigations. Foreign state-of-the-art will be considered throughout the RDTE cycle. Related data is exchanged with allied countries via data exchange agreements and NATO Panel VII-NBC defence.

C. (U) WORK PERFORMED BY: US Army Tank-Automotive Command (TACOM), Warren, MI, is responsible for the development and overall management of this program. In-house RDTE work is being performed by Chemical Systems Laboratory, Aberdeen Proving Ground, MD. Honeywell, Inc., St. Petersburg, FL, is the prime contractor on the Hybrid Collective Protection Equipment (HCPE). Donaldson, Minneapolis, MN, is developing a centrifugal dust separator that can be applied as a product improvement on armored vehicles with ventilating blowers.

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Project: #DJ30
Program Element: #6.37.21.A
DOD Mission Area: #215 - Land Combat Support

Title: Collective Protection Materiel Armored Vehicles
Title: Chemical Defense Materiel Concepts
Budget Activity: #4 - Tactical Programs

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments The Advanced Development (AD) of collective protection materiel for armored vehicles was initiated in FY 1978 under Program Element/Project (PE/PROJ) 6.37.21.A, D604, Collective Chemical Protection Materiel. PE/PROJ 6.37.21.A, DJ30, Collective Protection Materiel for Armored Vehicles, was initiated in FY 1980. The following are the significant events that have occurred under Project D604 and are directly related to the efforts ongoing in Project DJ30: (a) Secretarial Determination and Findings (D&F) was approved July 1979 and (c) Development Test I Operational Test I (DT I/OT I) on the hybrid system was initiated March 1979. The AD contract on the hybrid system was awarded during June 1980 under project DJ30. At the beginning of this program (FY 1978), US ROLAND was the only armored vehicle, of the nine identified as having Congressional interest, requiring the Hybrid Collective Protection Equipment (HCPE). The remaining eight vehicles were earmarked for the Ventilated Facepiece System. Therefore, providing the hybrid system to US ROLAND has received top priority during FY 1980. In early FY 1980, the XM1 Tank, Multiple Launched Rocket System (MLRS), and Division Air Defense Gun (DIVAD) were identified by the user as possible candidates for the hybrid system. A preliminary concept review of the Honeywell Inc. hybrid design was held during September 1980 at Chemical Systems Laboratory. Concepts were presented for both US ROLAND application and the modular approach to Hybrid Collective Protection Equipment.

2. (U) FY 1981 Program: Work on information voids and data gap program related to collective protection for armored vehicles and crews will be continued. Development Test I/Operational Test I on the Hybrid Collective Protection Equipment (HCPE) will be completed. The assessment of vehicle crew compartment air leakage reduction concepts will continue. Compatibility/suitability tests directed toward the integration of detection, alarm, and decontamination apparatuses into armored vehicles will continue. The XM1 auxiliary power unit (APU) turbine will be evaluated as a possible interior decontamination source. Design, construction, and testing of the prototype centrifugal dust separator will continue. The centrifugal dust separator will be evaluated as a possible product improvement on armored vehicles with ventilating blowers.

3. (U) FY 1982 Planned Program: Continue Advanced Development (AD) of the Hybrid Collective Protection Equipment (HCPE) to include the following: (a) Initiate Development Test II/Operational Test II (DT II/OT II) on the HCPE with emphasis on collecting data to prove reliability and maintainability, and (b) continue design construction and testing of prototype HCPE to correct deficiencies identified during DT II/OT II. Continue test and evaluation efforts to establish performance and hazard data to quantify the relative overall protective performance of NBC protective systems installed on armored vehicles. Simulated challenge of agents, smokes, radioactive particulates and dusts will be performed on vehicles in both static and simulated operation models.

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Project: #D130
 Program Element: #6.17.21.A
 DOD Mission Area: #215 - Land Combat Support

Title: Collective Protection Materiel Armored Vehicles
 Title: Chemical Defense Materiel Concepts
 Budget Activity: #4 - Tactical Programs

4. (U) FY 1981 Planned Program Continue AD of the HCPE to include the following: (a) complete DT II/OT II; (b) finalize all design, construction, and testing; (c) complete the technical data package; and (d) conduct Development Acceptance In-Process Review (DEVA-IPR). HCPE will be type classified from a combined advanced and engineering development effort conducted under this project. Continue data collection efforts, as required, to quantify unknowns and fill information data gaps relative to NBC collective protection systems.

5. (U) Program to Completion: Continuing.

6. (U) Major Milestones:

<u>Major Milestones</u>	<u>Current Milestone Dates</u>	<u>Milestone Dates Shown in FY 1980 Submission</u>
Development Test I/ Operational Test I	March 1979-November 1981	-Not Shown
Development Test II/ Operational Test II	March 1982-November 1982	-Not Shown
Development Acceptance In-Process Review	February 1983	-Not Shown
Type Classification	February 1983	
Initial Operational Capability	February 1984	-Not Shown

The Hybrid Collective Protection System will be type classified from a combined advanced and engineering program. In view of this development approach, major milestones are included in this FY 1982 Congressional Descriptive Summary submission. Milestones were not included in the FY 1981 submission.

7. (U) Resources (\$ in thousands):

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Project: #DJ30 Title: Collective Protection Materiel Armored Vehicles
 Program Element: #6.37.21.A Title: Chemical Defense Materiel Concepts
 DOD Mission Area: #215 - Land Combat Support Budget Activity: #4 - Tactical Programs

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>to Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
RDTE						
Funds (current requirements)	5940	4380	5369	5556	Continue	Not Applicable
Funds (as shown in FY 1981 submission)	3941	4704	5225	-	Continue	Not Applicable

Increased funding in FY 1980 is due to funds being reprogrammed into this project from the companion engineering development Project 6.47.25.A, D023, Collective Protection Materiel for Armored Vehicles. The adjusted funds in both projects were adequate to conduct the revised program. The FY 1981 decrease reflects the application of general Congressional reductions. Increased funding in FY 1982 results from adjustments to compensate for pay raises and inflation.

Other Appropriations: Not Applicable.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D691

Program Element: #6.37.21.A

DOD Mission Area: #215 - Land Combat Support

Title: Chemical Detection and Warning Materiel

Title: Chemical Defense Materiel Concepts

Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: There is an urgent need to provide all Services with an improved rapid detection and warning system which will provide United States (US) forces with early warning of an approaching chemical agent attack, whether in vapor or liquid/aerosol form. The suspected use of chemical agents in Afghanistan has caused an intensification of research and development efforts and the chemical special in-process review directives form the basis of the proposed detection and warning program. Current detection systems lack necessary response time, sensitivity, agent specificity and off-target detection capability. Failure to correct these chemical defense deficiencies would seriously jeopardize the survivability of US Forces in the event of a chemical attack. This project supports Advanced Development of an integrated detection and monitoring capability for all known threat agents to prevent contamination and rendering our combat forces ineffective, determine the need for decontamination, and give the all-clear for rehabilitation.

B. (U) RELATED ACTIVITIES: No comparable work is done by other Services. Coordination is maintained with the other Services to assure provision of required detection and warning materiel and avoid duplication of effort. Coordination and cooperation are maintained with allied countries via Data Exchange Agreements and through meetings of North Atlantic Treaty Organization (NATO) Panel VII-NBC Defense. Companion Engineering Development (ED) work is being done under Program Element 6.47.25.A, Chemical Defense Materiel, Project D020, Chemical Detection Warning and Sampling Devices. Related Exploratory Development work is being conducted under Program Element 6.27.06.A, Chemical Defense and General Investigations, Project A553, Chemical Biological Defense and General Investigations.

C. (U) WORK PERFORMED BY: In-house: US Army Chemical Systems Laboratory, Aberdeen Proving Ground, MD. Contract: Honeywell, St Petersburg, FL; Bendix, Towson, MD; Calspan, Buffalo, NY; and Mine Safety Appliance Co, Murrysville, PA.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: During earlier years Advanced Development (AD) was completed on the M256 Chemical Detector Kit, XM207 Chemical Attack Warning and Transmission System, and XM9 Liquid Agent Detector Paper. During FY 1979, the key effort was the reinitiation of AD on Remote Sensing Chemical Agent Alarm, XM21. During FY 1980, the following was accomplished: (1) AD contract was awarded on the XM272 Testing Kit for Chemical Agents in Water; (b) initiated AD and approved the Letter of Agreement (LOA) on the Automatic Liquid Agent Detector, XM82; and (c) Continued AD on the XM21 Remote Sensing Chemical Agent Alarm. A special In-Process Review (Apr 80) on the XM21 approved a new milestone schedule because more AD time is required to solve technology problems. Development Test I/Operational Test I (DTI/OTI) was initiated on the XM21. Current design of XM21 prototype indicates higher power requirement and system weight than the user prescribes.

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Project: #D601
 Program Element: #6.37.21.A
 DOD Mission Area: #215 - Land Combat Support

Title: Chemical Detection and Warning Materiel
 Title: Chemical Defense Materiel Concepts
 Budget Activity: #4 - Tactical Programs

2. (U) FY 1981 Program: The following will be accomplished on the XM21 Remote Sensing Chemical Agent Alarm: (a) continue AD, (b) Complete DTI/OTI, (c) prepare the Required Operational capability (ROC), (d) Conduct Department of Army Decision Review. The following will be accomplished on the XM82 Automatic Liquid Agent Detector (ALAD): (a) continue AD (b) award advanced development contract, and (c) conduct Special In-Process Review. The following will be accomplished on the XM272 Water Testing Kit: (a) continue AD, (b) conduct Special In-Process Review, and (c) initiate/complete DT I/OT I. AD will be initiated on the detection and warning components of the Nuclear, Biological, and Chemical (NBC) Reconnaissance System.

3. (U) FY 1982 Planned Program: Complete AD on the Detector Kit for Chemical Agents in Water, XM272. Validation In-Process Review (VAL IPR) will be conducted on the water test kit (3QTRFY82). Continue AD on the Advanced Chemical Agent Detector and Alarm (ACADA) and Automatic Liquid Agent Detector (ALAD), XM82. Initiate AD on detection and alarm components of the NBC Reconnaissance Vehicle.

4. (U) FY 1983 Planned Program: Complete AD and conduct Validation In-Process Review (VAL IPR) on the Automatic Liquid Agent Detector (ALAD), XM82. The following will be accomplished on the Automatic Chemical Agent Detection/Alarm (ACADA), XM83: (a) conduct Development Test I/ Operational Test I, (b) develop requirements document, (c) prepare and distribute final New Equipment Training Plan, (d) and conduct VAL IPR.

5. (U) Program to Completion: This is a continuing program.

6. (U) Major Milestones: Not Applicable.

7. (U) Resources (\$ in thousands):

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional to Completion</u>	<u>Total Estimated Cost</u>
RDTE						
Funds (current requirements)	6430	5724	10248	6063	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	4794	6230	6741	-	Continuing	Not Applicable

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Project: #D601

Program Element: #6.37.21.A

DOD Mission Area: #215 - Land Combat Support

Title: Chemical Detection and Warning Materiel

Title: Chemical Defense Materiel Concepts

Budget Activity: #4 - Tactical Programs

Increase in FY 1980 funding is due to refinement in program cost estimates. The FY 1981 decrease reflects the application of general Congressional reductions. Increase in FY 1982 funding is due to refinement in program cost estimates and initiation of AD on the detection and alarm components of the NBC Reconnaissance System which was added to the program since the FY 1981 submission.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.23.A

DOD Mission Area: #254 - Tactical Command and Control

Title: Command and Control

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	8964	12075	22379	27182	Continuing	Not Applicable
D101	Tactical Automation	8964	12075	3550	8328	Continuing	Not Applicable
D185	Military Software Standardization			3311	3782	Continuing	Not Applicable
D196	Military Computer Family			13656	13214	Continuing	Not Applicable
D192	Ada Joint Program Office			1862	1958	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Today, commanders must be provided the capability to know the complete tactical situation in near-realtime. This program pursues this goal by accelerating the fielding and the survivability of battlefield automated systems. It will provide a common, compatible family of computers (Military Computer Family), transportable software products and tools (including implementing Ada, the common tactical high-order computer programming language), intelligent input/output devices (terminals, displays, storage devices, etc.), to provide multilevel secure operating systems and distributed processing techniques to promote survivability on the battlefield, and development of computer resource management policy, procedures, regulations, and training to assure reduction of computer resource proliferation. This will allow continued competition, reduce proliferation of computer types, eliminating costly life cycle development in post-deployment maintenance phases, and prevent small production bases with costly sole source follow-on procurements. Battlefield survivability will be enhanced with training and logistics simplicity.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: These funds are essential to continue development of Ada and necessary software support tools. A major training effort is planned to introduce Ada to the military and civilian work force. Major efforts are planned for development and testing of a compatible family of military computers, peripherals, and terminals. Computer resource management policy and standardization control will continue. The development of secure operating systems will be initiated.

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Program Element: #6.37.23.A

DOD Mission Area: #254 - Tactical Command and Control

Title: Command and Control

Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Initiate parallel competitive contracts for MCF	FY81	FY81
Configure software development facility for Post-Deployment Support efforts	FY81	FY81
Initiate development of life cycle software tools	FY81	FY81
Complete development of Ada Language system	1Q FY82	2Q FY82
Develop code generator for MCF computer	FY82	FY82
Initiate Development of Common Operating System (TACEXEC)	FY82	FY82
Develop additional code generators for Ada language system	FY83	

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Program Element: #6.17.23.A

DOD Mission Area: #254 - Tactical Command and Control

Title: Command and Control

Budget Activity: #4 - Tactical Programs

Development Test for
Advanced Development
Models of MCF

FY81

FY82

The delay of one quarter in completion of Ada was due to the cost negotiation phase in the contractors' solicitation. The last milestone replaces the milestone development test for brassboard of MCF computers. The change in date is due to a restructuring of the program to include a new instruction set architecture.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	8964	12075	22379	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	8964	12998	25902	Continuing	Not Applicable

The decrease in FY 1982 is due to a restructuring of the MCF program and a projection of funds to establish the Ada Joint Program Office. The decrease in FY 1981 reflects the application of general Congressional reductions.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

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Program Element: #6.37.23.A
DOD Mission Area: #254 - Tactical Command and Control

Title: Command and Control
Budget Activity: #5 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: To meet the mission need, this program provides the advanced development of software languages. Initial emphasis will be on the Ada language and requirements tools. In the second phase the standardized and configuration-managed tools will be used for the specification and implementation of multiprocessor and microprocessor systems configurations. The final phase will provide techniques, procedures, and tools for the detection, control, and correction of field software failures with a reduction of required skill levels in the field. A compatible family of military computers (MCF), intelligent microprocessor-based terminals and peripheral devices, data distribution, operating systems and associated equipment will be developed. To promote a more survivable battlefield, another program is in the areas of distributed processing and secure software. Required policy, procedures, regulation, and training will be provided.

G. (U) RELATED ACTIVITIES: This project is related to all Army battlefield automation systems as it will provide a standard language family of computers and software for such systems. The instruction-set architecture to be used in the MCF, Nebula (MIL-STD - 1852), is under joint Air Force-Army management and control based on a Memorandum of Agreement of 12 September 1980 between the Air Force Systems Command and the Army Materiel Development and Readiness Command. This project is related to the Tactical Fire Direction System (TACFIRE), 2.37.26A; Communication Electronics, 6.27.01.A; Tactical Automation Technology, 6.27.46.A; Automatic Test Support Systems, 6.47.46; Missile Hinder (AN/TSG-73), 6.43.02.A; and other Command and Control programs. There is no unnecessary duplication of effort within the Army or the DOD. Coordination to avoid duplication is accomplished through the Department of Defense Computer Resources Technology Panel of the Management Steering Committee for Embedded Computer Resources and the High-Order Language Working Group (HOLWG).

H. (U) WORK PERFORMED BY: Carnegie-Mellon University, Pittsburgh, PA; Softech Inc., Waltham, MA; Telelynx Brown Engineering, Huntsville, AL; Higher Order Software, Cambridge, MA; EG&G, Rockville, MD; Computer Sciences Corporation, Norwood, NJ. In-house development is performed by the US Army Communications Research and Development Command.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Revised technical and acquisition strategies were developed for the Military Computer Family to reduce risk and enhance industry interest. Experimental evaluations were conducted of existing architectures to determine performance on military problems. An advanced architecture, Nebula, was designed. This architecture is oriented to Ada and to realtime computation, and it provides security capabilities. Proposals for MCF were submitted on 29 August 1980. A contract to develop Ada was awarded to Softech, Inc. A Software Development Support System (SDSS) was established to certify all software products and tools for Army software support centers. A tactical display system overlay generator and validation of the mass storage technology into Army-based computer systems were initiated. The

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Program Element: #6.37.23.A

DOD Mission Area: #254 - Tactical Command and Control

Title: Command and Control

Budget Activity: #4 - Tactical Programs

Microprogrammable Multiprocessor (MMP) System was interfaced to the ARPANET demonstrating the capability for worldwide rapid post-deployment support. An Army-wide Post-Deployment Software Support study was conducted and a management plan developed. Computer support was provided to Army organizations. Participation was provided to NATO, joint service panels, and Army software conferences, panels, and symposia, as well as in planning the Army implementation of DOD Directive 5039.29, Management of Computer Resources in Major Defense Systems. A revised standard (MIL-STD-1462A) was prepared as a test programming language for Automatic Test Equipment (ATE) Systems. Work progressed on a maintenance information delivery system. A cost algorithm and design guide was developed for a Test Program Set (TPS).

2. (U) FY 1981 Program: The four-step bid evaluation for AD of MCF will be completed, and up to four competitive contracts will be awarded in April 1981. The Nebula Control Board will issue MIL-STD-1362A, the final standard. Nebula support software and validation software will be designed and tested. Procurement for facility for testing the MCP will be initiated. Initiated a contract for the MCF compatible family of intelligent terminals and peripherals. Award two competitive contracts for the design in Ada of two different battlefield automated systems intended to exploit the various generic functions of the language. Start an Ada training program for the Army and DOD community. Implement the Ada test cases. The Army expects to provide funds for the Ada Joint Program Office when established. The management of planning for the integration of Army tactical data systems with feeder systems will be continued. General engineering support to Project Managers and centers will also continue. Existing Army standards and procedures in the area of computer resource management will be improved. Participation on NATO, joint service, and Army panels involved with computer resource management and standardization will continue. The development of a secure kernel operating system for the Army standard Software Support and Development System (SDSS) computer will be started. Distributed processing techniques for the maneuver battlefield element will be investigated. The conversion of existing support software to execute on the SDSS computer will begin.

3. (U) FY 1982 Planned Program: The Military Computer Family effort will transition to its own project in FY82, D186 (under 63723A). Military Software Standardization will also transition to its own project in FY82, D185 (under 6.37.23A). Development of Ada will be completed, and additional target generators and tools will be identified for subsequent development. Validation, verification, and testing of Ada will continue. Ada education programs will be defined. Development of an Ada code generator for the MCP computer will begin. Development of life cycle support standards and guidelines will be initiated. Ada program design studies will be initiated. Participate on NATO, joint service, and Army panels involved with computer resource management and standardization. The secure kernel operating system for the SDSS computer will be developed. The transition of existing support software to the SDSS will be completed. Distributed processing and data processing techniques to promote survivability for battlefield functional areas will be developed. The Army has programed to provide the Army share for support to the Ada Joint Program Office. This effort will help standardize the software effort for the Department of Defense.

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Program Element: #6.37.23.A

Title: Command and Control

DOD Mission Area: #254 - Tactical Command and Control

Budget Activity: #4 - Tactical Programs

4. (U) FY 1983 Planned Program: Continue development of MCF standard terminals, peripherals, and software and Ada code generators. Products and tools of the Ada language will continue to be improved and supplied to other users. Training programs for Ada will be formalized.

5. (U) Program to Completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #0186
Program Element: #6.37.23.A
DOD Mission Area: #254 - Tactical Command and Control

Title: Military Computer Family (MCF)
Title: Command and Control
Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: The increasing complexity, speed, and lethality of modern warfare have made automation on the battlefield essential for weapon system and equipment control and to provide the commander with an up-to-the-minute grasp of battlefield information from which he can make decisions. This will entail the introduction of sophisticated yet rugged computers into the field in increasing numbers. Proliferation of types already complicates logistics, maintenance, and training. No single standard has been found to be adequate. The challenge is to transition from proliferation to standardization of a single Military Computer Family. But standardization tends to be the antithesis of advancing technology, flexible evolution, and competition. Goals for the MCF program are (1) technology insertion to take advantage of rapid advances in computer technology in order to realize improvements in reliability, performance, capacity, cost, size, weight, and power and to assure supportability; (2) open competition for computers that is sustained throughout the acquisition life-cycle; (3) reduction of acquisition and support costs over the life-cycle; (4) reduction of time from inception to fielding of battlefield automation systems (BAS); (5) avoidance of unnecessary proliferation of types of battlefield computers; (6) high reliability of computers; (7) ease of maintenance (fault detection and isolation, parts replacement); (8) interchangeability of parts across different systems; (9) provision for distributed processing to accommodate degraded mode operation, graceful degradation, and load shifting; (10) minimum logistics support burden; (11) flexibility for system evolution to support system functional expansion and change. The approach planned to meet the above goals is to provide a wide range of computing capabilities via several subfamilies and standards (hardware and software) for the field and for support. A software-compatible and plug-compatible family of computers will employ the same advanced standard instruction-set architecture, interfaces, busses, configurations, and enclosures. The computers will use standard peripheral devices and fieldable software products. On the development and support side, a single standard high order language (ADA) and standard software development and post-deployment support tools will be used. This family will constitute a standard product line that all battlefield automation managers will be expected to use. (In July 1980, the Assistant Secretary of the Army established policy and a transition plan for the use of MCF and ADA in all future BAS.) An open solicitation is planned that will lead to the award of up to four contracts for competitive advanced development (AD) of the MCF. Each contractor is expected to deliver AD models in 21 months. The competition will be in the spirit of A-109 with each developer having the opportunity to develop his own total solution to meeting the performance/goal "envelope." The competitive emphasis in AD will be on achieving the best life cycle cost (including ILS approach) and operational effectiveness profile, and on developing the technology/approach that will be used to achieve the performance/goal envelope in production models. Toward this end, a Technology Insertion Plan will be required from each contractor 21 months after the date of award that presents his planned approach, in detail, to achieve the goals, not in the AD model, but in the full-scale development (FSD) model and

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Project: #D186
Program Element: #6.37.23.A
DOD Mission Area: #254 - Tactical Command and Control

Title: Military Computer Family (MCF)
Title: Command and Control
Budget Activity: #4 - Tactical Program

In the production units. The AD model will be a stepping stone toward the goals. The technical approach being taken is to delay for as long as reasonable the freezing of technology for production units, delivery of which will be in 1986. The AD phase will end with awards of FSD contracts to two of the initial competitors based upon a second competition. During the FSD period, these contractors will complete ILS packages and will deliver models for the DT/OT II fly-off and for use by PM's committed to the use of MCF in their systems. The production decision is planned for early in CY 1986, as is the production contract award. It is planned that the fly-off will end with the winner being awarded a fixed-price five-year requirements contract. The approach outlined above will provide an intensity of competition that should satisfy industry's demand for participation, and adequately address the problems of sole source and old technology. A cyclic development is planned that will produce software and plug-compatible upgraded computers via new open competitions every five years.

B. (U) RELATED ACTIVITIES: This project is related to all Army battlefield automation systems as it will provide a standard family of computers for such systems. The instruction-set architecture to be used in the MCF is under joint Air Force-Army management and control based on a Memorandum of Agreement of 12 September 1980 between the Air Force Systems Command and the Army Materiel Development and Readiness Command. Related exploratory development work is conducted under 6.27.01.A, Tactical Automation Technology. Previous advanced development work on this project was conducted under Project D101 of 6.37.23.A. The Department of Defense Management Steering Committee for Embedded Computer Resources has coordination responsibility over all service computer standardization programs. MCF is the only DOD computer standardization project oriented to the technologies of 1984 and beyond with provision for continuing competition and technology insertion. In this regard, there is a close relationship between the MCF Project and the VHSIC Program (6.27.04.F). There is no unnecessary duplication of effort among the Army's MCF Program, the Navy's NECS and AN/AYK-14 Programs, and the Air Force's MIL-STD-1750 Program. Critical related projects within 6.37.23.A are the ADA Project (D101 and D185) and the MCF Intelligent Terminal Family (D101).

C. (U) WORK PERFORMED BY: Primary contractors have been performing work on MCF under 6.37.23.A, D101, and 6.27.01.A, A094. They are listed here for continuity: EG&G, Rockville, MD; Carnegie-Mellon University, Pittsburgh, PA; General Research Corporation, McLean, VA; Research Triangle Institute, Research Triangle Park, NC. The in-house developing organization responsible for the project is the US Army Communications Research and Development Command, Fort Monmouth, NJ.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Prior accomplishments were funded by 6.37.23.A, D101, and 6.27.01.A, A094. They are listed here for continuity. Extensive analyses of existing computer development and weapons system programs were

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Project: #0186
Program Element: #6.37.23.A
DOD Mission Area: #254 - Tactical Command and Control

Title: Military Computer Family (MCF)
Title: Command and Control
Budget Activity: #4 - Tactical Programs

conducted, and revised technical and acquisition strategies were developed for the Military Computer Family that should reduce risk and enhance industry interest. A contract was awarded to Carnegie-Mellon University for work on instruction-set architectures. Experimental evaluations were conducted of existing architectures to determine performance on military problems. An advanced architecture, called Nebula, was designed and has been evolving with the help of industry and other services. This architecture is oriented to the new DOD high-order language, ADA, and to realtime computation, and it provides 32-bit virtual address and security capabilities. Nebula (MIL-STD-1862) is now under joint Air Force-Army control based on a Memorandum of Agreement signed by AFSC and DARCOM. Nebula will be the architecture of the Military Computer Family. A contract was awarded to EG&G for work in the area of MCF hardware system architecture. MCF system requirements were delineated and computer interfaces specified. Following several major briefings to industry, review of preliminary specifications and Statement of Work for MCF, an RFQ was released on 11 July 1980. Proposals were submitted on 29 August 1980. A contract was awarded to General Research Corp. for the development of an MCF life-cycle cost model and for logistics support planning.

2. (U) FY 1981 Program: The FY 1981 MCF Program will be conducted under 6.37.23.A, D101, and 6.37.46.A, A094, and is described here to maintain continuity since this project will pick up work at the 6.3 level in FY82. The four-step bid evaluation for AD of MCF will be completed, and four competitive contracts will be awarded in April 1981. Evolution of the Nebula (MIL-STD-1862) instruction-set architecture will continue under joint Air Force-Army control. All of the MCF contractors will be involved in this activity. Completion of fine-tuning of Nebula is planned for November 1981, and the Nebula Control Board will issue MIL-STD-1862A, the final standard. Nebula support software and validation software will be designated and tested. A facility for testing MCF computers and interfaces will be planned and procurement initiated. Design of the MCF life-cycle cost model will be completed. Initiative will be taken to include the Navy in the joint Nebula control activity.

3. (U) FY 1982 Planned Program: Design plans for AD models of MCF computers will be completed, and a preliminary design review held. The Testability Program Plan, Reliability Program Plan, Reliability Prediction Report (first issue), Producibility and Engineering Plan, and Testability Program Report will be completed as will competing hardware functional designs of the computers and a final design review. Nebula evolution and refinement will be completed and MIL-STD-1862A will be issued. Development of the MCF test facility will be completed.

4. (U) FY 1983 Planned Program: The following competitive advanced development efforts will be completed: Technology Insertion Plan, Reliability Prediction, delivery of MCF computers and completion of acceptance tests, Final Producibility and Production Engineering Plan, Producibility Analysis, Nuclear Survivability Requirements Analysis, Life Cycle Cost Analysis, and DT I.

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Project: #D186
 Program Element: #6.37.23.A
 DOD Mission Area: #254 - Tactical Command and Control

Title: Military Computer Family (MCF)
 Title: Command and Control
 Budget Activity: #4 - Tactical Programs

5. (U) Program to Completion: Technology insertion designs will be completed, and additional quantities of AD models will be delivered and tested. Transitioning to full-scale development (to PE 6.47.27.A, D287) will commence. While this is not a "level-of-effort" project, it will be a continuing effort to permit the award of new competitively based (from AD forward) production contracts on a five-year cycle in order to avoid sole-source lock-in and technological obsolescence.

6. (U) Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Award of Competitive Advanced Development Contracts for the MCF	Apr 81	FY 1981
Final Instruction-Set Architecture (Nebula) Standardized (MIL-STD-1862A)	Nov 81	Not Shown
Technology Insertion Plans	Jan 82	Not Shown
Functional Designs of MCF	Jun 82	Not Shown
MCF Test Facility Operational	Dec 82	Not Shown
Delivery of AD Models of MCF	Jan 83	Not Shown
DT I Completed	Jul 83	Not Shown
Technology Insertion Design	Oct 83	Not Shown
Initiative of Next Cycle AD of MCF	Jun 84	Not Shown

7. (U) Resources (\$ in thousands):

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (Current Requirements	0	0	13656	13214	Continuing*	
Funds (as shown in FY 1981 submission)			Not Shown			

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Project: #D186

Program Element: #6.37.23.A

DOD Mission Area: #254 - Tactical Command and Control

Title: Military Computer Family (MCF)

Title: Command and Control

Budget Activity: #4 - Tactical Programs

*The MCF Program includes cyclic developments in order to avoid sole-source lock-in and technical obsolescence. This is the reason that the project is described as continuing. The estimated cost to complete the initial advanced development cycle is \$31000.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.26.A

DOD Mission Area: #216 - Land Combat Service Support

Title: Combat Support Equipment

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion Continuing	Total Estimated Costs Not Applicable
	TOTAL FOR PROGRAM ELEMENT	7528	6032	6824	8303		
DG01	Combat Engineer Equipment	2845	2814	3270	3353	Continuing	Not Applicable
DG14	Container Distribution Equipment	230	247	207	104	Continuing	Not Applicable
DK39	General Support Equipment	0	0	559	1397	Continuing	Not Applicable
DK41	POL Distribution Systems	3633	2503	1727	1688	Continuing	Not Applicable
D428	Tactical Rigid-Wall Shelters	820	468	1061	1761	Continuing	Not Applicable
D471	Camouflage	0	0	0	0	Continuing	Not Applicable
D526	Marine-Oriented Logistics Equipment	0	0	0	0	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Army requires new and advanced land combat service support equipment to meet the logistics support and mobility requirements of the current and future battlefield. The effectiveness and survivability of the combat forces in a hostile situation are highly dependent on supply capabilities. Vital cargo such as fuel, ammunition, food, water, and medical supplies must be delivered to field units in the required quantities, at the right time and location, and in useable conditions. Increased use of commercial containerships and fuel tankers to efficiently handle the large volumes of supplies requires military equipment capable of offloading, transporting, and handling containerized cargo and bulk fuels. Providing essential logistics resupply equipment is a primary objective of this program. This program also provides materiel that will increase the Army's tactical mobility, increase battlefield survivability, and reduce the logistics burden. A new family of standard, multipurpose tactical bridging will improve capabilities for crossing rivers and other natural barriers. New water purification equipment will efficiently provide potable water from any source, including nuclear-, biological-, and chemical-contaminated environments. The myriad of existing vans and shelters of various

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Program Element: #6.37.26.A
DOD Mission Area: #216 - Land Combat Service Support

Title: Combat Support Equipment
Budget Activity: #4 - Tactical Programs

sizes and types will be replaced by a new family of multipurpose tactical shelters. New hardened shelters will protect sophisticated communication/electronic equipment against nuclear, ballistic, and chemical/biological threats. New environmental control equipment (heating/air-conditioning) that is more efficient and highly reliable will be provided.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Funding is required to conduct Advanced Development (AD) of major components and subsystems for Bridging for 1985 and Beyond; access and egress systems for present inventory bridging; means to detect clandestine tunnels dug by hostile forces; components for a system to rapidly load ammunition into containers; bulk fuels distribution equipment to include large-capacity fabric storage tanks, rapidly emplaceable pipeline, low-temperature fuel dispensing, flexible hoseline, and field blending of fire-resistant fuels; equipment for cooling drinking water and monitoring water quality; a family of expandable and nonexpandable tactical shelters; and kits to provide protection for tactical shelters against nuclear, ballistic, and chemical/biological threats. Planned efforts in project D471 (Camouflage) have been deferred due to lack of approved user requirement documentation. Project D526 (Marine Oriented Logistics Equipment) has been terminated in response to Congressional direction to eliminate Army RDTE efforts on watercraft.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	7528	6032	6824	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	8576	6897	9630	Continuing	Not Applicable

The reduction in FY 1980 funding results from the combined effects of the following:

- DC01 - A \$50,000 reduction in funding based on refined cost estimates.
- DK39 - Deferral of all planned effort due to lack of approved user requirements documentation.
- DK41 - Deferral of planned effort on specific items due to lack of approved user requirements documentation.
- D428 - Additional funds reprogramed into project to accelerate development on hardening of shelters in response to increased emphasis on providing protection for critical weapons systems and operating personnel.

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Program Element: #6.37.26.A

Title: Combat Support Equipment

DOD Mission Area: #216 - Land Combat Service Support

Budget Activity: #4 - Tactical Programs

D471 - Deferral of planned effort due to lack of approved user requirements documentation.

The decrease of \$865 thousand in FY 1981 funding reflects the application of general Congressional reductions.

The net decrease in the FY 1982 funding requirement reflects the combined effects of the following:

DG01 - Increase in funds is required to resolve technical difficulties in time to meet the trilateral (US UK-GE) coordinated schedule for development of an interoperable family of tactical bridging.

DG14 - Reduction of the planned scope of effort.

DK39 - Deferral of planned effort on specific items due to revised priorities.

DK41 - Decreased funding requirements is due to realigning program to reflect incremental funding policies and deferral of planned effort on specific items due to revised priorities.

D428 - Increased funding requirement to support expanded scope of effort in response to the increased emphasis placed on the project in FY 1980.

D471 - Deferral of all planned effort due to lack of approved user requirements documentation.

D526 - Termination of the project in response to prior Congressional direction to eliminate Army RDTE efforts on watercraft.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable

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Program Element: #6.37.26.A

DOD Mission Area: #216 - Land Combat Service Support

Title: Combat Support Equipment

Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: This program supports Advanced Development (AD) of various items which are essential to the Army to provide the land combat support functions during combat and contingency operations. Included are: capabilities for rapid combat engineer construction; resupply of increasingly greater amounts of containerized cargo; mobile water purification units and water distribution equipment; environmental control for shelters and vehicles housing critical electronic equipment and personnel in all climates; resupply of bulk fuels, oils, and lubricants (POL); and tactical shelters to replace existing vans.

G. (U) RELATED ACTIVITIES: Coordination to avoid duplication and provide program guidance is accomplished through a trilateral (United States, United Kingdom, and Federal Republic of Germany) Memorandum of Understanding and the Steering Committee for Bridging for 1985 and Beyond, the Department of Defense Joint Container Steering Group, the Joint Committee on Tactical Shelters, the Program Advisory Group for Bulk Petroleum Fuels Distribution, and the DOD Executive Agent for Land-Based Water Resources. Related Exploratory Development programs are in Program Element (PE) 6.27.23.A, Clothing, Equipment, and Shelter Technology, and PE 6.27.33.A, Mobility Equipment Technology. Items in this PE progress to Engineering Development in PE 6.47.17.A, General Combat Support.

H. (U) WORK PERFORMED BY: In-house efforts are performed by the US Army Mobility Equipment Research and Development Command, Fort Belvoir, VA, and the US Army Natick Research and Development Command, Natick, MA. Current contractors include Pacific Car and Foundry, Renton, WA; Johns-Manville, Denver, CO; Rexnord Corporation, Milwaukee, WI; Airesearch Manufacturing Company, Phoenix, AZ; Foster-Miller Associates, Incorporated, Waltham, MA; PA Incorporated, Houston TX; General Research Corporation, McLean, VA; Goodyear Aerospace Corporation, Akron, OH; Arthur D. Little, Inc., Cambridge, MA; ILC Dover, Frederica, DE; Albany International Research Co., Dedham, MA; and Southwest Research Institute, San Antonio, TX.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Year Accomplishments: Technical feasibility testing of components for Bridging for 1985 and Beyond was completed, the results evaluated, and the International Final Concept Team recommended system concepts for Engineering Development. Fabrication of composite structural bridge elements and the design of expedient systems for access to and egress from wet gap crossing sites were initiated. Prototype components for tunnel detection systems were procured. A technology assessment and a cost and operational effectiveness analysis were completed, and the design concept was selected for a depot system to rapidly load ammunition into containers. An assessment of coated-fabric materials and manufacturing technology was completed and two manufacturers initiated fabrication of prototype 5,000-barrel-capacity bulk fuel storage

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Program Element: #6.37.26.A

DOD Mission Area: #216 - Land Combat Service Support

Title: Combat Support Equipment

Budget Activity: #4 - Tactical Programs

tanks. Continued development of components for low-temperature refueling systems included conducting development tests (DT I) on a bulk fuel transfer pump, initiating design of a fuel dispensing pump and fabrication of prototype hoses, drums, and storage tanks. Fabrication of prototype quick-connect pipeline couplings was initiated. Development of a mechanical pipe-joining system was continued. Design of a flexible hoseline system for short-haul fuel transfer was initiated. A concept design for nuclear hardening of S250 and S280 shelters was completed, and fabrication of prototypes for thermal and overpressure criteria testing was initiated. Development of kits for complexing the Army family of shelters was initiated.

2. (U) FY 1981 Program: Component fabrication and testing of modified girder, ramp, launcher, and transporter components of Bridging for 1985 and Beyond will be continued. Development of lightweight, high-strength bridge structural components will be continued. Development tests will be initiated on prototype access/egress systems for current bridging. Continued tunnel detection development will include evaluation of selected seismic and soil resistivity analysis techniques and the application of automatic data processing to reduction of field data. A container ammunition dunnage system for use with the rapid depot loading system will be developed and tested for compliance with transportation safety regulations. Fabrication of two competitive designs of a 5,000-barrel-capacity coated fabric fuel storage tank will be completed, and development and operational test (DT I/OT I) initiated. A rapidly emplaceable petroleum pipeline system will be procured and tested. Fabrication of a prototype refueling system components will be completed, and system design tests conducted. An experimental model of a unit for field mixing of fire-resistant fuel will be fabricated. A means for interconnecting rigid-wall shelters will be developed, and alternative structural designs will be evaluated. A prototype shelter with electromagnetic and radio frequency interference protection will be fabricated. Low-cost composite panels will be fabricated for evaluation with the family of Army standard shelters.

3. (U) FY 1982 Planned Program: Component testing of modified ramps, launcher, and the wheeled transporter for Bridging for 1985 and Beyond will be completed. Evaluation of the initial composite structural bridge members will be completed, and design of additional composite structural members and launch-mechanism components will be initiated. Development and operational tests will be conducted on the access/egress surfacing and placement systems for current bridging and on the egress system for swimming and fording vehicles. Prototype tunneling activity detectors will be procured and tested. The transfer vehicle subsystem for the Prestaged Ammunition Loading System will be designed and fabricated. Advanced Development will be initiated on a system for cooling drinking water in hot-arid climates and a water quality monitor. Operational testing of the 5,000-barrel coated-fabric fuel storage tanks and the rapidly emplaceable pipeline will be completed. Fabrication of development and operational test models will be completed for the flexible hoseline system, low-temperature fuel dispensing systems, and the field mixing and handling equipment for fire-resistant fuels. Kits to provide chemical/biological

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Program Element: #6.37.26.A

Title: Combat Support Equipment

DOD Mission Area: #216 - Land Combat Service Support

Budget Activity: #4 - Tactical Programs

agent, nuclear and ballistics protection for tactical shelters will be designed and fabricated. Fabrication of prototype, low-cost composite panels for the Army family of tactical shelters will be completed.

4. (U) FY 1983 Planned Program: Development of composite bridge structural and launch mechanism components will be continued. Development and operational tests and evaluation of the access/egress expedient surfacing system for current bridging will be completed. Development of access and egress systems for new bridging systems will be initiated. Advanced Development will be completed on the seismic, resistivity, and electromagnetic systems for tunnel detection. Exploration of geophysical techniques for deep tunnel detection will be continued. A systems evaluation of the rapid container ammunition loading system will be conducted and subsystem interface requirements verified. Advanced Development will be completed on the system for cooling water, the water quality monitor, the flexible petroleum hose/line system, the field blending equipment for fire-resistant fuels, the low-temperature refueling systems, and the large-capacity coated-fabric fuel storage tanks. Design of equipment for detection and rapid development and production of ground water sources will be initiated. Development of air-cycle air-conditioning units and a standard family of systems providing total environmental control will be initiated. Advanced Development of a 50-foot accordion shelter will be conducted. A shelter with nuclear, ballistic, chemical/biological agent protection kits will be fabricated for test. Hardware for interconnecting shelters will be fabricated for field evaluation.

5. (U) Program to Completion: This is a continuing program. Specific items will progress to Engineering Development (ED) upon completion of Advanced Development (AD), and new AD efforts will be initiated upon identification of critical system requirements.

FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.30.A

Title: Tactical Surveillance System

DOD Mission Area: #255 - Tactical Surveillance, Reconnaissance, and Target Acquisition

Budget Activity: #4 - Tactical Program

A. RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	11720	10933	-	-	Continuing	Not Applicable
D560	Tactical Surveillance System	11720	10933	-	-	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element supports the portion of the Army's Tactical Exploitation of National Capabilities (TENCAP) program advanced development work which is directed toward developing a tactical support system to receive, process, and disseminate intelligence/information from multiple sources which locates enemy units, activity and targets representing a general tactical threat. Systems developed will be the primary source of intelligence on enemy second-echelon forces. Such intelligence/information is essential to the tactical commander to enable him to fight and win while outnumbered in a high-intensity conflict. The tactical commander must have the capability to locate, identify, engage, and attrite superior enemy forces at maximum range to insure that a manageable combat power ratio exists in the main battle area. The tactical commander must also have the capability to seize the initiative from the enemy by blunting his strength and exploiting his weaknesses. In the TENCAP Program, advanced techniques are applied to exploit information collected from a variety of nationally controlled sensors which, in general, is not otherwise obtainable, and then provide that information to the tactical command and control environment in a sufficiently timely and useful form to greatly assist the commander in defeating the enemy.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Continue Advanced Development (AD) work on hardware/software interfaces between existing and future strategic and theater sensor systems and Army tactical exploitation systems. Begin prototype Tactical Imagery Exploitation System (Tacies) development. Conduct Tacies system/subsystem tests and demonstrations in conjunction with tactical exercises to assess the performance gains resulting from the use of new tactical surveillance systems.

D. BASIS FOR CHANGE BETWEEN FY 1982 and FY 1981 CONGRESSIONAL DESCRIPTIVE SUMMARIES: (\$ in thousands)

Program Element: #6.37.30.A

DOD Mission Area: #255 - Tactical Surveillance, Reconnaissance,
and Target Acquisition

Title: Tactical Surveillance System

Budget Activity: #4 - Tactical Programs

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	11720	10933		Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	11720	11886		Continuing	Not Applicable

(U) FY 1981 and FY 1982 changes are due to inflation adjustments.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.37.30.A

DOD Mission Area: #255 - Tactical Surveillance, Reconnaissance,
and Target Acquisition

Title: Tactical Surveillance System

Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: Data originating from a variety of strategic and tactical surveillance sensors must be transmitted to central collection points where the data can be processed and analyzed. The resulting tactical intelligence must then be rapidly disseminated and fused into the command and control environment in such a timely and useful form as to materially influence the land battle. Techniques and equipment which will provide for this rapid receipt, processing, and dissemination of intelligence data are being developed under this program.

G. (U) RELATED ACTIVITIES: Technological developments designed to shorten the time required to collect and disseminate information are related to this development. These areas include automated search procedures, data link and data compression technologies, and tactical identification and positioning. The use of satellite communications is being considered. This work is coordinated with appropriate departments and agencies. Program Element (PE) 6.47.40 (Tactical Surveillance Systems) covers engineering development (ED) work which is related to this program.

H. (U) WORK PERFORMED BY: RCA Corp., Camden, NJ; Aerospace Corp., El Segundo, CA; US Army Electronic Research and Development Command (ERADCOM), Adelphi, MD; Ford Aerospace Corp., Palo Alto, CA; Systems Planning Corp., Arlington, VA; MRI, Inc., McLean, VA; E-Systems, Inc., Garland, TX; General Dynamics Corp., San Diego, CA; General Electric Corp., King of Prussia, PA; DBA, Inc., Melbourne, FL.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: The systems interface elements for a demonstration system, the Digital Imagery Test Bed (DITB), interfacing with one collection system were completed and tested. Necessary experimental work was completed, and the DITB was prepared for an engineering demonstration. The Engineering demonstration was completed in fall 1979. Demonstration in a tactical environment (Reforger Exercise) was completed in fall 1980. System development for interface with a second collection system was continued. Advanced development (AD) of subsystems for an advanced exploitation system was continued.

2. (U) FY 1981 Program: Modification will begin to allow the DITB system to accept input from a new theater sensor. Correlation of new sensor data with other data will be evaluated. The DITB will be deployed to XVIII Abn Corps, Ft. Bragg, NC, for further operational evaluation. Improved communications and interfaces with the Interim Tactical ELINT Processor (ITEP) and all Source Analysis System (ASAS) will be developed. Development of specifications for a prototype Tactical Imagery Exploitation System (TIES) will begin based on analysis of FY80 demonstration results, FY81 operational evaluations, and competitive concept design studies completed in early FY81.

Program Element: #6.37.30.A

Title: Tactical Surveillance System

DOD Mission Area: #255 - Tactical Surveillance, Reconnaissance,
and Target Acquisition

Budget Activity: #4 - Tactical Programs

3. (U) FY 1982 Planned Program: Development of prototype TacIES will begin. Software development for tactical exploitation of TR-1 Advanced Synthetic Aperture Radar System (ASARS) data in TacIES will continue in coordination with USAF. The Digital Imagery Test Bed will be used to evaluate operational concepts and techniques developed for TacIES and to evaluate operator-system interfaces. Improved interfaces with the Interim Tactical ELINT processor (ITEP) and emerging All-Source Analysis System (ASAS) will be completed and evaluated. Software development to integrate data from a developing national sensor will begin.

4. (U) FY 1983 Planned Program: The TacIES prototype will be deployed to a tactical Corps, and operational evaluation will begin. TR-1/ASARS demonstrations and operational evaluations will be supported. Software development for integrating data from a new national sensor will continue.

5. (U) Program to Completion: This is a continuing program.

FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.37.A

Title: Antiradiation Missile Countermeasures (ARM-CM)

DOD Mission Area: #213-Ground Air Defense

Budget Activity: #4 - Tactical Program

A. RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion Continuing	Total Estimated Costs Not Applicable
	TOTAL FOR PROGRAM ELEMENT	4540	4622				
D181	Antiradiation Missile Countermeasures	4540	4622			Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEEDS:

This program element provides the broad, nonsystem-specific technology base for the development of countermeasures to the antiradiation missile threat. The program is oriented at developing countermeasures applicable to ground surveillance, counterbattery, and air defense radars, along with special classes of communications terminals. The effort addresses five areas of activity: threat evaluation and simulation; countermeasures development; laboratory simulation and testing; establishment and maintenance of a triservice field test capability; and support of Tri-Service Joint Working Group on Antiradiation Missile Countermeasures (ARM-CM).

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Continue analysis of threat information to provide simulations of enemy systems for the evaluation of ARM-CM effectiveness; update capabilities of generic seeker to emulate enemy systems and initiate reconfiguration of generic seeker to include postulated ARM seeker design responses to present ARM-CM's; provide field test instrumentation, field test support and data reduction for planned field tests of advanced development models of ARM-CM's for

Program Element: #6.37.37.A
DOD Mission Area: #213-Ground Air Defense

Title: Antiradiation Missile Countermeasures (ARM-CM)
Budget Activity: #4 - Tactical Program

the PATRIOT, FIREFINDER (AN/TPQ-37), and Air Force TPS-43E radars; continue development and test of passive decoy concept and a low-cost modular decoy (MODEC); continue development of postulated continuous wave (CW) ARM systems and development of countermeasures applicable to CW systems; continue analysis of anti-ARM radar technique for application to future radar system design; continue development of mainbeam ARM definition and countermeasures; continue analysis and development of active ARM-CM techniques; provide support to the Tri-Service ARM-CM Working Group and NATO ARM-CM analysis.

Program Element: #6.37.37.A
DOD Mission Area: #213-Ground Air Defense

Title: Antiradiation Missile Countermeasures (ARM-CM)
Budget Activity: #4 - Tactical Program

D. COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	4540	4622		Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	5545	4964		Continuing	Not Applicable

Decrease in FY 1980 resulted from reprogramming to higher priority programs. Decrease in FY 1981 and FY 1982 is due to budgeting constraints not anticipated in FY 1981.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

Program Element: #6.37.37.A
DOD Mission Area: #213-Ground Air Defense

Title: Antiradiation Missile Countermeasures (ARM-CM)
Budget Activity: #4 - Tactical Program

F. DETAILED BACKGROUND AND DESCRIPTION: The Army has fielded and has under development a variety of emitters which are susceptible to attack by location and tracking systems which utilize the radiation of the emitter as a tracking signature. These emitters are

These systems are relatively complex and expensive, and serve a critical role for the Army in the field. All are susceptible to enemy antiradiation missile attack in varying degrees. Given their criticality and susceptibility, it is imperative that ARM countermeasures be developed and tested vis-a-vis the known and projected threat. The objectives of this program are to characterize and simulate the known and projected threat missile systems, to develop appropriate countermeasures to provide laboratory and field test instrumentation, and to provide triservice data exchanges.

G. (U) RELATED ACTIVITIES: Development of antiradiation missile countermeasures is conducted by the three services with the Army being the lead service. The threat data and simulations, countermeasure technology, and field test instrumentation developed within this program are utilized within the specific ARM-CM development activities done in Program Elements 6.43.07.A (PATRIOT), 2.37.31.A (Improved Hawk), 6.43.09.A (ROLAND), and 6.37.29.A (Counterbattery Radar). The Navy has conducted work in Program Element 6.35.16N (Radar Surveillance Equipment), and by the Air Force in 6.39.18F (Electronic Warfare Technology), and 6.37.50F (Counter-Countermeasures Advanced Development). The field test instrumentation and simulations developed under project D181 directly support the Navy and the Air Force work. The three services routinely coordinate their respective service programs via the Tri-Service Joint Working Group on ARM-CM.

H. (U) WORK PERFORMED BY: The present contractors utilized in accomplishing this program are Computer Science Corporation, Huntsville, Alabama; General Dynamics, Pomona, California; HRB-Singer, State College, Pennsylvania; Brunswick Corporation, Defense Division, Costa Mesa, California; System Planning Corporation, Arlington, Virginia, and Huntsville Alabama; Malibu Research Associates, Inc., Santa Monica, California; Technology Services Corporation, Santa Monica, California and Silver Spring, Maryland; General Electric Corp, Syracuse, New York; Vought Corporation, Dallas, Texas; ESL Inc., Sunnyvale, California; Tektronix, Inc., Beaverton, Oregon; Hewlett Packard, Rockville, MD; and System Support Associates, Arlington, VA. The in-house developing organizations responsible for executing the program are Harry Diamond Laboratories, U.S. Army Electronic Research and Development Command (ERADCOM), Adelphi, Maryland; US Army Missile Command (MICOM), Redstone Arsenal, Alabama, Naval Weapons Center (NWC), China Lake, California.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

Program Element: #6.37.37-A
DOD Mission Area: #213-Ground Air Defense

Title: Antiradiation Missile Countermeasure: (ARM-CM)
Budget Activity: #4 - Tactical Program

1. (U) FY 1980 and Prior Accomplishments: In FY78 the generic seeker was developed for laboratory instrumentation; digital simulations of friendly ARM's were completed, and threat ARM simulation was initiated; analysis on the passive decoy concept was started; and the study of hardening techniques was initiated. In FY79 the generic seeker was utilized in the Radio Frequency Source Simulator at MCGOM, and hardware-in-the-loop simulations were performed in support of evaluation of ARM CM techniques for the HAWK and PATRIOT systems. The generic seeker was modified for mounting in the nose of a test aircraft with a realtime computer control to provide a "flyable" generic ARM seeker (FGAS) capability. A fighter aircraft-mounted instrumentation pod to be utilized with the FGAS was also developed for future field tests. The study of hardening techniques was completed. Development of threat ARM simulations continued. Feasibility studies of dual-mode (radio frequency-infrared) seeker technology were initiated in late FY79. Analysis of the feasibility of the mainbeam ARM concept continued during FY79. The low-cost modular decoy concept (MODEC) analysis, specification and tube development was started in late FY79. In FY80 the FGAS was integrated in an A-1 aircraft with the instrumentation pod and utilized in a HAWK ARM-CM field test in the third quarter of FY80. The feasibility analysis of the passive decoy concept was completed and breadboard hardware design started. Analysis of anti-ARM radar techniques for future radar design was initiated. Analysis of CW ARM homing methods and CM techniques against CW ARM's was started. Feasibility analysis of the main beam ARM concept and dual-mode seeker technology continued. Field test measurements relative to analysis of active ARM-CM techniques were made. Support in ARM CM analysis to NATO and support of the Tri-Service ARM-CM Working Group continued.

2. (U) FY 1981 Program: The flyable generic ARM seeker (FGAS) will be modified to improve its performance and provide additional discriminants relative to projected ARM seeker design. The FGAS with its instrumented aircraft will provide field test support for ARM-CM tests of PATRIOT, FIREFINDER (AN/TPQ-37) and the Air Force TSP-41E in the third and fourth quarter FY81. Threat ARM simulation development for use in ARM-CM effectiveness analysis will continue. The low-cost modular decoy (MODEC) prototype hardware should be completed in the third quarter of FY81, and field tests to evaluate the hardware will be conducted. Passive decoy breadboard hardware design and testing will continue. Analysis of anti-ARM radar techniques for future radar design will continue. Analysis of CW ARM homing methods and development of CM techniques against CW ARM's will continue. Analysis of the main beam ARM concept and dual-mode seeker technology as well as possible countermeasures against these projected threats will continue. Field test measurements relative to analysis of active ARM-CM techniques will continue, and some analysis on the feasibility of an anti-ARM missile system will be started. Modest efforts on determining the threat of a remotely piloted vehicle-ARM (RPV/ARM) combination will be initiated. Support of ARM-CM analysis for JAF and the Tri-Service ARM-CM Working Group will be continued.

3. (U) FY 1982 Planned Program: The FGAS with its instrumented aircraft will provide field test support for the Marine

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Program Element: #6.37.37.A

DOD Mission Area: #213-Ground Air Defense

Title: Antiradiation Missile Countermeasures (ARM-CM)

Budget Activity: #4 - Tactical Program

TFS-59 radar in the second quarter of FY82. Threat ARM simulation will continue. The brassboard hardware of the low-cost modular decoy will be initiated and should be completed by the end of FY82 or early FY83. Passive decoy brassboard hardware will be initiated. Analysis of anti-ARM radar techniques for future radar design will be completed. CW countermeasure development will be initiated as well as countermeasures development for the projected threats of main beam ARM and the dual-mode ARM. Analysis of the anti-ARM missile system concept will be completed. A feasibility analysis of a high-energy radio frequency kill concept will be initiated. An assessment of the impact of advanced ARM threats including main beam ARM's, dual-mode ARM's and RPV ARM's will be started. The design and construction of an Advanced Generic seeker and support instrumentation as a test instrument to emulate projected threats will be initiated. Support for NATO and the Tri-Service ARM-CM Working Group will be continued.

4. (U) FY 1983 Planned Program: Threat ARM simulation will continue. The Advanced Generic seeker and support instrumentation will be completed and tested. Test support for new ARM-CM techniques will be provided. The low-cost modular decoy and passive decoy brassboard hardware will be completed and evaluated. Support for NATO and the Tri-Service ARM-CM Working Group will be continued.

5. (U) Program to Completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.40.A Title: Division Air Defense Command and Control (SHORAD-C2 System)
DOD Mission Area: #213 - Ground Air Defense Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	3000	14085	13378	12562	16092	59117
D593	Short-Range Air Defense Command and Control (SHORAD-C2 System)	3000	14085	13378	12562	16092	59117

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Short-range air defense (SHORAD) command and control is provided thru three major elements: A sensor to provide aircraft position data, command and controlling information provided to enhance the air defense system gunner's capability in effectively engaging the target, and a communications medium which provides for the exchange of controlling and sensor information. The present manual SHORAD command and control system furnishes these elements with marginal effectiveness. When considering the improved short-range air defense weapon capabilities coupled with increased capability of threat aircraft, the present command and control system does not support the force commander's requirement to manage air defense. The shortfalls in the flow of air battle information results in slow, error-prone dissemination of airspace control orders by SHORAD Commanders, incomplete and inaccurate engagement information to SHORAD gunners, and untimely and inaccurate sensor data to the entire system. The impact of these shortfalls causes missed opportunities to engage enemy aircraft, the useless expenditure of air defense munitions through the simultaneous engagement of a single aircraft by two or more weapon systems, and increased risk to friendly aircraft. A new SHORAD command and control system is necessary to improve the effectiveness of SHORAD weapons and overcome present shortfalls by integrating weapons, sensors and data devices into a functional system. This will be accomplished through the use of digital processing of target information, improve dissemination of air threat warning and weapon control orders, the introduction of additional instrumentation to allow timely and accurate presentation of appropriate battle information at the gunner position, and expanded communication support. Initially, in an effort to support the earliest practical deployment of a viable command and control system that fulfills a near-term requirement, the use of already-developed hardware is necessary. This initial effort may be complemented and expanded through state-of-the-art technology and procurement to provide an "upgraded system" commensurate with long-term requirements.

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Program Element: #6.37.40.A

DOD Mission Area: #213 - Ground Air Defense

Title: Division Air Defense Command and Control (SHORAD-C2 System)

Budget Activity: #4 - Tactical Programs

C. (U) BASIS FOR 1982 RDTE REQUEST: The requested funds will continue the effort begun in FY80, including formal DT/OT activity scheduled to start in 4th Qtr FY81. Requested funds are needed for operation, modification and support of test hardware and software, collection and analysis of test data, system engineering, program management, development of an integrated logistics support package and engineering development of sensor. Available FY81 SHORAD C² funds will also be used for sensor engineering development.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission ^{1/}
Initiate System Design ^{1/}	2Q80	2Q79
Concept Feasibility ^{1/} Demonstration	1Q81	4Q80
Sensor Decision ^{2/}	2Q81	-
Complete System Design ^{1/}	3Q81	2Q80
Start DT/OT I	4Q81	-
ASARC I (changed from Validation IPR) ^{3/}	2Q82	1Q81
Testbed, Upgraded System ^{4/}	none	4Q83
Validation ASARC, Upgraded System ^{4/}	none	4Q83

¹ SHORAD C² Program funds were used to initiate system design in FY80, not FY79. The design will be completed after the Concept Feasibility Demonstration (CFD). The CFD was delayed pending the acquisition of a sensor capable of producing the required data.

² A General Officer Panel will convene to select the most suitable (for acquisition and/or modification) sensor to support deployment.

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Program Element: #6.37.40.A

Title: Division Air Defense Command and Control (SHORAD-C) System

DOD Mission Area: #213 - Ground Air Defense

Budget Activity: #4 - Tactical Programs

- 3 ASARC I was changed to accommodate the need to modify a sensor to support the testing.
- 4 The program for the "Upgraded System" has not been completely formulated and approved.

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Program Element: #6.37.40.A

Title: Division Air Defense Command and Control (SHORAD-C2 System)

DOD Mission Area: #213 - Ground Air Defense

Budget Activity: #4 - Tactical Programs

D. (U) COMPARISON WITH FY81 RDTE Request: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	3000	14085	13378	28654	59117
Funds (as shown in FY 1981 submission)	3000	15583	17112	26286	61981

D593 - The difference in funding for FY81 and FY82 represents reduced requirements for sensor modification because of the delay in the selection of a sensor for SHORAD command and control. That selection should be made in 2Q81. As a result of the delay, some funds that were to be used in FY81 will be carried to 1Q82, thereby reducing FY82 funding requirements.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
Other Procurement, Army						
Funds (current requirements)	0	0	0	33674	64959	98633
Funds (as shown in FY 1981 submission)				13370 1/	281430	294800
Quantities (current requirements)					20	20
Quantities (as shown in FY 1981 submission)					20	20

1/ - The FY81 submission did include procurement funds for an "Upgraded System." Since a program for an "Upgraded System" has not been completely formulated and approved, the procurement funding requirement has been reduced accordingly.

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Program Element: #6.37.40.A

Title: Division Air Defense Command and Control (SHORAD-C2 System)

DOD Mission Area: #213 - Ground Air Defense

Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: To fight and win on the battlefield in the 1980's, Short Range Air Defense systems require an integrated command and control (C²). A SHORAD Command and Control system will improve the effectiveness of SHORAD systems by providing precise and timely target information, including tentative target identification, to the SHORAD gunner. This will allow the gunner more time for positive visual identification, and allow engagement of targets in the forward aspect mode of, then, newly acquired weapons. That is, the gunner's effectiveness in selecting only hostile targets for earliest possible engagement will be enhanced because he will be able to identify and engage targets before the targets pass overhead. This function, called "cueing," will be performed by acquiring target data from a sensor (radar), and transmitting that data to SHORAD gunners via a digital data link over the Army's current VHF radios. The architecture for the cueing system will be determined by the Concept Feasibility Demonstration planned to start in 1QFY81. The sensor must have an automated capability for extracting target and transmitting target data with frequent updates as the target moves. The gunner must be furnished a device which will receive and display this improved target position data in such a way that the gunner can more accurately determine target direction (within 10 degrees in azimuth) than is possible with the currently deployed system. The SHORAD C² System will also provide an improved interface between the SHORAD battalion and a nearby HAWK or Patriot battalion. This improved interface will be used to provide the second major function of the SHORAD C² system, called "alerting." Alerting is described as warning all friendly ground forces of impending air attack so that those forces may take protective/defensive measures. This interface will be implemented by extracting information from the AN/TSQ-73 fire distribution system at the HAWK battalion or from the Patriot Command/Control Set, transmitting that information by HF radios directly to several locations simultaneously in the SHORAD battalion, including the battalion's liaison offices at the maneuver units. Alerting information can be transmitted to the lower echelons by using FM radio nets within the maneuver units. The use of HF radios will greatly expedite this alerting information by eliminating several retransmissions of the data required by use of the shorter range over VHF radios. The alerting system may be automated or manual, as determined by the CDF. The alerting system, in addition to the function described above, will also expedite the transfer of general weapon control instructions from the NATO command through the Patriot or HAWK battalions to the SHORAD battalion. Once these weapon control instructions are within the SHORAD battalion, the cueing system will be used down to the SHORAD gunners. When the HF and VHF radios are replaced in the late 1980's, the SHORAD C² system (both cueing and alerting) will be supported by the PLPS/JTIDS (Position Locating and Reporting System/Joint Tactical Information Distribution System) Hybrid. The sensor to be used for initial operational deployments of the cueing capability will be selected by a General Officer Panel in 1981. This sensor will be selected based upon several criteria, including availability, cost of modifications and/or additional sensors, and growth potential to meet the changing threat through the 1980's. This General Officer Panel should also select efforts to assure timely availability of a follow-on sensor in the 1980's.

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Program Element: #6.37.40.A
DOD Mission Area: #213 - Ground Air Defense

Title: Division Air Defense Command and Control (SHORAD-C2 System)
Budget Activity: #4 - Tactical Programs

G. (U) RELATED ACTIVITIES:

<u>System</u>	<u>Program Element #</u>
Roland	6.43.09.A
Chaparral	2.37.30.A
Divad Gun	6.43.18.A
Vulcan	2.37.41.A
Stinger	6.43.06.A
FAAR	2.37.30.A

The operation and/or configuration of the above systems will be directly affected by the SHORAD command and control system. Unnecessary duplication of effort will be avoided by continued direct contact and exchange of status information between and among the project offices involved.

H. (U) WORK PERFORMED BY: Program management will be performed by the Project Manager, Air Defense Command and Control Systems (ADCCS), assigned to the US Army Missile Command (MICOM), Redstone Arsenal, Alabama. Contracted efforts will be performed by competitively selected contractors, except in the case of nondevelopmental hardware, in which case, hardware and any necessary modifications will be acquired through the office currently responsible for that hardware. New software and test support unique to the SHORAD C² System, but for nondevelopmental hardware, may be acquired directly from the prime contractor for that hardware on a sole-source basis.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: The US Army Communications Research and Development Command (CORADCOM) and the US Army Air Defense School (USAAADS) coordinated a study titled "Division Air Defense Command and Control Analysis," which resulted in conclusions that operational effectiveness, reaction time, kill ratio, and aircraft identification could be improved with the introduction of automated command and control for SHORAD weapons. In-house efforts at CORADCOM were begun to define C² systems, exploiting existing off-the-shelf hardware. CORADCOM allocated \$600 thousand from program element 6.27.01.A, Project W92, Communications Technology, in FY 1979 to initiate a program that would lead to development of an improved SHORAD C² system to meet urgent requirements in Europe and evolve into an "upgraded system" that could more fully exploit the capabilities of new weapons systems. Concept development for the overall system was initiated. The SHORAD C² Program was placed under management of the Project Manager, Air Defense Command and Control Systems, in FY79. In FY80 hardware and software were acquired to initiate a Concept Feasibility Demonstration.

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Program Element: #6.37.40.A

DOD Mission Area: #213 - Ground Air Defense

Title: Division Air Defense Command and Control (SHORAD C² System)

Budget Activity: #4 - Tactical Programs

2. (U) FY 1981 Program: The Concept Feasibility Demonstration (CFD) will demonstrate various architecture for Cueing and for Alerting. A Sensor Selection Panel will decide which sensor is most suitable for acquisition and/or modification to support the Cueing effort. Start of DT/OT I for Cueing is dependent upon which sensor is selected.

3. (U) FY 1982 Planned Program: Acquisition and/or modification of a sensor to support SHORAD C² function will begin. The schedule for testing and/or technological base needs is dependent upon the sensor decision, but all necessary experimental work will be performed and the proposed system will be ready for full-scale development prior to proceeding with procurement of hardware and software for DT/OT.

4. (U) FY 1983 Planned Program: DT/OT II and III for the Cueing capability will be initiated, depending upon availability of the selected sensor. For the Alerting capability, all necessary experimental work will have been performed and the proposed system will be ready for full-scale development.

5. (U) Program to Completion: Depending upon which sensor is selected for the Cueing capability, production of hardware is expected to support initial deployments in FY85 or later. The alerting capability should be ready for initial deployments in FY86.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.45.A

Title: Tactical Electronic Support Measures Systems

DOD Mission Area: #255 - Tactical Surveillance,
Reconnaissance, & Target Acquisition

Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	15030	12576			Continuing	Not Applicable
	QUANTITIES						Not Applicable
D907	Tactical Electronic Surveillance Systems	10781	9955	-	-	Continuing	Not Applicable
D925	Tactical Electronic Warfare and Intelligence Command and Control Systems	4249	2621	-	-	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program encompasses the Army's Tactical Exploitation of National Capabilities (TENCAP) initiatives and Tactical Electronic Warfare/Intelligence (EW/I) Command and Control Systems for use by Division, Corps, and echelon above Corps commanders. The scope of the program is to identify and/or refine initial design concepts and to provide for advanced development through prototype fabrication and testing. The past decade has witnessed major technical advances and the introduction of increasingly sophisticated weapons and intelligence-gathering systems into the strategic and tactical operations of military forces both friendly and opposing forces. Army commanders at all echelons must have an intelligence system which will provide early detection, identification, and location of these enemy critical nodes in order to employ our own forces and weapons for effective enemy attrition. The systems in this program provide for the development of strategic intelligence collection interfaces with tactical operations and the development of an automated management, control, analysis, data reduction, and reporting system for generation of timely and effective combat intelligence and electronic warfare information and control of EW/I assets.

Program Element: #6.37.45.A

Title: Tactical Electronic Support Measures System

DOD Mission Area: #255 - Tactical Surveillance,
Reconnaissance, & Target Acquisition

Budget Activity: #4 - Tactical Programs

C. (U) BASIS FOR FY 1982 RDTE REQUEST:

1. (U) Pending the Army program modifications based on implementation of the Joint Tactical Fusion Plan, complete advanced development of the SIGINT/EW subsystem (SEMS) of the All-Source Analysis System (ASAS). A Corps-level prototype module with attendant software will continue to be fabricated. Hardware and software will be evaluated.

2. (U) Continue investigation of applications to exploit strategic sensor programs.

D. COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	15030	12576		Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	15119	12756		Continuing	Not Applicable

The decrease in FY81 is due to a general Congressional Reduction. The increase shown in FY 1982 is due to additional advanced development efforts required to refine, stabilize, and finalize software design and code, and conduct verification testing of the advanced model of the ASAS/SEMS (Project D925).

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands): Not Applicable.

Program Element: #6.37.45.A

DOD Mission Area: #255 - Tactical Surveillance,
Reconnaissance, & Target Acquisition

Title: Tactical Electronic Support Measures Systems

Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is to establish the technical feasibility and military potential of projects being developed in two functional areas: tactical electronic surveillance (D907), and tactical electronic warfare intelligence (EWI) command and control (D925). All items are non-Signals Intelligence (SIGINT)/Intelligence-Related Activities (IRA). Project D907 includes the development of equipment and systems which collect, process, and disseminate intelligence/information from a variety of strategic and tactical electronic surveillance sensors to locate and identify enemy units, activity, and targets. Project D925 encompasses development of automated, centralized tactical facilities for analysis, integration, and reporting of the collection from, and management of, all the Army's tactical intelligence and electronic warfare (EW) resources, as well as integrating data from national, joint, and allied sensor systems.

G. (U) RELATED ACTIVITIES: Related developments are conducted by the Air Force, Navy, and NSA. Coordination is effected by the exchange of technical reports, attendance at scientific meetings and conferences, joint participation in subgroups and working panels. In addition, formal requirements documents of each Service are exchanged, reviewed, and commented upon by other Services. Coordination is also accomplished as part of the program reviews conducted by the Office of the Secretary of Defense (Under Secretary for Research and Engineering).

H. (U) WORK PERFORMED BY: The major contractors for the two projects are: Aerospace Corp, El Segundo, CA; GTE Sylvania, Mountain View, CA; TRW, Incorporated, Redondo Beach, CA; and RCA Corporation, Burlington, MA. In house developing organizations are: US Army Electronics Research and Development Command (ERADCOM), Adelphi, MD; US Army Communications Research and Development Command, Fort Monmouth, NJ; Project Manager, All-Source Analysis System, Vint Hill Farms, Warrenton, VA; US Army Electronic Warfare Laboratory, Fort Monmouth, NJ; and US Army Materiel Development and Readiness Command (DARCOM) Alexandria, VA.

Program Element: #6.37.45.A

DOD Mission Area: #255 - Tactical Surveillance,
Reconnaissance, & Target Acquisition

Title: Tactical Electronic Support Measures Systems

Budget Activity: #4 - Tactical Programs

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments:

a. (U) D907 - Studies were completed. System design was completed to interface with two strategic electronic surveillance systems. Two Interim Tactical ELINT Processors (ITEP's) were developed and deployed for operational evaluation and limited operational capability.

b. (U) D925 - Advanced Development of the Signal Intelligence/Electronic Warfare (SIGINT/EW) subsystem (part of the All-Source Analysis System (ASAS)) and prototype fabrication was initiated. Development is scheduled to continue in advanced development through 1982 because of the necessity to structure the control and processing systems in consonance with the technologies derived from the Battlefield Exploitation and Target Acquisition (BETA) program and the Technical Control and Analysis Center (Division) (TCAC(D)) (see PE/Project 6.43.21.A/D926-All-Source Analysis System).

2. (U) FY 1981 Program:

a. (U) D907 - Continue development and improvement of strategic sensor interfaces to enhance tactical utility. Continue ITEP operational evaluation.

b. (U) D925 - Advanced Development of the ASAS SIGINT/EW module will continue. The hardware will be integrated into tactical shelters, and computer software will be designed and coded, and testing will begin. The TCAC(D) software package will be delivered to the government and tested. The Joint Tactical Fusion Program (JTFF) will be initiated which may revise this strategy. However, as of the date of this summary, specific modifications have not been defined.

3. (U) FY 1982 Planned Program:

a. (U) D907 - Deploy additional ITEP systems. Continue joint programs to enhance tactical utility of strategic systems.

b. The JTFF should be fully implemented, and a joint program strategy initiated. Pending any program modifications, advanced development of the ASAS/SEWS will be completed. Hardware and software will be evaluated and accepted from the contractor. DT/OT I will be conducted.

Program Element: #6.37.45.A

Title: Tactical Electronic Support Measures Systems

DOD Mission Area: #255 - Tactical Surveillance,
Reconnaissance, & Target Acquisition

Budget Activity: #4 - Tactical Programs

4. (U) FY 1983 Planned Program:

- a. (U) D907 - Continue analysis of strategic sensors and advanced development of strategic interfaces.
- b. (U) D925 - Complete DT/OT I of ASAS/SEWS. Initiate development of flat-panel display and interactive color graphic terminal.

5. (U) Program to Completion: This is a continuing program. Development under this element will normally be transferred to engineering development, Program Element, 6.47.45.A, Tactical Electronic Surveillance Systems, and Program Element 6.43.21.A, or Joint Tactical Fusion Program.

FY 1982 RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D907

Program Element: #6.37.45.A

DOD Mission Area: #255 - Tactical Surveillance,
Reconnaissance and Target Acquisition

Title: Tactical Electronic Surveillance System

Title: Tactical Electronic Support Measures Systems

Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: This project supports the Army's Tactical Exploitation of National Capabilities (TENCAP) program advanced development (AD) work which is directed toward developing a tactical support system to collect, process, and disseminate electronic intelligence/information which locates and identifies enemy units, activity, and targets representing a general tactical threat. The systems developed will be the primary source of intelligence on enemy second-echelon forces. Data originating from a variety of strategic and tactical electronic surveillance sensors must be transmitted to tactical echelon central collection points where the data can be processed and analyzed. The resulting tactical intelligence must then be rapidly disseminated and fused into the command and control environment in such a timely and useful form so as to materially influence the land battle. Techniques and equipment which provide for this rapid receipt, processing, and dissemination of intelligence data are being developed under this program.

B. (U) RELATED ACTIVITIES: Technological developments designed to shorten the time required to collect and disseminate information are related to this development. These areas include automated search procedures, data link technologies, tactical identification and positioning, and data reduction/filtering. The potential of satellite communications is being considered. This work is coordinated with the appropriate offices at the national level to avoid duplication of effort.

C. (U) WORK PERFORMED BY: Aerospace Corporation, El Segundo, CA; US Army Electronics Research and Development Command (ERADCOM), Adelphi, MD; US Army Communications Research and Development Command, Fort Monmouth, NJ; MRJ Inc., Fairfax, VA.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Studies were completed which provide the technical basis for the equipment, techniques, systems development and interface definition with three strategic systems and four theater/tactical systems. Advanced development work was initiated on one strategic electronic surveillance system to make it more responsive to tactical commanders' needs. System design was completed for interface with two strategic electronic surveillance systems. Two Interim Tactical ELINT Processors (ITEP's) were developed and deployed for operational evaluation and limited operational capability. Both ITEP's are performing well and are providing excellent support to Army Corps.

Project: #D907

Program Element: #6.37.45.A

DOD Mission Area: #255 - Tactical Surveillance,
Reconnaissance and Target Acquisition

Title: Tactical Electronic Surveillance System

Title: Tactical Electronic Support Measures Systems

Budget Activity: #4 - Tactical Programs

2. (U) FY 1981 Program: Continue development and improvement of strategic sensor interfaces to enhance tactical utility and reduce communications requirements. Continue Interim Tactical ELINT Processor (ITEP) operational evaluation and develop improved software to enhance tactical support capability of deployed ITEP's based on these evaluations. Develop improved communications and interfaces with the Digital Imagery Test Bed (DITB), the emerging All-Source Analysis System (ASAS), and the prototype Tactical Imagery Exploitation System (TactIES).

3. (U) FY 1982 Planned Program: Continue advanced development work on joint programs to enhance tactical utility of strategic sensors. Continue development of communications and interfaces between ITEP, prototype TactIES, and ASAS. Perform technical analysis of potential utility of developing strategic sensors.

4. (U) FY 1983 Planned Program: Based on ITEP experience and strategic systems advanced configuration, initiate design for fully operational Tactical ELINT Processor (TEP) to be developed in consonance with the future strategic ELINT sensor mix and the ASAS. Continue analysis of developing strategic sensors with the objective of enhancing tactical utility early in the program.

5. (U) Program to Completion: This is a continuing program.

6. (U) Major Milestones: Not applicable.

7. Resources (\$ in thousands):

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>to Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
RDTE						
Funds (current requirements)	10781	9955			Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	10781	10159		-	Continuing	Not Applicable

(U) The reduction in FY81 was due to Congressional authorization reduction. The increase in FY82 is due to inflation adjustment.

FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: # D925

Title: Tactical Electronic Warfare Intelligence
Command and Control Systems

Program Element: #6.37.45.A

Title: Tactical Electronic Support
Measures System

DOD Mission Area: #255 - Tactical Surveillance,
Reconnaissance, and Target Acquisition

Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION:

1. The past decade has witnessed major technical advances and the introduction of increasingly sophisticated weapons and intelligence gathering systems into the strategic and tactical operations of military forces, both friendly and opposing. Army commanders at all echelons must have an intelligence system which will provide early detection, identification, and location of these enemy critical nodes in order to employ our own forces and weapons for effective enemy attrition. This project provides for the advanced development of the All Source Analysis System (ASAS),

2. (U) Based on summer 1980 Congressional guidance to redirect the BETA project, the Services have submitted a Joint Tactical Fusion Plan (JTFFP) to the Office of the Secretary of Defense (OSD). This plan describes a program for the joint development and acquisition of a tactical correlation/fusion capability for the Services and includes the current ASAS and BETA projects. The proposed objective is to acquire service systems at the earliest possible date in a joint program which ensures interoperability within and among services. The program will:

a. (U) Provide an automated capability to support joint air/ground combat operations in near-realtime.

b. (U) Make maximum use of the investment in the Battlefield Exploitation and Target Acquisition (BETA) project by incorporating it into development of the Army's All Source Analysis System (ASAS), the Air Force's Automated Tactical Fusion Division (ATFD), and into theater fixed facilities, as appropriate.

c. (U) Provide the ASAS the required Sensitive Compartmented Information (SCI) capability by maturing and incorporating the Army's Quick Reaction Capability (QRC) Technical Control and Analysis Center (Division) (TCAC(D)) and ASAS/Signals Intelligence (SIGINT) EW Subsystem (SEWS) Advanced Development Model (ADM) into ASAS.

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Project: # D925

Title: Tactical Electronic Warfare Intelligence
Command and Control Systems

Program Element: #6.37.45.A

Title: Tactical Electronic Support
Measures System

DOD Mission Area: #255 - Tactical Surveillance,
Reconnaissance, and Target Acquisition

Budget Activity: #4 - Tactical Programs

d. (U) Use an incremental approach to development and procurement to minimize cost and duplication to the extent allowed by operational necessity and service-unique requirements.

e. (U) Use Command and Control (C2) architectures defined by the Services.

f. (U) Comply with Congressional direction, Department of Defense Directives and other applicable guidance.

3. (U) The Joint Tactical Fusion Plan (JTFF), approved by the Office of the Secretary of Defense on 5 December 1980, will be the conceptual framework from which to evolve a Program Manager Charter, a program development plan, and a system acquisition strategy. These programmatic documents will be completed by June 1981. Therefore, strategies portrayed in this descriptive summary (and project D926, PE 6.43.21.A) are subject to modification as the Army develops its revised program.

8. (U) RELATED ACTIVITIES: Related developments are conducted by the Air Force, Navy, and NSA although these efforts will be redefined upon implementation of the Joint Tactical Fusion Program. Current coordination is effected by the exchange of technical reports, attendance at scientific meetings and conferences, joint participation on subgroups and working panels. In addition, formal requirements documents of each service are exchanged, reviewed, and commented upon by other services. Coordination is also accomplished as part of the program reviews conducted by the Office of the Secretary of Defense (Under Secretary for Research and Engineering). The following Air Force/Navy/NSA PE's apply: 6.43.21.A and 6.43.21.F, Joint Tactical Fusion System; 6.47.10.1, Reconnaissance Electronic Warfare Equipment; 6.37.55.A, Tactical Electronic Countermeasures, and 3.56.85.G, Tactical Cryptologic Program. There is no unnecessary duplication of effort among services and agencies.

C. (U) WORK PERFORMED BY: The major contractor for the current advanced development effort of the All Source Analysis System is RCA Corporation, Burlington, MA. In-house developing organizations are: US Army Electronics Research and Development Command (ERADCOM), Adelphi, MD; Project Manager, All Source Analysis System, Vint Hill Farms, Warrenton, VA; US Army Electronic Warfare Laboratory, Fort Monmouth, NJ; and US Army Materiel Development and Readiness Command (DARCOM) Alexandria, VA.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

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Project: # D925

Title: Tactical Electronic Warfare Intelligence
Command and Control Systems

Program Element: #6.37.45.A

Title: Tactical Electronic Support
Measures System

DOD Mission Area: #255 - Tactical Surveillance,
Reconnaissance, and Target Acquisition

Budget Activity: #4 - Tactical Programs

1. (U) FY 1980 and Prior Accomplishments: Advanced development of the Signal Intelligence/Electronic Warfare subsystem (SEWS) of the All Source Analysis System (ASAS) and prototype fabrication were initiated. Effort consists of development of one Corps-level, 5-shelter prototype model. Development is currently scheduled to continue in Advanced Development (AD) into FY 1982; however, this strategy may be revised based on the Joint Tactical Fusion Programs. (See PE/Project 6.43.21.A/D926-Joint Tactical Fusion Program).

2. (U) FY 1981 Program: The ASAS/SEWS will continue in advanced development. The hardware will be integrated into tactical shelters, and computer software will be designed, coded, and testing will begin. The TCAC(D) software package will be delivered to the government and tested. The Joint Tactical Fusion Program (JTFF) will be initiated which may revise the strategy described above. However, as of the date of this summary, specific modifications have not been defined.

3. (U) FY 1982 Planned Program: The JTFF should be fully implemented with a joint program strategy and development plan. Pending any program modifications, advanced development of the ASAS/SEWS will be completed. Hardware and software will be evaluated and accepted from the contractor. DT I/OT I will be conducted. The TCAC(D) will be deployed. (See Project D926, para. D1.)

4. (U) FY 1983 Planned Program: Pending any JTFF modifications, DT I/OT I of the ASAS/SEWS will be completed. A large, single-color, flat-panel display product improvement will be initiated to support the evolutionary design of the ASAS. The ASAS/SEWS ADM software is utilized as operational software in the TCAC(D), a Quick Reaction Capability (QRC) system procured for the European Divisions and one CONUS unit with FY 1979 OPA dollars. Evolutionary software improvements, based upon field-generated requirements, will continue to be developed and integrated into the ASAS.

5. (U) Program to Completion: Software improvements will continue. A multicolor flat-panel display and a video disc PIP will be initiated. These components will be integral to the ASAS and are required to support the evolution of the ASAS from the 1970's computer technology into the very large-scale integrated circuit (VLSI) technology of the 1980's.

6. (U) Major Milestones: Not applicable at this time. Will be prescribed based on Joint Tactical Fusion Plan Acquisition strategy and official designation of the ASAS as a major system.

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Project: # D925

Title: Tactical Electronic Warfare Intelligence
Command and Control Systems

Program Element: #6.37.45.A

Title: Tactical Electronic Support
Measures System

DOD Mission Area: #255 - Tactical Surveillance,
Reconnaissance, and Target Acquisition

Budget Activity: #4 - Tactical Programs

7. Resources: (\$ in thousands)

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>to Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
RDTE						
Funds (current requirements)	4249	2621			Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	4245	2597	1	1	Not Shown Continuing	Not Applicable

Quantities: Not applicable.

Other Appropriations: Not applicable.

The funding level differences in FY 1980 and 1981 are attributable to minor budgetary adjustments. \$5000 thousand increase shown in FY 1981 is due to additional advanced development efforts required to refine, stabilize, and finalize software design and code and conduct verification testing of the advanced development model of the ASAS/SEWS.

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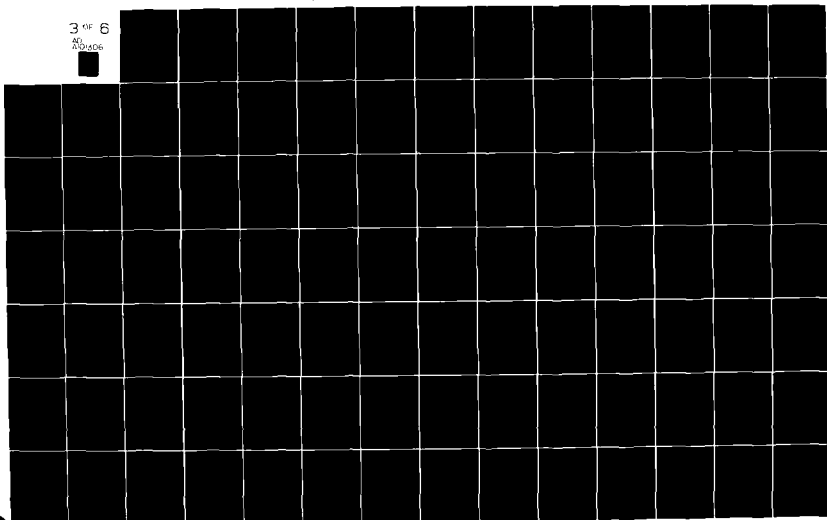
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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.46.A

DOD Mission Area: #256 - Tactical Communications

Title: Single Channel Ground and Airborne Radio System (SINCGARS)

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (Project Listing): (\$ in thousands)

<u>Project Number</u>	<u>Title</u>	<u>FY80 Actual</u>	<u>FY81 Estimate</u>	<u>FY82 Estimate</u>	<u>FY83 Estimate</u>	<u>Additional To Completion</u>	<u>Total Cost Estimated</u>
	TOTAL FOR PROGRAM ELEMENT	20475	15714	15526	9135	1000	76695
D555	Single Channel Ground and Airborne Radio Subsystem (SINCGARS)	20475	15714	15526	9135	1000	76695

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the advanced development of the Very High Frequency (VHF) Single Channel Ground and Airborne Radio System - (SINCGARS-V) and selected ancillary devices. SINCGARS is the future combat net radio (push-to-talk netted operations) replacing the current VRC-12 series, and is the primary means of communications for armor, artillery, and infantry forces. It is used primarily from brigade down to platoon. Configurations consist of manpack, vehicular, and aircraft. Larger and less mobile radios capable of communications via multichannels (12, 24, etc.) through the means of multiplexing equipment are not covered under this element. In addition to providing a radio with improved maintainability and reduced size and weight, SINCGARS-V will satisfy the need for a tactical radio system to operate in an electronic countermeasure (ECM) environment. Technique being validated is frequency hopping (FH).

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Funds are requested for the continuation of the SINCGARS-V contractual effort to include system test and evaluation of the Advanced Development Prototypes, internal support, and preparation for the next decision milestone in FY83. Funds are also requested for contract awards for Advanced Development of the Steerable Null Antenna Processor (SNAP II), the Vehicular Intercom System, and Audio Transducers (earphones, microphones, loudspeakers) which will interface with the SINCGARS-V radio.

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Program Element: #6.37.46.A
 DOD Mission Area: #256 - Tactical Communications

Title: Single Channel Ground and Airborne Radio System (SINCGARS)
 Budget Activity: #4 - Tactical Programs

<u>SINCGARS-V Major Milestones</u>	<u>Current Milestone Dates</u>	<u>Milestone Dates Shown in FY81 Submission</u>
Advanced Development (AD) Contract Award	APR 78	APR 78
Development Test/Operational Test (DT/OT) Completion	JUN 82	FEB 82
Army Systems Acquisition Review Council/Defense Systems Acquisition Review Council II	NOV 82	MAY 82
Engineering Development (ED)	DEC 82	JUL 82
DT/OT Completed	NOV 84	JUL 84
ASARC/DSARC III	MAR 85	NOV 84

Change in milestone dates (SINCGARS-V only) was directly attributable to the incorporation of a specification change into the contracts. The change clarified and amplified requirements.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	20475	15714	15526	10135	76695
Funds (as shown in FY 1981 submission)	18476	15587	6698	8100	69278

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Program Element: #6.37.46.A

Title: Single Channel Ground and Airborne Radio System (SINGARS)

DOD Mission Area: #256 - Tactical Communications

Budget Activity: #4 - Tactical Programs

Increase in FY80 represents funds reprogrammed into the program for a change in the specification to all three competitive contracts and cost growths on all three competitive contracts. The increase in FY81 is attributable to the incorporation of a modification to the Integrated Logistics Support Package to all three competitive contracts. The increase in FY82 is attributable to anticipated award of advanced development contracts for the Steerable Null Antenna Processor (SNAP II), the Vehicular Intercom System (VIS), and the Audio Transducers.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

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Program Element: #6.37.46.A
DOD Mission Area: #256 - Tactical Communications

Title: Single Channel Ground and Airborne Radio System (SINCGARS)
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The objective of this task is to develop a new family of combat net radios (manpack, vehicular and aircraft configurations) and selected ancillary devices. The program has the following key development goals: (1) modularity with maximum commonality of components in the various configurations; (2) capability of operating with an add-on communication Security (COMSEC) and Electronic Counter-Countermeasure (ECCM) modules; (3) interoperability with combat net radios of NATO allies; and (4) capability of operating in a nuclear environment (Defense Nuclear Agency participation). There is extensive participation in the program by the Air Force, Navy, and Marine Corps. SINCGARS-V is being designed to either replace Air Force, Navy, and Marine Corps close air support VHF radios or to be interoperable with them. The system will be capable of operating with or without COMSEC, with or without ECCM, or as a total system in all modes. It will transmit voice, tactical data, and record traffic to include teletype and facsimile. The following ancillary devices are included in the program: (1) Vehicular Intercom System: This intercom system will replace the AN/VIC-1. Techniques and objectives being explored are: (a) improved operational functions and capabilities, (b) improved reliability and durability, (c) improved installation and maintenance, and (d) improved COMSEC. (2) Transducers: New transducers are being developed that increase intelligibility at reduced volumes to overcome hearing losses. The two basic approaches are to: (a) reduce background noise by filtering and directivity, and (b) extend the audio bandwidth.

G. (U) RELATED ACTIVITIES: Program Element 6.47.51.A, SINCGARS Engineering Development; Program Element 6.27.01.A, Communications Electronics; Program Element 6.37.07.A, Communications Development; and Program Element 6.47.01.A, Communications Engineering Development, provide exploratory, advanced, and engineering developments of related and supporting single-channel net radio equipment.

H. (U) WORK PERFORMED BY: Contractors are: Cincinnati Electronics Corp, Cincinnati, OH; ITT Aeronautical/Optical Division, Ft Wayne, IN; and Collins Telecommunications Products Division, Rockwell International, Cedar Rapids, IA. In-house developing organization is the US Army Communications Research and Development Command (CORADCOM). The National Security Agency (NSA) is responsible for development of the COMSEC Module (VANDAL).

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: The Major System Requirements Specifications (MSRS) was approved by the Department of the Army, in April 1980 on SINCGARS-V. Cost/Schedule Control Systems Criteria (C/SCSC) redemonstration reviews were held at Cincinnati and ITT. Engineering Design Tests (EDT) were initiated at the contractors' facilities. Cost growth proposals were received from all three contractors. NATO began participating in the Test Integration Working Groups (TIWG) under the terms of the Memorandum of Understanding (MOU) signed in December 1979. Three design study and material investigation contracts were completed on the Transducer program.

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Program Element: #6.37.46.A

Title: Single Channel Ground and Airborne Radio System (SINGARS)

* DOD Mission Area: #256 - Tactical Communications

Budget Activity: #4 - Tactical Programs

2. (U) FY 1981 Program: Finalize and validate Cincinnati and ITT to the C/SCSC procedures. Approval of an updated Baseline Cost Estimate (BCE) will be accomplished. An MOU with Germany will be finalized after comparative testing of Electronic Counter-Countermeasure (ECCM) Techniques. Completion of EDT will be accomplished. Final design reviews will be conducted. Advanced Development Verification Testing (ADVT) will be initiated. Proposals will be evaluated in preparation for Advanced Development (AD) contract awards on the Vehicular Intercom and Transducer programs.

3. (U) FY 1982 Planned Program: Funds requested are required for the Development and Operational Testing of SINGARS-V. Continue funding three competitive contractors; continue to monitor contracts and provide engineering support; develop Technical Data Package for the next phase of the program; proposals will be evaluated and contracts awarded for Advanced Development models of the new Vehicular Intercom System and the Transducer models to support the SINGARS-V.

4. (U) FY 1983 Planned Program: Milestone II will be held to approve decision on next phase of program. Engineering Development (ED) contract will be awarded on SINGARS-V; monitor and provide engineering support to Vehicular Intercom and Transducer AD contracts.

5. (U) Program to Completion: This project is continued in program element 6.47.51.A, SINGARS Engineering Development, Project Number D282.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: 6.37.46.A

Title: Single Channel Ground and Airborne Radio
Subsystem (SINCGARS)

DOD Mission Area: # 256 - Tactical Communications

Budget Activity: #4 - Tactical Program

J. (U) Test and Evaluation Data:

1. (U) Development Test and Evaluation.

a. (U) Developmental testing of SINCGARS-V will consist of Engineer Design Testing (EDT) and Advanced Development Verification Tests (ADVT) designed to determine and validate the degree to which the contractors meet the technical criteria of the user. In addition, the Advanced development equipment models will be tested to evaluate the technical performance versus requirement of the specification.

b. (U) There are three prototype development contractors: Rockwell International (Collins), Cedar Rapids, Iowa; Cincinnati Electronics, Cincinnati, Ohio, and ITT Aerospace/Optical Division, Ft. Wayne, Indiana. The US Army Test and Evaluation Command (TECOM) is the agency responsible for the conduct of development tests. For test and evaluation support TECOM has contracted with Bell Technical Operational Corporation, Sierra Vista, Arizona. US Army Materiel Systems Analysis Activity is the independent DT designer and evaluator. SINCGARS-V is a major Army program managed by a fully chartered Project Manager Office.

c. (U) The major test facility to be utilized in the conduct of DT 1 is the Army Electronic Proving Ground (AEPG) at Ft. Huachuca, Arizona. Army civilian and military personnel will be used to conduct these tests. Contractor test facilities and personnel will be used to conduct the contractor portion of the DT. AEPG personnel will monitor these tests.

d. (U) The schedule for developmental testing (DT 1) is:

(1) (U) EDT (Draft Plan)	January 1980
(2) (U) EDT	Jul 80-Feb 81*
(3) (U) Final Design Review	April 1981*
(4) (U) ADVT (Draft Plan)	January 1981
(5) (U) ADVT (Contractor)	Jun-Nov 1981*
(6) (U) TEMP	July 1981

*** Milestones.**

e. (U) Each contractor will provide 10 receiver-transmitters in the following configurations for DT 1:

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Program Element: 6.37.46.A

Title: Single Channel Ground and Airborne Radio
Subsystem (SINCGARS)

DOD Mission Area: # 256 - Tactical Communications

Budget Activity: #4 - Tactical Program

(1) (U) Two (2) Manpack
(2) (U) Two (2) Vehicular (short-range)
(3) (U) Two (2) Vehicular (long-range)
(4) (U) Two (2) Vehicular with additional receiver-only capability
(5) (U) Two (2) Aircraft
(6) (U) In addition, sixteen (16) Security Modules and Electronic Countercounter Modules will be delivered for test during DT 1. Ancillary devices such as Securable Remote Control units and ECCM fill devices will also be available for test.

f. (U) In addition to the Army, SINCGARS-V will be utilized by the Navy, Marines and Air Force.

g. (U) EDT is presently being conducted.

h. (U) Reliability Growth Testing will be performed during DT. Data from this test will identify items requiring frequent maintenance. Sufficient test time will be available to verify the adequacy of design changes incorporated to reduce the frequency of repair. Subsequent to DT I/OT I, each contractor will be required to conduct a Prototype Reliability Qualification Test (PRQT), a Maintenance Teardown and Evaluation, and a Maintainability Demonstration. The PRQT will verify those design changes which were not verified during the Reliability Growth Test and verify the adequacy of design changes resulting from DT/OT.

(U) The Maintenance Teardown and Evaluation and the Maintainability Demonstration will be conducted to evaluate technical manuals maintenance capability (i.e., BITE, test support equipment, maintenance concept, etc.). Maintenance personnel used during these tests will be military personnel with appropriate MOS.

i. (U) Environmental testing will be conducted in accordance with MIL-STD-81 OC.

2. (U) Operational Test and Evaluation:

a. (U) Operational Testing (OT) of SINCGARS-V will be conducted between December 1981 and June 1982. Testing will concentrate on obtaining data for subsequent evaluation of the functional performance of each SINCGARS-V configuration and the overall effectiveness of SINCGARS-V concepts. Typical users (soldiers) will operate the equipment.

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Program Element: 6.37.46.A

Title: Single Channel Ground and Airborne Radio
Subsystem (SINCGARS)

DOD Mission Area: # 256 - Tactical Communications

Budget Activity: #4 - Tactical Program

c. (U) All subsystems and support equipment needed for test are on schedule.

d. (U) There are three prototype development contractors: Rockwell International (Collins), Cedar Rapids, Iowa; Cincinnati Electronics, Cincinnati, Ohio, and ITT Aerospace/Optical, Ft Wayne, Indiana. Operational Test and Evaluation Agency (OTEA) is the Army agency responsible for the conduct of Operational Tests. There are no other planned independent operational tests.

e. (U) Ft Polk, LA, has been selected as the test site for OT I. OT I will be conducted by a Mechanized Infantry Brigade. OT is designed to test all contractor configurations concurrently and will be tested against the requirements in the Test Evaluation Master Plan (TEMP).

f. (U) The schedule for operational testing is:

- (1) (U) OT (Draft Plan) - June 1981
- (2) (U) OT - December 1981 - June 1982 (Major Milestones)
- (3) (U) TEMP - July 1981

g. (U) Each contractor will provide the following configurations for OT I:

- (1) (U) Four (4) manpack
- (2) (U) Six (6) vehicular (short-range)
- (3) (U) Twelve (12) vehicular (long-range)
- (4) (U) Four (4) vehicular with additional receiver-only capability
- (5) (U) Six (6) aircraft
- (6) (U) Thirty-nine (39) COMSEC and ECCM modules will be available for test during OT. Ancillary devices will also be available and tested as part of the system.

h. (U) SINCGARS-V will be utilized by the Navy, Marines, and Air Force in addition to the Army. No tests have been conducted by any of these DOD components.

i. (U) Subsequent to DT I/OT I each contractor will be required to conduct a Prototype Reliability Qualification Test (PRQT), a Maintenance Teardown and Evaluation, and a Maintainability Demonstration.

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Program Element: 6.37.46.A

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Title: Single Channel Ground and Airborne Radio
Subsystem (SINGARS)

DOD Mission Area: # 256 - Tactical Communications

Budget Activity: #4 - Tactical Program

j. (U) OT is scheduled to be completed prior to the program's budget year major production contract award. No operational testing has been initiated on SINGARS-V.

<u>Operational Technical Characteristics</u>	<u>Threshold</u>
FREQUENCY RANGE	30-88 MHz
NUMBER OF CHANNELS	2320
CHANNEL SPACING	25 kHz
<u>VOICE COMMUNICATIONS RANGE</u>	

	<u>Threshold</u>
ECCM PROCESSING GAIN	23 dB
CHANNEL BANDWIDTH	25 kHz

MANPACK	8 km
VEHICULAR	35 km
AIRCRAFT	35 km

DIGITAL TRANSMISSION (DATA) RANGE (Bit Error Rate .1 B/S)

TACFIRE DATA	17 km
ALL OTHER DATA	17 km
MANPACK	4.5 km
VEHICULAR	17.5 km

PHYSICAL DETECTABILITY

MANPACK	200 meters
VEHICULAR	500 meters

MTTR

ORGANIZATIONAL	15 min
DIRECT SUPPORT	45 min
GENERAL SUPPORT	2.5 hrs

MTBF

MANPACK	1300 hrs
VEHICULAR	1250 hrs
AIRBORNE	750 hrs

DEMONSTRATED TECHNICAL CHARACTERISTICS TO BE DETERMINED.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.55.A Title: Tactical Electronic Countermeasures Systems
 DOD Mission Area: #257 - Electronic Warfare & Counter C³I Budget Activity: #4 - Tactical Programs

A. RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	9859	8867			Continuing	Not Applicable
DK12	Communications Electronic Countermeasures Systems	4954	5553			Continuing	Not Applicable
DK13	Non Communications Electronic Countermeasures Systems	2605	2856			Continuing	Not Applicable
DK14	Expendable Jammers	0	0			Continuing	Not Applicable
D251	Protective Electronic Warfare Equipment	2300	458			Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The objective of this program is to provide for validation/advanced development of tactical electronic countermeasures (ECM) equipment and systems to assist the tactical Army (Brigade, Division, and Corps) commander in denying, destroying, disrupting, and deceiving hostile command and control communications and radars associated with weapons systems, maneuver forces, and other threats of immediate value to the commander. Overcoming current equipment deficiencies

Is of prime importance to the Army tactical commander. This program provides for tactical systems which, by exploiting technical superiority, will serve as force multipliers to assist in offsetting Warsaw Pact numerical mobility, and firepower superiority. A complementary mix of airborne and high-survivability ground assemblies will provide 24-hour, all-weather coverage in depth.

C. BASIS FOR FY 1982 RDTE REQUEST: FY 1982 funds are required to support: development of automatic test equipment applications software for the Tactical Ground-based Communications JAMMER (TACJAM) and the helicopter jammer (QUICK FIX); improved frequency capability in both systems; continuation of advanced development of a family of expendable jammers; initiation of advanced development of jamming systems; continuation of efforts; and advanced development of the Air Defense Electronic Warfare System (ADEWS).

Program Element: #6.37.55.A Title: Tactical Electronic Countermeasures Systems
 DOD Mission Area: #257 - Electronic Warfare & Counter C-1 Budget Activity: #4 - Tactical Programs

D. COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	9859	8867		Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	8734	9399		Continuing	Not Applicable

Increase in FY 1980 of \$1125 thousand is due to an increase of \$1450 thousand in Project DK 13 as the result of an increased requirement for software effort in interrelating control and analysis centers with ECM systems, and reprogramming to higher priority requirements of \$325 thousand from Project D251.

Decrease in FY 1981 reflects the application of general Congressional reductions.

Decrease in FY 1982 attributable to alignment of funds to higher priority requirements.

E. OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
Other Procurement, Army*:						
Funds (current requirements)	21400	62700				
Funds (as shown in FY 1981 submission)	21400	60800				
Quantities (current requirements)	11	25				

Program Element: #6.37.55.A Title: Tactical Electronic Countermeasures Systems
 DOD Mission Area: #257 - Electronic Warfare & Counter C-1 Budget Activity: #4 - Tactical Programs

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Cost
Quantities (as shown in FY 1981 submission)	11	23		Not Shown		

*Funds/quantities shown are for TACJAM (Project DK 12). Difference of two systems between FY81 quantities is based on contract reduced costs. FY82 has an increase of three systems. Funds were adjusted in FY 1981 and FY 1982 for quantity increases and inflation. Difference in cost to completion is due to inflation.

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Cost
Aircraft Procurement, Army**:						
Funds (current requirements)	0	0				
Funds (as shown in FY 1981 submission)	18900	5400		Not Shown		
Quantities (current requirements)	0	0				
Quantities (as shown in FY 1981 submission)	5	0		Not Shown		

**Funds/quantities shown are for QUICK FIX/BLACK HAWK (UH-60A) aircraft (Project DK 12). Changes in funding and quantities are to reflect BLACK HAWK production. Previous funding contained funds to modify EH-1H/X to QUICK FIX configuration. The current funding for this MOD is as follows: FY80 - \$16,000; FY81 - \$5,600; FY82 - \$2,700.

Program Element: 16.37.55.A Title: Tactical Electronic Countermeasures System
DOD Mission Area: 257 - Electronic Warfare & Counter G-I Budget Activity: 4 - Tactical Programs

F. **DETAILED BACKGROUND AND DESCRIPTION:** The objective of this program is to provide for validation/advanced development of tactical electronic countermeasures (ECM) equipment and systems to deny or to degrade the enemy's use of his electromagnetic communications and radar devices. This program includes the development of ECM equipment to deny and/or degrade hostile forces use of their communications, noncommunications, infrared, and optical battlefield surveillance devices. Equipment developed includes ground-vehicular-mounted and airborne ECM systems. Developments include Heliborne Communications Jamming System (QUICK FIX); Tactical Army Communications Jammer (TACJAM); quick-erectable antenna mast assemblies; automated test equipment software development for all systems; expendable jammers warning devices as self-protection measures for tactical vehicles and installations; and countermeasures Systems developed in this program element normally proceed to Program Element 6.47.50.A, Tactical Electronic Countermeasures Systems, for full-scale development.

G. (U) **RELATED ACTIVITIES:** Related electronic warfare developments are conducted by the Air Force and Navy. Air Force developments are conducted in Program Elements 6.37.18.F, Electronic Warfare Technology, and 6.37.43.F, Electro Optic Warfare. Navy developments are found in Program Elements 2.57.64.N, Electronic Warfare Countermeasures Response; 6.35.21.N, Surface Electronic Warfare; and 6.37.97.N, Surface Electromagnetic and Optical Systems. Coordination is maintained between the Services to maximize the interchange of technical data and minimize duplication of effort. Coordination is accomplished by the exchange of technical reports, attendance at scientific meetings and conferences, joint participation on subgroups and working panels of the Technical Cooperation program, and by the Joint Tri-Service Electronic Warfare Panel. In addition, formal requirements documents of each Service are exchanged and reviewed by the other Services. Coordination is also accomplished as part of the program reviews conducted by the Office of the Secretary of Defense (Under Secretary for Defense for Research and Engineering).

H. (U) **WORK PERFORMED BY:** US Army Electronic Warfare Laboratory, Fort Monmouth, NJ; the US Army Signal Warfare Laboratory, Vint Hill Farms Station, Warrenton, VA; US Army Materiel Development and Readiness Command, Alexandria, VA. The major contractors are: ESL Incorporated, Sunnyvale, CA; GTE Sylvania, Mountain View, CA; and RCA Corporation, Camden, NJ.

I. (U) **PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:**

1. **FY 1980 and Prior Accomplishments:** Studied techniques of enemy militank guided missile (ATGM). Electronic countermeasures (ECM) for ATGM were field tested. The heliborne communications intercept and jamming system QUICK FIX was developed, tested, type classified standard A, and a production contract awarded. In addition, a program to optimize the communications

Program Element: #6.37.55.A

DOD Mission Area: #257 - Electronic Warfare & Counter C-I

Title: Tactical Electronic Countermeasures Systems

Budget Activity: #4 - Tactical Programs

receivers was completed. Development and Operational Testing, standard type classification, and award of procurement contract for the Tactical Army Communications Jammer (TACJAM) were accomplished. Procurement of applications software for TACJAM and QUICK FIX automatic test equipment continued. System validation leading toward the development of a family of very rugged and rapidly erectable antenna systems for use with communications and noncommunications jammers was completed. A program to develop optimized communications was begun. Advanced Development for a series of expendable electronic countermeasures (ECM) devices was initiated.

2. FY 1981 Program: Efforts initiated in prior years will continue. Development of Automatic Test Equipment (ATE) software for TACJAM and QUICK FIX will continue. System validation leading toward the development of a family of very rugged and rapidly erectable antenna systems (tactical antenna masts and assemblies) for use with communications and noncommunications jammers will be completed and tested. A program to optimize communications will be completed, and a developmental product improvement program to apply the results to deployed and developmental jammers will be initiated. Advanced development of expendable jammers will continue. Development of warning devices for self-protection electronic warfare will continue.

3. FY 1982 Planned Program: Efforts initiated in prior years will continue. Automatic test equipment (ATE) applications software for TACJAM and QUICK FIX will continue. Development of expendable jammers will be continued, and development testing will be initiated. Development of an Air Defense Electronic Warfare System (ADEWS) will begin. Development of jamming systems will begin. Efforts to develop Countermeasures will begin.

4. FY 1983 Planned Program: Efforts initiated in prior years will continue; these include the development of a family of expendable jammers, development of jammers, and development of an Air Defense Electronic Warfare System. Automatic test equipment applications software for TACJAM and QUICK FIX will be completed. Development of Electronic Warfare devices for self-protection will be reinitiated.

Program Element: #6.37.55.A Title: Tactical Electronic Countermeasures System
DOD Mission Area: #257 - Electronic Warfare & Counter C³I Budget Activity: #4 - Tactical Programs

5. (U) Program to Completion: This is a continuing program.

FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: DK12

Program Element: #6.37.55.A

DOD Mission Area: #257 - Electronic Warfare
and Counter-C3I

Title: Communications Electronic Countermeasures Systems

Title: Tactical Electronic Countermeasures Systems

Budget Activity: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: The objective of this project is to establish the technical feasibility and military potential of tactical communications electronic countermeasures (ECM) equipment and systems to assist the tactical Army (Brigade, Division and Corps) commander in denying, destroying, disrupting, and deceiving hostile command and control communications associated with weapons systems, maneuver forces, and other threats of immediate concern to the commander. Overcoming current equipment deficiencies,

is of prime importance to the Army tactical commander. This project provides for the orderly development of future systems to counter a changing threat and to replace systems now fielded. It provides for tactical systems which, by exploiting technical superiority, will serve as force multipliers to assist in offsetting Warsaw Pact numerical, mobility, and firepower superiority. A complementary mix of airborne and high-survivability ground assemblies will provide twenty-four-hour, all-weather coverage in depth. Noncommunications and expendable jammer development have been moved to Project DK13 and DK14 respectively for this program element for FY82 and outyears.

B. (U) RELATED ACTIVITIES: Technological developments designed to shorten the time required to collect and disseminate information are related to this development. These areas include automated search procedures, data link technologies, and tactical identification and positioning. Engineering development efforts of this project are accomplished in Program Element 6.47.50.A, Project DL12, Tactical Electronic Countermeasures Systems.

C. (U) WORK PERFORMED BY: Major contractors are Analytica, Inc, Willow Grove, PA; GTE Sylvania, Mountain View, CA; ESL Incorporated, Sunnyvale, CA; Quest Research, McLean, VA. In-house development and contract monitoring are accomplished by the US Army Signals Warfare Laboratory, Warrenton, VA.

Project: #DK12
Program Element: #6.37.55.A
DOD Mission Area: #257 - Electronic Warfare
and Counter-C3I

Title: Communications Electronic Countermeasures Systems
Title: Tactical Electronic Countermeasures Systems
Budget Activity: #4 - Tactical Programs

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1980 and Prior Accomplishments: A heliborne communications intercept and jamming system, QUICK FIX IA, was developed, tested, and three Quick Reaction Capability (QRC) models were deployed. Development of this system into a capability to meet total Division and Brigade requirements is proceeding in accordance with developmental product improvements. The QUICK FIX IB, which upgrades the IA by the inclusion of an improved jamming system (the AN/TLQ-17A) successfully completed DT III and started OT III. The QUICK FIX II, which adds a direction-finding capability, has been developed, tested, type classified standard A, and a production contract for the first 10 QUICK FIX II systems in a Huey helicopter (EH-1X) was awarded. A ground-based tactical communications jammer the AN/MLQ-34 (TACJAM), has been developed, tested, type classified standard A, and a production contract awarded. This system is mounted in an armored shelter on a tracked vehicle, featuring rapid mobility, very fast setup/teardown, and high-performance, computer-controlled multisignal jamming. Developed G Series quick-erection (sixty-to-ninety seconds) antenna masts and assemblies which have been found applicable not only to communications or noncommunications ECM and signals intelligence equipment but also to other military systems; for example, the PATRIOT Missile system and several tactical communications systems. Development of a series of expendable jamming devices capable of disrupting hostile tactical

was started.

2. FY 1981 Program: Support to procurement of the TACJAM and QUICK FIX will continue. Development of applications software to allow intermediate maintenance to be performed at common automatic test system facilities for TACJAM and QUICK FIX will continue. Prototype development of various types of expendable jammers will continue. Development of the family of very rugged and rapidly erectable (sixty-to-ninety seconds) antenna systems (tactical antenna masts and assemblies) for use with communications and noncommunications jammers will be completed and tested. Procurement of the antenna masts will be accomplished with the procurement of the using systems; that is, TACJAM, TRAILBLAZER, PATRIOT Missiles, Communications Systems, and others. FY81 begins developmental product improvements to TACJAM to add a capability, taking the lower frequency range from This program will continue through 1986. In addition, a program will be started to add the capability to TACJAM to effectively jam signals. This is an advanced development new start with advances in technology required prior to the integration into TACJAM.

3. FY 1982 Planned Program: Efforts initiated in prior years will continue. Development of Automatic Test Equipment (ATE) software for TACJAM and QUICK FIX will continue. Upgrade of the QUICK FIX systems will continue to improve

Project: #DK12

Program Element: #6.37.55.A

DOD Mission Area: #257 - Electronic Warfare
and Counter-C3I

Title: Communications Electronic Countermeasures Systems

Title: Tactical Electronic Countermeasures Systems

Budget Activity: #4 - Tactical Programs

Jamming and direction-finding by development of a [] antenna for use on a helicopter which will take advantage of the AN/TLQ-17A and attempt to improve upon the current accuracy. The TACJAM developmental product improvement program will continue with the add-on program and the ECM upgrade, plus the starting of a program to increase the capability of the current system through software modifications without significant equipment changes.

4. FY 1983 Planned Program. Efforts initiated in prior years will continue. Automatic test equipment applications software for TACJAM and QUICK FIX will be completed. The developmental product improvements to TACJAM will continue. QUICK FIX jamming and direction-finding improvements will continue. A program to perform nuclear weapons effects assessments on TACJAM and QUICK FIX will start.

5. (U) Program to Completion: This is a continuing program.

6. (C) Major Milestones:

Task Name	Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
AN/ALQ-151, QUICK FIX	Type Classification	1 Qtr FY 1978	1 Qtr FY 1978
AN/MLQ-34, TACJAM	Type Classification	3 Qtr FY 1979	3 Qtr FY 1979
ECM	AD Start	2 Qtr FY 1981	Not Shown

Slippage of two months in AN/MLQ-34 type classification was due to administrative delays in approving results of development acceptance in-process review (DEVA IPR).

Project: #DK12
 Program Element: #6.37.55.A
 DOD Mission Area: #257 - Electronic Warfare
 and Counter-C3I

Title: Communications Electronic Countermeasures Systems
 Title: Tactical Electronic Countermeasures Systems
 Budget Activity: #4 - Tactical Programs

7. Resources (\$ in thousands):

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>to Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
RDTE						
Funds (current requirements)	4954	5553	1	-	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	4954	5959		Not Shown	Continuing	Not Applicable

Quantities: Not Applicable

Decrease in FY 1981 attributable to the application of Congressional general reductions.
 Decrease of \$7379 thousand in FY 1982 is due to restructuring of the overall program element by moving expendable jammers and noncommunications jammers to Project DK14 and DK13 respectively and internal budget adjustments for higher priority Army projects.

Other Appropriations:

Other Procurement, Army***						
Funds (current requirements)	21400	62700		-		
Funds (as shown in FY 1981 submission)	21400	60800		Not Shown		

Other Appropriations:

Quantities (current requirements)	11	25		1		
Quantities (as shown in FY 1981 submission)	11	23		Not Shown		

***Funds/quantities shown are for TACJAM. (See Descriptive Summary for Program Element 6.37.55.A.) FY 1981 has an increase of two systems based on contract reduced costs. FY 1982 has an increase of three systems. Funds were adjusted in FY 1981 for inflation and FY 1982 for quantity increase and inflation.

Project: #DK12

Program Element: #6.37.55.A

DOD Mission Area: #257 - Electronic Warfare
and Counter-C3I

Title: Communications Electronic Countermeasures Systems

Title: Tactical Electronic Countermeasures Systems

Budget Activity: #4 - Tactical Programs

Aircraft Procurement, Army****

Funds (current requirements)	0	0	
Funds (as shown in FY 1981 submission)	18900	5400	Not Shown

Quantities (current requirements)	0	0	
Quantities (as shown in FY 1981 submission)	5	0	Not Shown

****Funds/quantities shown are for QUICK FIX/BLACKHAWK (UH-60A) aircraft. (See Descriptive Summary for Program Element 6.37.55.A.) Changes in funding and quantities are to reflect BLACKHAWK production. Previous funding contained funds to modify EH-1H/X to QUICK FIX configuration. The current funding for this MOD is as follows: FY80-\$16000, FY81-\$5600, and FY82-\$2700.

FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: # DK14

Title: Expendable Jammers

Program Element: # 6.37.55.A

Title: Tactical Electronic Countermeasures Systems

DOD Mission Area: #257-Electronic Warfare and Counter Command,
Control, Communications, and Intelligence

Budget: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: This project funds the advanced development of a series of expendable electronic warfare (EW) equipment capable of disrupting hostile tactical communications and noncommunications systems and capable of being emplaced behind enemy lines by artillery, unattended/airborne (U/A) platforms and/or by hand. The basic advantages of expendables are: 1 - Can be quickly and accurately deployed in close proximity to hostile communication and noncommunications systems; 2 - Are capable of disrupting these hostile systems without compromising US Army ground and airborne troop locations; 3 - Will not normally interfere with friendly equipment due to low power output and distant emplacement of the devices. The expendable electronic counter-countermeasures (ECM) capability will consist of a mix of barrage and automatic scan/lock-on jam types with

There is also a requirement for the development of the sensing and guidance systems necessary to create a homing antiradiation sensor to be targeted against

The tasks included in the expendable jammer (EXJAM) project are expendable EW, homing antiradiation sensor (Homerun) system, Remotely Piloted Vehicles (RPV) EW payload, and microwave/communications expendable jammers.

B. RELATED ACTIVITIES: During FY 1980 an internal laboratory infrared (ILIR) program entitled "Remote Control of Expendable Jammers Using Spread Spectrum Techniques" was performed under Program Element 6.11.01A, Project Number IL161101A91A. The objective of this in-house effort was to assess the feasibility of

Experimental remote control links utilizing matched pairs of surface wave devices were breadboarded and successfully tested within the laboratory. The results of this program have been used as the basis for an FY 1981 program entitled "Expendable Jammer Techniques" being performed under Program Element 6.27.15A, Project 62715A042. Effort will result in a sufficient quantity of remote control links to permit determination of the

The tasks currently being performed under this project 63755DK14 were previously funded under program elements 6.27.55.D251 (Protective Electronic Warfare Equipment) and 6.37.55.DK12 (Communications Electronic Countermeasures). The US Army Electronic Research and Development Command (ERADCOM) Project Officer has been assigned expendable electronic countermeasures (ECM) (jamming) devices. Among his responsibilities is monitoring Army and other services expendable ECM device programs in order to preclude any possibility of a duplication of effort within the Army or the Department of Defense.

Project: # DK14

Program Element: # 6.37.55.A

DOD Mission Area: #257-Electronic Warfare and Counter Command,
Control, Communications, and Intelligence

Title: Expendable Jammers

Title: Tactical Electronic Countermeasures Systems

Budget: #4 - Tactical Programs

C. (U) WORK PERFORMED BY: The prime contractors performing work on the EXJAM program are Motorola, Inc., Scottsdale, AZ, for Artillery-Delivered Smart Set-On EXJAM; Fairchild, Long Island, NJ, for Artillery-Delivered Barrage EXJAM and Sanders Associates, Nashua, NH for Microwave EXJAM. The in-house developing organizations within the US Army Electronics Research and Development Command (ERADCOM) are the Electronics Warfare Laboratory (EWL), Ft Monmouth, NJ, for the Artillery-Delivered Smart Set-On and Microwave EXJAM; US Army Electronics Research and Development Command - Signal Warfare Laboratory (SWL), Warrenton, VA, for the Artillery-Delivered Barrage EXJAM; and US Army Electronics Research and Development Command - HD Laboratory (HDL), Adelphi, MD, for the Artillery-Delivered Barrage EXJAM.

D. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1980 and Prior Accomplishments: In FY76 US Army Electronics Research and Development Command (ERADCOM) initiated the development of the scan lock-on and barrage hand-emplaced communications jammers. These jammers were completed in FY77 and an operational feasibility test conducted. The conclusions from the test indicated that expendable jammer (EXJAM) devices can be expected to

Based on the FY78 results, an accelerated development for the very high frequency (VHF) artillery-delivered barrage jammer was initiated. Principal efforts in the initial stages of this effort were concerned with battery life, automatic antenna erection, and deployment dispersion. These efforts have resulted in a planned procurement of a lithium reserve battery, development of new composite material antennas and the verification of appropriate deployment of EXJAM devices. Also in FY78, development of an artillery-delivered scan lock-on jammer was started. Eighteen scan lock-on devices were delivered in FY80 for in-house government testing. A feasibility model of a microwave (RADAR) expendable jammer was also built and tested in FY78. Tests proved the feasibility of using a microwave expendable jammer (EXJAM) against specified threats. Contracts were awarded in FY80 for the advanced development of a VHF artillery-delivered barrage device and a microwave device.

2. FY 1981 Program: Those efforts started in FY80 for and a microwave EXJAM will continue through FY81. During FY81, designs will be finalized and approved and initial prototypes will be delivered for government evaluation. Development of a scan lock-on EXJAM will begin in second quarter FY81. In house test and evaluation of existing communications EXJAM devices will continue. Artillery EXJAM dispersion techniques will complete field testing. Prototype development of the homing antiradiation drone system, Homerun, will begin.

Project: # DK14

Program Element: # 6.37.55.A

DOD Mission Area: #257-Electronic Warfare and Counter Command,
Control, Communications, and Intelligence

Title: Expendable Jammers

Title: Tactical Electronic Countermeasures Systems

Budget: #4 - Tactical Programs

3. FY 1982 Planned Program: Fabrication and documentation for the advanced development (AD) artillery-delivered barrage and scan lock-on EXJAM and the microwave EXJAM will be completed. The development test/operational test (DT/OT) II and the validation in-process review (IPR) for each of these devices will be completed and a transition decision, to engineering development, will be made. All necessary experimental work will have been performed, and these EXJAM programs will be ready for full-scale development. Also, development of a Homerun program will be initiated. for the

4. (y) FY 1983 Planned Program: Development of an airborne platform carried and seeded barrage and scan lock-on communications EXJAM will begin. The artillery-delivered EXJAM will transition to engineering development. Advanced development of the Homerun system will continue through FY83.

5. Program to Completion: Continue advanced development of the airborne platform barrage and scan lock-on EXJAM programs.

communications and microwave EXJAM devices in FY84.

Start improvement programs for com-

6. (y) Major Milestones: Not Applicable.

7. Resources (\$ in thousands):

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional to Completion</u>	<u>Total Estimated Cost</u>
RDTE						
Funds (current requirements)	0	0				
Funds (as shown in FY 1981 submission	Not Shown					

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Project: # DK14 Title: Expendable Jammers
Program Element: # 6.37.55.A Title: Tactical Electronic Countermeasures Systems
DOD Mission Area: #257-Electronic Warfare and Counter Command, Control, Communications, and Intelligence Budget: #4 - Tactical Programs

This is the first time a Congressional Descriptive Summary was submitted for expendable jammers.

Other Appropriations: Not Applicable.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.02.A

Title: Aircraft Weapons

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	6403	5130	3568	729	1517	5617
DL62	Aircraft Rocket Subsystems	4153	4286	2939	729	1517	29204
DL13	Aircraft Gun-Type Weapons	2250	844	629	0	0	26060

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program is needed to support the development and test of improved aircraft weapon subsystems, excluding missiles. The program is necessary in order to support the continuing requirement for low-cost, reliable, easily maintainable, lightweight, increasingly effective armament subsystems of advanced design for attack helicopters. The development and testing of new rocket (2.75 inch) warheads and an improved motor will be accomplished for use as secondary armament capability on attack helicopters.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Basic rocket trajectory data will be acquired for integration in aircraft fire controls. Environmental and aircraft induced parameters affecting rocket trajectory will be defined. Evaluation of several factors not currently incorporated in the trajectory equation will be initiated. These equations must be developed to overcome deficiencies in delivering rockets accurately. Trajectory constants for the different rocket motor/warhead combinations will be developed and refined. Fire control computer information necessary to produce the read-only trajectory data cards which will be required for future production aircraft and for upgrading the fire control computers of fielded aircraft, and the data necessary to upgrade the Rocket Management System data cards will be developed. Recommended changes to the Rocket Management System thumbwheel to reflect changes in rocket (motor/warhead/fuze) configuration will be obtained. The type classification action for the 30mm High-Explosive Dual-Purpose (XM789) ammunition will be completed by conducting in-process reviews (IPR) for type classification by examining the technical data package for suitability for competitive procurement and by transitioning the item to single service manager.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

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Program Element: 06.42.02.A
 BOD Mission Area: 0212 - Fire Support

Title: Aircraft Weapons
 Budget Activity: 04 - Tactical Programs

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
Funds (current requirements)	6403	5130	3568	2246	50163
Funds (as shown in FY 1981 submission)	5243	5511	4970	1890	50431

The FY 1980 increase reflects reprogramming action to fund special effort to solve problems encountered during pre-qualification testing of the high-explosive dual-purpose 30mm Ammunition (XM789). These developmental problems resulted in schedule slip of approximately 12 months establishing the additional funding requirement for FY 1982 to complete this development leading to type classification. The FY 1981 decrease reflects the application of general Congressional reductions. The overall decrease in FY 1982 results from a decrease in the 2.75-inch Rocket Development Program due to higher priority Army requirements.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands) Not Applicable.

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Program Element: 6.42.02.A
DOD Mission Area: #212 - Fire Support

Title: Aircraft Weapons
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: This program supports the development of new gun and rocket weapons subsystems for Army Aircraft. The requirement is for reliable, low-cost, easily maintainable, minimum drag, lightweight armament subsystems of advanced design that provide sufficient standoff range and effectiveness. The submunition warhead element provides multipurpose lethality against personnel, materiel, and lightly armored targets. Analysis and firings to date indicate a net result of the improvements will be an increase in antipersonnel lethality of greater than 50-1 when compared to the current standard system. The 19-tube lightweight launcher has a 50% weight reduction compared with the current 19-tube launcher and the lightweight launcher is compatible with the current and improved families of rockets. The 30mm ammunition element provides a lethal combat round with both shape charge and high-explosive capability for use by the Attack Helicopter (AAH) and the US Marine Corps Harrier. This ammunition will be interoperable in NATO Gun Systems.

G. (U) RELATED ACTIVITIES: Close liaison is maintained with the other services and industry to avoid duplication of effort. The Army participates in the Tri-Service Joint Technical Coordinating Group for Air-Launched Non-Nuclear Ordnance, an organization chartered at the major field command level. This group provides a medium for exchange of technical information and determination of joint use implications. An Army representative serves on the Air Munitions Requirements and Development Committee, an organization within the Office of the Secretary of Defense. One of the functions of this committee is the establishment of joint service requirements and development of air munitions. Related Program Elements are 6.42.01.A, Advanced Attack Helicopter; 6.42.12.A, COBRA/TOW; 6.32.06.A, Aircraft Weapons; and 6.22.01.A, Aircraft Weapons Technology.

H. (U) WORK PERFORMED BY: Contractors: Hughes Aircraft Company, Canoga Park, CA; Norris Industries, Los Angeles, CA; Hercules Incorporated, Radford, VA; Hi-Line Plastics, Incorporated, Olathe, KS; Cosin Industries, Sheboygan, WI; Hughes Helicopters, Culver City, CA; Honeywell Incorporated, Minneapolis, MN; and seven other contractors or prospective bidders accounting for (\$1,765,000) of the effort. In-house organizations: US Army Aviation Research and Development Command, St. Louis, MO; US Army Armament Research and Development Command, Dover, NJ; US Army Missile Research and Development Command, Huntsville, AL; Naval Ordnance Station, Indian Head, MD; Lake City Ammunition Plant, Lake City, MD; Project Manager, Advanced Attack Helicopter, St. Louis, MO; Project Manager, COBRA/TOW, St. Louis, MO.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Initiated development of: new family of 2.75-inch rocket warheads with remote set fuzing capability; a training practice, high-explosive, dual-purpose 30mm ammunition round, interoperable in the NATO 30mm guns, for attack helicopters. Completed development of the 2.75-inch Lightweight Rocket Launcher for attack

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Program Element: 86.42.02.A
DDO Mission Area: #212 - Fire Support

Title: Aircraft Weapons
Budget Activity: #4 - Tactical Programs

helicopters. This Lightweight Rocket Launcher will be compatible with the new Remote Settable Fuze on the 2.75" Rocket Systems. Completed development of the 30mm High-Explosive Incendiary Ammunition (XM799) for the USMC for use in Harrier Aircraft. Resolved problems associated with the High-Explosive Dual-Purpose (HEDP) Ammunition in bore explosions which allowed the Army to move to qualification testing of the ammunition.

2. (U) FY 1981 Program: The multipurpose submunition warhead (XM261) and improved rocket motor continue development. Static, ejection, fragmentation, and armor penetration tests will be conducted on submunitions. Fuzes and ballute assemblies will be wind tunnel and flight tested. The MK66 rocket motor with the XM261 and M151 warheads will be wind tunnel tested. DT/OT II test will be completed and Type Classification of the XM261 with the new MK66 rocket motor will be initiated.

3. (U) FY 1982 Planned Program: The type classification of the improved rocket motor will be completed. The technical data package will be updated, and the effort transferred for production procurement during FY83. Basic rocket trajectory data for the multipurpose submunition warhead will be acquired for integration into the AHIS fire control. The high-explosive, dual-purpose (HEDP) ammunition will be type classified. Detailed examination of the technical data package will be conducted to assure suitability for competitive procurement and transition to single service manager.

4. (U) FY 1983 Planned Program: Refinement of the multipurpose submunition rocket trajectory data for the warhead, improved rocket motor and AHIS combination will be initiated. Production actions will be initiated pending availability of funds.

5. (U) Program to Completion: Full engineering development efforts will be reestablished for illumination and smoke warheads and are scheduled to complete development in FY 1986.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.04.A
DOD Mission Area: #261 - Airlift

Title: Air Mobility Support Equipment
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	250	1187	3064	3958	Continuing	Not Applicable
DC32	Ground Support Equipment	0	0	1345	2096	Continuing	Not Applicable
DC33	Cargo Handling Equipment	0	651	939	1061	Continuing	Not Applicable
DC45	Aviation Life Support Systems	250	536	780	801	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program develops items of equipment, excluding aircraft, that support the Army air mobility requirement. The program leads to the production of items which enhance the cargo handling operations and crew survivability for aircraft or which facilitate the maintenance of the aircraft fleet. To evade enemy air defense systems, Army aircraft must fly at low levels, when operating near the Forward Edge of the Battle Area (FEBA). Special Electronic Mission Aircraft (SEMA) maintain a standoff distance from the FEBA to avoid enemy air defense systems and must operate at higher altitude for mission accomplishment. These operating conditions demand improved aircraft subsystems and components to enhance the efficiency, safety, and survivability of air crewmembers operating in a hostile environment. New and improved ground support, cargo handling and aviation life support equipment is required to minimize aircraft turnaround times and to maximize efficient operations and maintenance, especially in forward battle areas. The optimizing of the cargo capabilities for the cargo and utility helicopters will result in reduced airframe requirements, operating costs, and manpower requirements for given cargo requirements.

C. (U) BASIS FOR FY 1982 RDTE REQUEST:

(U) Ground Support Equipment: Initiate Engineering Development of: a Small Portable Analyzer Diagnostic Equipment (SPADE) to diagnose the condition of helicopter drive train bearings during ground run-up; a highly mobile, lightweight turbine-powered Aviation Ground Power Unit (AGPU) capable of providing all electric, hydraulic, and pneumatic ground servicing requirements of the Army's current and developmental aircraft systems; a mobile, self-contained, high-pressure Aviation

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Program Element: #6,42,04.A
 DOD Mission Area: #261 - Air Lift

Title: Air Mobility Support Equipment
 Budget Activity: #4 - Tactical Programs

Decontamination, De-Icing, and Cleaning System (ADDCS) for rapid decontamination/cleaning of the external surfaces of Army aircraft; and AVIM Non-Divisional Shop Sets, to be mounted in International Standards Organization-sized shelters, to replace current sets which are mounted in obsolete vans.

(U) Cargo-Handling Equipment: Complete procurement of prototypes of an external container system for cargo (Cargo Helicopter External Lift System) for Development Test II/Operational Test II. Award contracts for additional helicopter Internal Cargo-Handling Systems (ICHS) prototypes for Development Test II/Operational Test II with the CH-47.

(U) Aviation Life Support Equipment: Complete development of a Flotation Kit for helicopter aircrewmembers. Initiate engineering development of an Emergency Locator Transmitter (ELT). Conduct Development Test II/Operational Test II for two different oxygen systems. A helicopter (bottled) oxygen system will provide oxygen to aircrewmembers during search and rescue missions and high-altitude training. The RV-LD/RU-21 Special Electronic Mission Aircraft (SEMA) will be equipped with an integral oxygen system (On-Board Oxygen Generating System) which generates and filters oxygen when operating at high altitudes and/or in chemical agent environments.

<u>Major Milestones</u>	<u>Current Milestone Dates</u>	<u>Milestone Dates Shown in FY 1981 Submission</u>
Improved Lighting System for Army Aircraft (ILSAA) Complete DT/OT II	*	FY 1981
Inflatable Body and Head Restraints System (IBAHRS) Initiate Engineering Development	FY 1982	Not Shown

*The Improved Lighting System for Army Aircraft (ILSAA) is now a nondevelopmental item. It is being incorporated into applicable aircraft improvement programs. All program funding is based on validated acquisition cost estimates contained in approved or draft requirements documents.

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Program Element: #6.42.04.A
DOD Mission Area: #261 - Airlift

Title: Air Mobility Support Equipment
Budget Activity: #4 - Tactical Programs

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	250	1187	3064	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	450	1230	1653	Continuing	Not Applicable

The \$200 thousand reduction in FY 1980 and the \$43 thousand reduction in FY 1981 resulted from the diversion of funds to other higher priority Army programs. The increase of \$1411 thousand in FY 1982 is necessary to meet new development efforts in the Ground Support Equipment project. This project was not funded in previous years (FY 1980 and FY 1981). The new Ground Support initiative for aircraft includes the development of a new ground power unit, an aircraft decontamination unit, a nondivisional shop set (intermediate level of maintenance), and a portable diagnostic set.

E. (U) OTHER APPROPRIATION FUND: Not Applicable.

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Program Element: #6.42.04.A
DOD Mission Area: #261 - Airlift

Title: Air Mobility Support Equipment
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: This ongoing program is a composite of Ground Support Equipment, Cargo-Handling Equipment, and Aviation Life Support Equipment. Engineering development of ground support equipment is to develop equipment and procedures applicable to the servicing and maintenance of Army aircraft. The cargo-handling projects are to develop slings, nets, and devices to optimize the rapid movement by helicopter of equipment and supplies to and within forward areas. Development of aviation life support equipment will continue to enhance the overall safety and survivability of Army airmen.

G. (U) RELATED ACTIVITIES: Program Elements 6.32.09.A, Air-Mobility Support; 6.22.09, Aeronautical Technology; and 6.22.10.A, Airdrop Technology, in coordination with Joint Technical Coordinating Group (Air Force Program Elements 6.42.28.F, Tactical Airlift Modernization; and 4.11.18, C-141 Stretch Modification); and NATO Standardization agreements. US Army Materiel Development and Readiness Command/US Army Training and Doctrine Command (DARCOM/TRADOC) Life Support Steering Council. US Army Aviation Research and Development Command (AVRADCOM)/TRADOC Joint Working Group for Aviation Life Support Equipment (ALSE) Development. Duplication of effort is avoided through coordination of Joint Working Groups composed of development activity representation of all services.

H. (U) WORK PERFORMED BY: H. Koch and Sons, Anaheim, CA; Boeing-Vertol, Ridley Park, PA; Sikorsky Aircraft Company, Stratford, CT; Kaman Aviation, Windsor Locks, CT; Bell Helicopter, Dallas, TX; Martin Marietta, Baltimore, MD; Fiber Science, Salt Lake City, UT; Air Research, Phoenix, AZ; Whitehill Mfg Corp, Lima, PA.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Cargo-Handling Equipment: A high-performance helicopter rescue hoist has been procured and fielded to meet an urgent requirement stated by the Surgeon General for Medical Evacuation units. Aviation Life Support Equipment: A vacuum-packed flotation kit for helicopter crewmembers and passengers was procured and submitted to formal Army DT/OT II. The development cost of this kit has been reduced by using an adaptation of a US Air Force standard life raft.

2. (U) FY 1981 Program: Cargo-Handling Equipment: Engineering development of an external helicopter lift system (Container Helicopter External Lift System) will be initiated based on the satisfactory completion of validation testing of the Container Lift Adapter and an 8x8x20-foot Helicopter External Gondola System (HEGS-10). Aviation Life Support Equipment: Complete the Development Test/Operation Test II of Helicopter Flotation Kit. Award a development contract for an oxygen system for use in the UH-2, OH-58, CH-47, and EH-60 to allow these aircraft to fly, in accordance with Army regulations, at altitudes over 10,000 feet. An On-Board Oxygen Generating System (OBOGS) will also enter engineering development to support high-altitude missions of the RV-ID/RU-21 aircraft.

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Program Element: #6.42.04.A
DOD Mission Area: #261 - Airlift

Title: Air Mobility Support Equipment
Budget Activity: #4 - Tactical Programs

3. (U) FY 1982 Planned Programs:

(U) Ground Support Equipment (GSE): Engineering development of the following end items will be initiated: Small Portable Analyzer Diagnostic Equipment (SPADE), Aviation Ground Power Unit (AGPU), Aircraft Decontaminating De-Icing and Cleaning System (ADDCS), and Aviation Intermediate Maintenance, Non-Divisional Shop Set.

(U) Cargo-Handling Equipment (CHE): Acquisition of Cargo Helicopter External Load System (CHELS) hardware and test support packages for Development Test/Operation Test II will be initiated. Engineering development of an Internal Cargo-Handling System (ICHS) for the CH-47 will be initiated with the procurement of additional prototype hardware and necessary test support packages for Development Test/Operational Test II (DT/OT II).

(U) Aviation Life Support Equipment: The Helicopter Flotation Kit will be type classified standard. The Development Test/Operation Test II of the Helicopter Oxygen System will continue. Development Test/Operation Test II of the On-Board Oxygen-Generating System installed in the RU-21/RU-1D aircraft will be initiated. Engineering development will be initiated on an Emergency Locator Transmitter (ELT). All necessary experimental work for the above items will be performed, and these items will be ready for full-scale development.

4. (U) FY 1983 Planned Program: Ground Support Equipment: Acquisition of Aviation Ground Power Unit (AGPU), Small Portable Analyzer Diagnostic Equipment (SPADE), Aviation Decontaminating De-Icing and Cleaning System (ADDCS), and Aviation Intermediate Maintenance (AVIM) Shop Set prototypes and test support packages will continue. Cargo-Handling Equipment: Development Test/Operational Test II will be initiated for the Container Helicopter External Lift System (CHELS). Acquisition of prototype Internal Cargo-Handling System (ICHS) for the CH-47 will be continued and initiated for the UH-60. Engineering development will be initiated on the 8x9x10-foot Helicopter External Gondola System (HEGS-10) and on a helicopter external cargo sling system constructed with advanced technology materials. Aviation Life Support Equipment: The helicopter On-Board Oxygen system for use in the UH-1, OH-58, CH-47 and EH-60 aircraft will be type classified standard. Complete Development Test/Operation Test II of the On-Board Oxygen Generating System (OBOGS) installed in RV-1D and RU-21 aircraft. Engineering development will be initiated for the Inflatable Body and Head Restraint System (IBAHRS) based on successful completion of the validation phase. An engineering development contract will be awarded by the Naval Air Development Center for design and fabrication of the IBAHRS. Separate contracts will be awarded by the US Army Aviation Research and Development Command for system integration in the AH-1S and AH-64 aircraft. Initiate Development/Operational Test II of the Emergency Locator Transmitter (ELT). All necessary experimental work for the HEGS-10 and the IBAHRS will be performed, and these systems will be ready for full-scale development.

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Program Element: 46.42.04.A

DOB Mission Area: 261 - Airlift

Title: Air Mobility Support Equipment

Budget Activity: 4 - Tactical Programs

5. (U) Program to Completion: This is a continuing program. All FY 1982 efforts are scheduled to be completed with achievement of an Initial Operational Capability (IOC) by FY 1986 except for the Aviation Ground Power Unit (AGPU) and Aviation Decontaminating De-Icing and Cleaning System (ADDCS) which have an estimated IOC for FY 1987.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.06.A
DOD Mission Area: #261 - Airlift

Title: BLACKHAWK
Budget Activity: #4 - Tactical Program

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	5259	5046	6158	3110	0	498214
D069	UH-60 Feasibility Demonstration	3000	5046	6158	3110	0	17314
D173	BLACKHAWK (UH-60A)	2259	0	0	0	0	480900

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program will demonstrate the feasibility of firing the HELLFIRE missile from the UH-60 aircraft, a Congressional initiative. The program also satisfies an Army requirement to establish and qualify aircraft hard points and hardware to mount external stores such as the M-56 helicopter mine dispensing system or an external fuel storage system to improve the self-deployability of the UH-60A BLACK HAWK.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Funds are required to cover the third increment of contractual effort to include qualification flight testing, missile firing, and a preliminary airworthiness evaluation.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Contract Award	February 1981	Not Shown
Critical Design Review	June 1980	Not Shown
1st Missile Firing	2nd Qtr FY 1982	3rd Qtr FY 1981
Demonstration Completion	1st Qtr FY 1983	4th Qtr FY 1981
Final Report	3rd Qtr FY 1983	1st Qtr FY 1982

An initial schedule adjustment was required for in-house design determinations, coordination of a Mission Needs (MN) document and to obtain and evaluate a development proposal from Sikorsky Aircraft. The Aviation Research and Development Command

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Program Element: #6.42.06.A
 DOD Mission Area: #261 - Airlift

Title: BLACKHAWK
 Budget Activity: #4 - Tactical Programs

developed the total program cost estimate based on an analysis of similar engineering development in the Advanced Attack Helicopter program and evaluation of contractor development proposals.

D. (U) COMPARISON WITH FY 1981 ROTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
ROTE					
Funds (current requirements)	5259	5046	6158	1110	498214
Funds (as shown in FY 1981 submission)	1000	5420	0	0	8420

FY 1980 and 1981 funds for the UH-60 Feasibility Demonstration were shown under Program Element 6.43.10A, Heliborne Missile-HELLFIRE, in the FY 1981 budget submission. There were no funds requested for project D178, BLACK HAWK, in the FY 1981 budget request; consequently no Congressional Descriptive Summary was submitted. Subsequently, \$1999 was reprogrammed into D178, BLACK HAWK, to complete maturity testing, and an additional \$300 was later added as reported to Congress in December 1980 in a Notification of Reprogramming. The FY 1981 decrease reflects a Congressional reduction in inflation adjustment. FY 1982 and FY 1983 funds were added to satisfy an Army requirement to develop and qualify an external stores support system capable of supporting the M-56 mine-dispensing system or external fuel tanks required for improved self-deployability and extended mission ranges for the UH-60A, BLACK HAWK. The remainder of the Total Estimated Cost reflected for Current Requirements (\$478641) is attributable to Project D178, BLACK HAWK.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands) Not Applicable

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Program Element: #6.42.06.A
DOD Mission Area: #261 - Airlift

Title: BLACKHAWK
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: This project encompasses the design, development, test and full qualification of the External Stores Support System (ESSS), the feasibility demonstrations of the HELLFIRE missile and M-56 mine dispensing system, and the development of an external fuel system for extended range capability. Funds have been programmed to incrementally fund the following efforts through program completion in FY 1983:

1. (U) Relocate, design, and qualify fuselage hard points and a removable external stores system for the UH-60A capable of carrying eight HELLFIRE missiles on each side of the UH-60A. The stores system will also be capable of carrying external fuel tanks and mine dispensers.

2. (U) Conduct flight tests to qualify the ESSS with external fuel tanks and to evaluate compatibility of the system with missiles and launchers.

3. (U) Fire ballistic missiles to insure HELLFIRE missile blast pressure is compatible with the UH-60A structure and conduct an airborne firing survey to determine airframe and missile compatibility with regard to both structural loads and stability of the airframe and missile.

4. (U) Conduct a preliminary airworthiness evaluation and a developmental test by the US Army Test and Evaluation Command. Contract award is scheduled to allow coordination of Letter of Agreement (LOA) requirements and a UH-60A Mission Needs (MN) change to accommodate the External Stores Support System (ESSS).

G. (U) RELATED ACTIVITIES: The HELLFIRE missile is being developed under Program Element 6.43.10.A, Heliborne Missile-HELLFIRE.

H. (U) WORK PERFORMED BY: United Technologies Corporation, Sikorsky Aircraft Division, Stratford, CT; Rockwell International, Columbia, OH; BLACK HAWK Project Manager's Office, St. Louis, MO.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: In September 1980, a contract was awarded to Rockwell International for missile and launcher refurbishment and test support. Contract to the airframe contractor, Sikorsky Aircraft, to initiate the design and modification of hard points and external stores and fabrication of test articles has been delayed to allow coordination of the Letter of Agreement (LOA) with a draft Mission Needs (MN) change for the UH-60A helicopter. The LOA is in the final stages of staffing and will be signed prior to contract award currently scheduled for February 1981.

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Program Element: #6.42.06.A
DOD Mission Area: #261 - Airlift

Title: BLACKHAWK
Budget Activity: #4 - Tactical Programs

2. (U) FY 1981 Program: System design, fabrication of flight articles, integration with flight vehicle, instrumentation, and initial flight tests will be accomplished during FY 1981.
3. (U) FY 1982 Planned Program: Handling qualities evaluation with missiles installed, firing of three ballistic missiles, test analysis, mine dispenser design verification testing, external stores system qualification flight testing, and preliminary airworthiness by the Army Aviation Engineering Flight Activity (AEFA), Edwards AFB, CA are scheduled for FY 1982.
4. (U) FY 1983 Planned Program: Completion of flight testing; design and qualification of fuel, pneumatic, and electrical systems for transfer of external fuel; and government developmental testing are scheduled to complete required engineering development.
5. (U) Program to Completion: Engineering development is scheduled to be completed with FY 1983 funding.

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FY 1982 RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.07.A

Title: Advanced Attack Helicopter

DDO Mission Area: #211 - Close Combat

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	176036	172946	94027	0	0	1141385 9
D425	Advanced Attack Helicopter	176036	172946	94027	0	0	1141385

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Army needs the Advanced Attack Helicopter (AAH) to provide a significantly improved tank-killing capability over the current AH-1 attack helicopter to assist in defeating numerically superior Warsaw Pact armor forces. In recognition of the sophistication and lethality of the air defense threat and improvements in the ballistic protection of Warsaw Pact armor, a more survivable, versatile, and lethal attack helicopter is required to maintain a favorable combat exchange ratio. The AAH has been designed to provide these advantages. Emphasis has been placed on the design and development of a weapons system with superior flight performance; an armament capability to defeat, and a mission equipment package to allow day, night, and adverse weather operation, high survivability, and unequalled versatility. Aircraft armament includes the HELLFIRE Modular Missile System, 30mm chain gun, and 2.75-inch rockets. The AH-64 will be the Army's primary attack helicopter and will be complemented by the AH-1 series attack helicopters. The program is currently in Full-Scale Engineering Development (Phase 2), which was preceded by competitive airframe development.

C. (U) BASIS FOR FY 1982 RDT&E REQUEST: Provides funds to develop support and test equipment for maintenance task, develop diagnostic programs for mission equipment status, qualify automatic test equipment, correct deficiencies discovered in OT II, flight test a composite main rotor blade, conduct tests in climatic hangar and an icing survey in Minnesota, and provide data from flight tests for preparation of Army crew manuals.

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Program Element: #6.42.07.A
DOD Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Award Aerial Vehicle Development Contract (Phase 1)	June 1973	June 1973
First Flight	September 1975	September 1975
Complete Air Vehicles Fly-Off	September 1976	September 1976
Award Full-Scale Engineering Development Contract (Phase 2)	December 1976	December 1976
Award Competitive Target Acquisition Designation Systems and Pilot Night Vision Systems (TADS/PNVS) Contracts	December 1976	December 1976
Competitive TADS/PNVS Selection	March 1977	March 1977
Complete OT II	April 1980	April 1980
Production Contract Award	August 1981	August 1981
First Production Delivery	December 1981	December 1981
Initial Operational Capability (IOC)	November 1983	December 1983
	January 1985	October 1984

Delay in first production delivery and IOC is a result of reduced procurement funding in FY82 and FY83.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

RDTE	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
Funds (current requirements)	176036	172946	94027	0	1141385
Funds (as shown in FY 1981 submission)	176036	171564	58246	0	1104222

The funding level difference in 1981 is attributable to the application of higher fuel, inflation, and civilian pay pricing

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Program Element: #6,42,07,A
 DOD Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter
 Budget Activity: #4 - Tactical Programs

indices than were applied last year. FY 1982 is increased by \$15000 thousand to complete RDTE effort deferred from FY 1981 as a result of a mid-air collision on 22 November 1980 and loss of one prototype flight test vehicle. Remaining RDTE effort has been redistributed to the other four flight vehicles with some work being delayed until FY 1982. Other increased costs shown in FY 1982 are the result of higher fuel, inflation, and civilian pay pricing indices than were applied last year. This cost estimate is from Army cost analyses and should be achieved since FY 1982 is the last year of development and estimates in previous years have been valid.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Cost
Aircraft Procurement, Army						
Funds (current requirements)	0	50800	365500	554100	4486900	5452300
Funds (as shown in FY 1981 submission)	0	50400	427400	Not Shown	3872300	4350100
Quantities (current requirements)	0	0	8	44	484	536
Quantities (as shown in FY 1981 submission)	0	0	14	Not Shown	522	536

The funding level difference in 1981 is attributable to the application of higher inflation indices than were applied last year. Cost differences in FY 1982 were \$39,700 thousand as a result of higher inflation indices than were used last year; \$8,400 thousand from a new baseline cost estimate; and a reduction of \$10,000 thousand in the final preparation of the FY82-86 budget. This reduction caused an increase in the total estimate of \$76,400 thousand since procurement of 8 AAH's is delayed from FY82-86 to FY88-89. To meet outyear obligational authority, procurement was reduced in FY 1983 by \$230,100 thousand and in FY 1984 by \$267,400 thousand. This adjustment caused an increase in the total estimate of \$511,700 thousand since procurement of 111 AAH's is delayed from FY82-86 to FY88-89. It is planned to readjust the FY83-86 program to the original procurement profile in the FY 83-87 budget and thus erase this increase in the program estimate. The remaining \$449,100 thousand increase in the total estimate is from the application of higher inflation indices than were used last year.

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Program Element: #6.42.07.A
DOD Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: In September 1972, the US Army approved an Advanced Attack Helicopter (AAH) development program for an attack helicopter with greater agility, better performance, and a greater aerial fire support capability than currently available in existing Army aerial weapons systems. The AAH program was presented to the Defense Systems Acquisition Review Council (DSARC I), and on 10 November 1972, the Deputy Secretary of Defense authorized release of the AAH Request for Proposals (RFP). This specified a \$1.4M to \$1.6M (FY72 constant dollars) constraint on the recurring flyaway design-to-unit production cost, based upon an initial production buy of 472 aircraft. In April 1976, the planned procurement quantity was increased to 536 aircraft. The RFP stressed acquisition and operational costs as prime considerations in the program and in the competitive selection between contractors. Five helicopter manufacturers, Bell, Sikorsky, Boeing-Vertol, Hughes, and Lockheed responded to the RFP. As a result of the HELLFIRE DSARC on 25 February 1976, it was decided that the HELLFIRE missile would be utilized as the point target weapon for the AAH in lieu of the initially proposed Tube-Launched, Optically Tracked, Wire-Guided (TOW) Missile System. On 23 March 1976, the DSARC directed that the Target Acquisition Designation Sight (TADS) and the Pilot Night Vision Sensor (PNVS) be competitively developed with flyoff on the AAH. Development of the AAH consists of two phases. The first phase was conducted as a flyoff of two prototypes each from the competing contractors, Bell Helicopter Textron and Hughes Helicopters, to insure airframe acceptability in the critical area of flight handling quantities and performance. Competitive development contracts for Phase 1 were awarded to Bell Helicopter Textron and to Hughes Helicopters. Government testing (flyoff) was completed on 30 September 1976. The AAH DSARC II, held on 7 December 1977, resulted in approval of the AAH to enter full-scale engineering development (Phase 2). On 10 December 1976 the Secretary of the Army selected Hughes Helicopters (YAH-64) as the prime aircraft system contractor for Phase 2. Phase 2 consists of modification of the two Hughes Helicopters' Phase 1 aircraft, fabrication of three additional air vehicles, subsystems development, and integration and testing of the total weapons system. Of particular importance to the AAH program was the competitive development of TADS/PNVS with Martin Marietta and Northrop Corporation. Martin Marietta was selected as the winning contractor in April 1980. At the direction of the Office of the Secretary of Defense, the use of the WECCOM-30 ammunition for the 30mm gun on the YAH-64 was obviated in favor of development of an ADEN/DEFA (British and French gun) compatible round to provide interchangeability and interoperability with NATO and other US 30mm guns. The YAH program manager has development responsibility for this ammunition. A project manager for the TADS/PNVS and a product manager for the 30mm ammunition have been designated to assist the Advanced Attack Helicopter program manager in the development of the AAH system.

G. (U) RELATED ACTIVITIES: The Army AH-1S COBRA/TOW, Program Element (PE) 6.42.12.A, and the Marine Corps AH-1T are related helicopters. The AH-1S provides the Army a current aerial antitank capability with the TOW missile until the availability of the higher performance AAH. The AH-1S will constitute the "low" end of the high-low attack helicopter mix. The AH-1S and AH-1T

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Program Element: 6.42.07.A
DOD Mission Area: 0211 - Close Combat

Title: Advanced Attack Helicopter
Budget Activity: 04 - Tactical Programs

lack performance, adverse weather mission capability, firepower, night vision devices, and survivability characteristics required of the attack helicopter and available in the AAH. The General Electric T700 engine installed in the YAH-64 is being managed by the BLACK HAWK project manager (PE 6.42.06.A). The Heliborne Missile HELLFIRE is being developed under PE 6.43.10.A. The 30mm ADEM/DEFA ammunition is being developed under PE 6.42.02.A, Aircraft Weapons. These related activities are all carefully monitored to preclude duplication of effort.

H. (U) WORK PERFORMED BY: Hughes Helicopters, Culver City, CA, is the airframe and 30mm ammunition developer and is responsible for the total weapon system integration in Phase 2. General Electric Company, Lynn, MA, is the manufacturer of the government-furnished T700 engine. Martin Marietta, Orlando, FL, is the contractor for the Target Acquisition Designation Sight (TADS) and the Pilot Night Vision Sensor (PNVS). The Advanced Attack Helicopter (AAH) program manager's office, located at the US Army Aviation Research and Development Command, St Louis, MO, is responsible for the development program. Major subcontractors include Advanced Structures Division, Montrovia, CA; Aircraft Gear Corporation, Chicago, IL; Bendix, Utica, NY; Bertea, Irvine, CA; Garrett Aerospace, Phoenix, AZ, and Torrance, CA; General Electric, Lynn, MA; Honeywell, Minneapolis, MN; Kearfott, Little Fall, NJ; Litton Guidance and Control Systems, Woodland Hills, CA; Litton Precision Gear, Chicago, IL; Lockheed Aircraft Service Company, Ontario, CA; Menasco, Burbank, CA; RCA Automated Systems, Burlington, MA; Rockwell International, Columbus, OH; Sperry, Phoenix, AZ; Teledyne Ryan Aeronautical, San Diego, CA; Teledyne Systems Company, Northridge, CA.

1. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Competitive contracts for Phase I development were awarded to Bell Helicopter Textron and Hughes Helicopters on 22 June 1973. Phase I development concentrated on aerial vehicle development. Phase 2 was scheduled to include subsystems development and subsystems integration into the total weapons system. Throughout FY 1974 and 1975 and until the latter part of FY 1976, each of the contractors designed, fabricated, and tested a Ground Test Vehicle (GTV) and two prototype air vehicles. On 30 September and 1 October 1975, respectively, Hughes Helicopters and Bell Helicopter Textron made first flights with their prototypes and began the contractor flight test programs. On 31 May 1976, each contractor delivered two flyable prototype aircraft to the government for flight training, testing, and evaluation. Flight testing was successfully completed on 30 September 1976. Source selection activities, which began in July 1976 when the Army received Phase 2 proposals from each of the contractors, were completed with the selection of Hughes Helicopters as the winning contractor. A contract award for full-scale engineering development was made on 10 December 1976. Target Acquisition Designation Sight (TADS) and Pilot Night Vision Sensor (PNVS) proposals from industry were received by the Army

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Program Element: 06.42.07.A

DOD Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter

Budget Activity: #4 - Tactical Programs

In November 1976, and TADS/PNVS contracts were awarded to Martin Marietta and Northrop Corporation on 10 March 1977. During FY 1977, Hughes Helicopters initiated engineering design efforts to incorporate configuration changes identified by the Phase I Source Selection Evaluation Board. Testing was also initiated on the GTV and air vehicles to support the Phase 2 prototype modification effort. Due to restructuring of the original FY 1978 budget request, fabrication of the additional three prototypes was delayed from FY 1977 until FY 1978. During FY 1978, design, fabrication, and assembly of the three additional prototype aircraft were initiated. In FY 1979, prototype TADS/PNVS systems were integrated with the AAH fire control system. Pilot flight training was initiated to support flight testing for the Armament and Fire Control Survey and in preparation for the TADS/PNVS flyoff scheduled for early 1980. In July 1979, the AAH development program was restructured internally to consolidate all remaining operational testing (OT) at the end and to provide additional time to correct technical problems. In this restructuring, the production contract award was delayed one year, which also accommodated the increasing production leadtimes. In April 1980, Martin Marietta was selected as the contractor for the maturity phase of the TADS and PNVS program which includes finalization of the design, qualification testing, and support of the Advanced Attack Helicopter (AAH) flight tests. Flight tests of the new stabilator design demonstrated that the previous flight handling and loads problems were eliminated, and complete expansion of the aerodynamic flight envelope was accomplished. Integration and testing of the weapons systems, TADS/PNVS, and fire control system on the AAH were highly successful.

2. (U) FY 1981 Program: Contractor and government flight testing will continue on all four vehicles with emphasis on reliability, availability, and maintainability (RAM) culminating in a user assessment of RAM during the OT II in June through August 1981. Long Lead Time Item (LTI) contracts will be awarded during February 1981 in preparation for the production contract in December 1981.

3. (U) FY 1982 Planned Program: Data from Operational Test (OT) II, completed in August 1981, will be prepared for the use of ASARC/DSARC II production decision in November 1981. Contract award for the production Phase will be made to Hughes Helicopters and the TADS/PNVS winner during December 1981. Development and test efforts will include development of support and test equipment for maintenance tasks, development of diagnostic programs for mission equipment, and qualification of automatic test equipment. Additional effort will correct deficiencies found in OT II. A composite main rotor blade will be flight tested on the Advanced Attack Helicopter (AAH). The Army will also conduct tests in the Eglin AFB climatic hangar, an icing survey in Minnesota, and perform flight tests to provide data for Army crew manuals.

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Program Element: #6.42.07.A
DOD Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter
Budget Activity: 94 - Tactical Programs

4. (U) FY 1983 Planned Program: Procurement of 44 AAHs.
5. (U) Program to Completion: Procurement of AAH will continue.

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FY 1982 RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.07.A
DOD Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter
Budget Activity: #4 - Tactical Program

1. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation:

a. (U) The AAH developmental program is divided into two phases. Phase I was competitive development of the basic aircraft with very limited weapons integration. Phase 2 encompasses the integration of all weapons subsystems into the winning Phase 1 aircraft together with the fabrication and test of 3 new prototype aircraft built to approximate production configuration. Within the Phase 2 effort was a competitive development and selection of the Target Acquisition Designation Sight (TADS) and Pilot's Night Vision Sensor (PNVS). Both independent and joint developmental tests are conducted by contractor and government test personnel. Significant past developmental program events are as follows:

(1) (U) Competing Advanced Attack Helicopter (AAH) contractors, Bell Helicopter Textron and Hughes Helicopters, successfully completed Phase I testing on 30 September 1976. Phase I testing included contractor design support tests, testing of individual components to verify structural integrity and establish fatigue life, and bench testing of dynamic components. Complete dynamic system testing was conducted utilizing the Ground Test Vehicle (GTV) beginning in April 1975. Following successful completion of GTV qualification testing, first flights occurred on 30 September and 1 October 1975 for Hughes and Bell, respectively. Each contractor completed more than 300 hours of flight testing prior to delivery of two flight vehicles each to the Army on 31 May 1976. The primary objective of this contractor testing was flight envelope development, demonstration of structural integrity, and evaluation and verification of aircraft flight handling qualities. The 30mm cannon and 2.75-inch rockets underwent limited in-flight firing tests also.

(2) (U) The Army Engineering Flight Activity (AEFA) at Edwards Air Force Base, California, conducted Development Test (DT) I during July-September 1976 to evaluate flight handling qualities and aircraft performance including in-flight firing of the 30mm cannon and 2.75-inch rockets. Reliability, availability, and maintainability (RAM) data was obtained throughout the DT test program. The Army selected the Hughes YAH-64 to enter Engineering Development (Phase 2), and a contract was awarded on 10 December 1976.

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Program Element: #6.42.07.A
DOD Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter
Budget Activity: #4 - Tactical Program

b. (U) During Phase 1 government competitive tests (GCT), which combined developmental and operational testing on the YAH-64, the major deficiencies identified included controllability problems in sideward flight, an unreliable auxiliary power unit and engine starting system, and structural inadequacy of the cooling fan associated with the infrared suppression system. Design changes have been made in Phase 2 as discussed below.

(1) (U) Phase 2 developmental tests (DT) make maximum use of contractor/government integrated tests to eliminate duplication and have expanded the aircraft flight envelope and evaluated modifications that have been proposed to the Phase 1 design. The first set of modifications (MOD 1) incorporated a changed empennage, improved automatic stabilization equipment and a new infrared suppressor and removed the unreliable cooling fan. Findings from the Government Engineering Design Test (EDT-1), conducted in May 1978 to evaluate the MOD 1 changes, indicated improved sideward flight characteristics, improved handling qualities (particularly in the areas of static longitudinal stability, pitch-to-side-slip coupling and control breakout forces), and much improved reliability, availability, and maintainability (RAM) with the removal of the unreliable cooling fan. The most significant deficiencies discovered during this test include: less than desirable main-rotor-to-canopy clearance; undesirable handling characteristics with Stability Augmentation System (SAS) off in left sideward flight and at speeds above 120 knots true; vibrations at the crew station in excess of specification requirements; and canopy drumming caused by a combination of aircraft vibration and main rotor passage. Subsequent to EDT-1, a second set of modifications (MOD 2) was installed on the Phase 1 prototypes. These modifications included incorporation of the suit of weapons subsystems (e.g., Target Acquisition Designation Sensor (TADS), Pilot Night Vision Sight (PNVS), and HELLPRE missile) and airframe-related changes such as a new auxiliary power unit.

(2) (U) During the MOD 2 period, the government conducted an evaluation to confirm the correction of deficiencies in the airframe. This test, EDT-2, occurred in April 1979. Only one major new deficiency was revealed; this was insufficient left pedal during right sideward flight at most critical azimuth and high velocity. Although the main rotor mast was raised prior to this test, canopy vibrations remained unsatisfactory. Sideward flight characteristics with SAS off also remained unsatisfactory. These results indicated that the design of the empennage, primarily in the fixed horizontal stabilizer area, was deficient. As a result of these findings, a basic redesign was undertaken to incorporate a movable stabilizer (stabilator). The deficiencies did not, however, preclude continued subsystems development and integration. The systems-configured Phase 1 aircraft arrived at the weapon test facility at Yuma Proving Ground, AZ, in June 1979. The first flight of a prototype helicopter with the redesigned stabilator was on 31 October 1979, and all five prototypes had received the modification by May 1980. Flight test data indicates that the stabilator has corrected the technical problems it was designed to correct.

c. (U) Prototypes used during Phase 2 include both early developmental aircraft from Phase 1 and 3 new helicopters. The Phase 1 aircraft had a series of modifications so as to generally conform to the final specification. The new

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Program Element: #6.42.07.A
DDO Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter
Budget Activity: #4 - Tactical Program

Phase 2 aircraft are the production configuration, and producibility engineering is being implemented for them. No known changes are contemplated in the total system which would invalidate the developmental effort to date or affect the procurement of long-lead items.

d. (U) In May 1980, the aircraft with all final subsystems entered the final period of test and evaluation. Prior to this time, the four system prototypes were in several unique configurations primarily determined by the stabilizer configuration and the TADS/PNVS type. In April 1980, Martin Marietta was selected as the winning TADS/PNVS competitor and was awarded a contract to complete TADS/PNVS development. The final 15 months of the developmental program will, therefore, be testing all aspects of a total system for battle.

e. (U) In accordance with the AAH development contract the following T&E assignments apply:

(1) (U) Development Contractor:

- (a) (U) Prototype Aircraft - Hughes Helicopters, Culver City, CA
- (b) (U) TADS/PNVS - Martin Marietta Co, Orlando, FL
- (c) (U) 30mm Ammo - Hughes Helicopters
- (d) (U) HELIFIRE Missile - Rockwell International Corporation, Columbus, OH

(2) (U) Test support is provided by Army development and readiness commands with contract consultative services to be obtained as required.

(3) (U) Service Program Manager: MG E. M. Browne, Program Manager--AAH, US Army Materiel Development and Readiness Command.

(4) (U) Development Test and Evaluation:

- (a) (U) US Army Test & Evaluation Command (USATECOM) Yuma Proving Ground, AZ, and Electronics Proving Ground, MD
- (b) (U) US Army Aviation Research and Development Command (USAAVRADCOM), St Louis, MO
- (c) (U) Ballistic Research Laboratory (BRL), Aberdeen Proving Ground, MD

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Program Element: #6.42.07.A
DOD Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter
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(d) (U) US Army Aeromedical Research Laboratories (USAARL), Ft Rucker, AL

(e) (U) US Army Communications and Electronics Research Command (USACERCOM), Night Vision Laboratories (NVL), Ft Monmouth, NJ

(f) (U) US Army Materiel Systems Analysis Agency (USAMSAA), Aberdeen Proving Ground, MD

f. (U) Major test areas and agencies involved are as follows:

(1) (U) Air Vehicle Tests - DT: Contractor primary test base is Carlsbad, CA (Palomar Airport). Adjacent USMC Camp Pendleton is used to fire the various weapons in a restricted mode. Government DT air vehicle tests are also conducted at this facility for short periods, but the major government tests are conducted at Edwards AFB, CA.

(2) (U) Systems Tests - DT: The major site for both contractor and government systems tests is USA Yuma Proving Ground (YPG), AZ. Relatively short tests, to examine unique system characteristics, are accomplished away from YPG (e.g., natural icing tests in northern Minnesota).

g. (U) Future major test reviews are scheduled for: February 1981 - Long-leadtime items, and November 1981 - Army and Defense Systems Acquisition Review Councils (ASARC/DSARC III).

h. (U) Four flying prototypes are in the test program. In addition, one ground test vehicle is used to support the power train qualification.

i. (U) A total of 62 HELLFIRE guided missile firings is planned during the AAH test programs. These firings will contribute to the development of this missile which is being conducted by a separate project manager at US Army Missile Command. Of the 62 AAH missile firings, 59 are guided without warhead, and 3 are guided with high-explosive antitank warheads.

j. (U) Reliability, availability, and maintainability (RAM). RAM data will be collected during developmental testing to assist the RAM assessment at OT II. Specific RAM objectives are listed in paragraph 2f.

k. (U) The total system is designed to meet the requirements for worldwide operations. In furtherance of these requirements, and in addition to individual component laboratory environmental tests, the total system will undergo tests in natural desert environment (YPG), cold environments (Minnesota), temperate environments (California) and simulated envi-

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DOD Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter
Budget Activity: #4 - Tactical Program

Comments of a climatic hangar. Environmental conditions such as vibration, shock, fatigue, and temperature are also an inherent part of the developmental effort.

2. (U) Operational Test and Evaluation:

a. (U) Operational Test (OT) I was conducted in September 1976 at Edwards Air Force Base, CA, by the US Army Operational Test and Evaluation Agency (OTEA) in conjunction with Development Test (DT) I. Approximately 16 hours were flown on each contractor's design during this test utilizing representative attack helicopter mission profiles. Aircraft flight and detectability characteristics and mission performance in a low-level and nap-of-the-earth (NOE) operational environment were emphasized. Military crews for the competitive flight tests consisted of an Army Engineering Flight Activity (AEFA) test pilot as pilot, and an experienced attack helicopter pilot from the US Army Forces Command (FORSCOM) units as copilot/gunner. Operational Army maintenance personnel observed all maintenance activities. The current Army attack helicopter (AH-1G) was concurrently flown on all YAH-64 missions to establish comparative baseline information. The full weapons, avionics, and navigation subsystems were not tested during OT I. OTEA prepared an independent evaluation of OT I which was briefed to the Army Systems Acquisition Review Council in December 1976. OTEA concluded that the Advanced Attack Helicopter (AAH) was suitable for continuation into the next phase. The major discrepancies identified were those associated with the auxiliary power unit and starting system. These were previously discussed in the Development Test section.

b. (U) OTEA is scheduled to conduct OT II, separate from developmental tests, during June-August 1981 at Ft. Hunter-Liggett, CA. Three fully equipped YAH-64 prototype helicopters will fly approximately 350 hours under a complete range of flying conditions and mission profiles. This test will be an operational evaluation of the full subsystems-equipped aircraft and will obtain reliability, availability, and maintainability (RAM) data prior to a production decision. It will include firing of the HELLFIRE, 30mm, and 2.75-inch rocket systems, as well as nonfiring exercises. Flight crews and maintenance personnel will be provided by FORSCOM. OTEA will prepare an independent evaluation.

c. (U) The AAH RAM-operational suitability verification which will take place during OT II will be a true operational suitability test where a mix of simulated missions including the AAH primary and alternate mission profiles will be flown by Army pilots. Army ground support personnel will perform all support functions. Proper ground support equipment, including most automatic test equipment, will be utilized for the test. Operational realism will be emphasized. An Army RAM data collection team will gather data throughout the test for determination of AAH reliability and maintainability characteristics.

d. (U) Operational Test Agencies:

Program Element: #6.42.07.A

DOD Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter

Budget Activity: #4 - Tactical Program

(1) (U) US Army Forces Command (USAFORSCOM), Ft McPherson, GA.

(2) (U) US Army Training and Doctrine Command (USATRADOC), Ft Monroe, VA.

e. (U) Independent Operational Test Agency: US Army Operational Test and Evaluation Agency (USAOTEV), Falls Church, VA.

f. (U) The reliability, availability, and maintainability (RAM) assessment at the completion of Operational Test (OT) II will be based on data collected in OT II and all flight test data accumulated during Phase 2 developmental testing. Army maintenance personnel will perform unit and intermediate maintenance support on all systems and subsystems except for Target Acquisition Designation Sight (TADS) and Pilot Night Vision Sensor (PNVS) removal and replacement and some black box diagnostics. The RAM objectives in terms of maintenance man-hours per flight hour (MMH/FH) and mean time between failure (MTBF), which are to be assessed at OT II, are listed below along with the values to be achieved at full-rate production after completion of the follow-on evaluation. These values are supported by reliability growth analysis. Full maturity of RAM characteristics is expected to occur at approximately 100,000 flight hours.

RAM REQUIREMENTS

	<u>OT II</u>	<u>Full-Rate Production</u>
MMH/FH	14.4	13
System Reliability (MTBF - hours)	1.95	2.2
Mission Reliability (MTBF - hours)	17.6	18.5
TADS Reliability (MTBF - hours)	100	108
PNVS Reliability (MTBF - hours)	120	130

3. System Characteristics:

Program Element: #6.42.07.A
 DOD Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter
 Budget Activity: #4 - Tactical Program

Operational/Technical Characteristics*	Objective	Demonstrated Performance**
Primary Mission Gross Weight (PMGW)-lbs	13910	13920
Cruise Airspeed @ PMGW (Knots)	145-175	142
Vertical Rate of Climb @ PMGW-(feet per minute)	450-500	470
Mission Reliability	.95	
Weapon Accuracy (P _H)		
30mm		
HELLFIRE (stationary targets)	.25-.35	.29
Lateral acceleration (g's)	1.81	1.83
Endurance (hrs) - Primary Mission	2.5-2.8	2.50
- Alternate Mission		
Expendable Ordnance @ PMGV	8-12	8
HELLFIRE Missile (No.)	320-500	320
30MM (rds)		
Target Recognition (km) Maximum - Day		
- Night		
Target Designation (km) Maximum		
Day		
Night		

NOTES: * Performance required at primary mission gross weight, operating within specified mission profiles.

** From the AAH Source Selection Evaluation Board (SSEB) final report, government developmental tests, and TADS/PNVS competition and testing at Yuma Proving Grounds.

FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.12.A

Title: COBRA/TOW

DOD Mission Area: #211 - Close Combat

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	945	8515	20074	8561	To Be Determined	To Be Determined
D619	COBRA/TOW	945	8515	20074	8561	To Be Determined	To Be Determined

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program is needed to develop a night/observed battlefield antiarmor capability for the AH-1S, COBRA/TOW, by incorporating forward looking infrared (FLIR) in the TOW Missile system and to develop the necessary control features for complete compatibility with the TOW and Improved TOW missiles (TOW II), as an integral element of the ground combined arms team. The AH-1S is a single-engine, two-seat attack helicopter designed to deliver the TOW missile, 20mm ammunition, and 2.75-inch rockets. However, its capabilities are limited primarily to daytime operations. The AH-1S will complement the Army's primary attack helicopter, the AH-64, to be fielded in the mid-1980's.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: The requested funds will be for continuation of the development of forward looking infrared (FLIR) capability in the COBRA/TOW telescope sight unit, and to develop the necessary digital control systems for complete compatibility with the Improved TOW Missile (TOW II).

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Development Contract for Facts/I-TOW	Apr 1981	Not Shown

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Program Element: #6.42.12.A
DOD Mission Area: #211 - Close Combat

Title: COBRA/TOW
Budget Activity: #4 - Tactical Programs

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST (\$ in thousands):

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	945	8515	20074	8561	To be determined
Funds (as shown in FY 1981 submission)	970	9145	4560	-	To be determined

The reduction in FY 1980 reflects funds reprogramed to higher priority Army requirements. The FY 1981 decrease reflects the application of general Congressional reductions. The FY 1982 figures reflect concurrent development efforts to gain complete capability with the improved TOW missile by incorporating a digital control system.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Cost
Aircraft Procurement, Army:						
Funds (current requirements, New Aircraft)	29500	44500	-	-	-	-
Funds (as shown in FY 1981 submission)	29500	-	-	-	-	505100
Quantities (current requirements)	12	17	-	-	-	-
Quantities (as shown in FY 1981 submission)	15	-	-	-	-	-

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Program Element: #6.42.12.A
DOD Mission Area: #211 - Close Combat

Title: COBRA/TOW
Budget Activity: #4 - Tactical Programs

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>To Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
Funds (current requirements- Modification of Aircraft)	276400	138900	33100	117200	219300	1277200
Funds (as shown in FY 1981 submission)	276400	121300	18300	To be determined	To be determined	To be determined
Quantities (current requirements)	160	76	-	-	-	-
Quantities (as shown in FY 1981 submission)	160	64	-	-	-	-

The FY 1980 new procurement quantity reflects numbers of aircraft procured under a new contract reflecting higher subsystem costs. FY 1981 new buy figure of \$44500 thousand represents amount authorized by Congress for new AH-1S's. Under Modification of Aircraft, Congress authorized \$17200 thousand for modification of 12 TH-1C's to AH-1S's in FY 1981. Increased costs shown in FY 1982 and beyond reflect required funds to procure aircraft survivability equipment and the enhanced M65 TOW missile system.

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Program Element: #6.42.12.A
DOD Mission Area: #211 - Close Combat

Title: COBRA/TOW
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: To fulfill an urgent requirement for an operational aerial antitank system, the Army initiated a development program to equip the AH-1G (COBRA) aircraft with the Tube-Launched Optically Tracked Wire-Guided (TOW) missile system. This system was designed as the AH-1Q. During operational testing of the AH-1Q, it was determined that certain performance limitations resulted from the additional weight of the TOW missile system. A Product Improvement Program (PIP), designed to alleviate the performance limitations in the area of hover performance and payload capabilities, was initiated during FY 1974. The program was low risk as the engine was state-of-the-art and is similar to an engine that had already undergone extensive testing. The transmission gear boxes and tail rotor were components already in service on the Marine Corps AH-1J helicopter. An AH-1Q modified by the installation of these components has an increase in maximum gross weight from 9,500 pounds to 10,000 pounds and was designated the AH-1S. Funds were approved in FY 1974 and FY 1975 to modify 200 existing AH-1G's. Additional funds were approved in FY 1979 to convert and modernize 160 more AH-1G COBRA's to the AH-1S COBRA/TOW configuration as the initial effort toward modernizing the remainder of the existing AH-1G fleet. Funds were also approved in FY 1975 thru FY 1980 to procure 309 new AH-1S COBRA/TOW's.

G. (U) RELATED ACTIVITIES: Prior to the revised FY 1973 budget, the Improved COBRA Armament Program (ICAP), which incorporated the TOW missile system on the COBRA, had been previously identified in Program Element (PE) 6.42.02.A, Aircraft Weapons. The funds for this armament subsystem were shifted in FY 1977 to this program element. Also shifted to this element was the advanced technology program to develop a new COBRA main rotor blade. This advanced composite material blade was previously funded under Advanced Structures, PE 6.32.11.A. This restructuring consolidated all ongoing developmental COBRA improvement projects under a single program element (6.42.12.A) to obtain optimum program management. Office of the Secretary of Defense approved development of both the Army AH-1S and Marine AH-1J helicopters because of different mission requirements.

H. (U) WORK PERFORMED BY: Contractors: Bell Helicopter Textron, Ft. Worth, TX - Airframe; Kaman Aerospace Corp., Bloomfield, CN; General Electric Armament Division, Burlington, VT - Turret. In-house organizations: Aviation Research and Development Command, St. Louis, MO; and Ammunition Research and Development Command, Rock Island, IL. The program is managed by the Project Manager, COBRA, US Army Troop Support and Aviation Readiness Command, St. Louis, MO.

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Program Element: #6.42.12.A
DOD Mission Area: #211 - Close Combat

Title: COBRA/TOW
Budget Activity: #4 - Tactical Programs

1. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Development and qualification, including contractor and government testing, of the Universal Turret (UT) and Rocket Management Subsystem (RMS) was completed in October 1979. Production deliveries with the UT subsystem began in September 1978. Fabrication of the prototype fire control subsystems was completed and initial testing began in September 1978. The fire control subsystem developmental testing including operational issues was completed in November 1979. Ground operational checks, aerial nonfiring performance tests, and aerial firing performance tests to verify accuracy and performance in all functional modes of pilot heads-up-display (HUD), fire control computer (FCC), air data system (ADS), and laser rangefinder will be accomplished.

2. (U) FY 1981 Program: Begin full-scale engineering program for development of night capability for the COBRA/TOW by incorporating common module forward-looking infrared components into the COBRA/TOW telescopic sight unit. Complete prototype design.

3. (U) FY 1982 Planned Program: Continue engineering development of the FLIR-augmented COBRA/TOW sight (FACTS). Major effort directed towards fabrication of production prototypes, and begin systems integration. Begin Producibility Engineering and Planning (PEP).

4. (U) FY 1983 Planned Program: Complete engineering development of the FLIR-augmented COBRA/TOW sight (FACTS), and complete necessary DT/OT tests leading to production decision.

5. (U) Program to Completion: Currently, it is anticipated that the FACTS development effort will be completed, and procurement initiated in FY 1983.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.15.A
DOD Mission Area: #261 - Airlift

Title: UH-1 Modernization
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in Thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	200	0	0	0	16656	16856
D147	UH-1 Modernization	200	0	0	0	16656	16856

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The objective of this program is to meet continuing Army requirements for UH-1H/V combat support utility helicopters in the active Army and Army Reserve components by modernizing and extending the twenty-year service life of current UH-1H/V assets. To meet this need, the aircraft will be returned to depot for modification to the service life extension configuration and accomplishment of selected mission-required product improvements. This configuration includes a change from metal to composite main rotor blades which will provide increased life and reliability, improved performance, reduced maintenance, and increased survivability, safety, and producibility.

C. (U) EXPLANATION OF CANCELLATION OR DEFERRAL: The FY81 RDTE request was for initiation of the design and development of a composite main rotor blade for the UH-1. Congress interposed no objection to the overall UH-1 aircraft system modernization; however, they did question further development investment in composite rotor blades when the technology exists presently. Additional development, with attendant cost, is required for each different helicopter type due to differences in rotor systems, controls, and aircraft operating envelopes. Deferral of FY82 funding was due to requirements of higher priority Army programs.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #b.42.17.A
DOD Mission Area: #261 - Airlift

Title: Synthetic Flight Training Systems
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	1098	0	8333	TBD	Continuing	Not Applicable
D275	Synthetic Flight Training Systems	1098	0	8333	TBD	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program develops high fidelity operational flight, weapon sub-systems, and mission environment helicopter simulators to support initial entry rotary-wing training and combat operational training. The goal is to produce a simulation of the combat environment for tactical flight, to include nap-of-the-earth (NOE), weapons engagement, and enemy interaction, in order to provide realistic and cost effective training. The simulators are used to complement the training accomplished in actual helicopters during formal courses of instruction and for maintenance of combat readiness for rated Aviators.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: To initiate full-scale engineering development of the weapon simulator for the AH-64, Advanced Attack Helicopter including the simulation of the gunner's Target Acquisition Designation Sensor (TADS), the Pilot's Night Vision Sight (PNVS), and all weapon subsystems on the AH-64.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	1098	0	8333	TBD	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	1198	0	14733	N/A	Continuing	Not Applicable

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Program Element: #6.42.17.A
DOD Mission Area: #261 - Airlift

Title: Synthetic Flight Training Systems
Budget Activity: #4 - Tactical Programs

The FY 1982 decrease in funding is due to program adjustments due to the lack of sufficient funding priority within Army resources.

E. OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional to Completion</u>	<u>Total Estimated Cost</u>
Aircraft Procurement, Army						
Funds (current requirements)	16800	0	31300	TBD	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	Not Shown					
Quantities (current requirements)	2(CH-47)	0	2(AH-1S) 1(CH-47)	2(AH-1S)	Continuing	Not Applicable
Quantities (as shown in FY 1981 submission)	Not Shown					
Military Construction, Army						
Funds (current requirements)	2350	9110	10200	8430	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	Not Shown					

Funding in FY81 was deferred due to resource requirements of higher priority programs. Aircraft Procurement, Army and Military Construction, Army data submission was not required for FY81 deferred programs.

F. (U) DETAILED BACKGROUND AND DESCRIPTION: This program develops a family of high-fidelity flight, weapon subsystems, and mission environment helicopter simulators to support initial entry helicopter pilot training, transition training, and combat operational training. A major thrust is the development of a simulation of the combat environment for tactical flight, including nap-of-the-earth (NOE), weapons engagement, and enemy interaction, to provide realistic and cost effective training in a totally safe environment. The simulators complement the training accomplished in actual helicopters during formal courses of instruction and for maintenance of combat readiness for rated Aviators. Each simulator includes a replica of the helicopter cockpit, mounted on a motion system, plus an instructor's station with the equipment necessary for the instructor to control the training scenario, the operating environment, and the measurement of the pilot's performance. Each simulator

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Program Element: #6.42.17.A
DOD Mission Area: #261 - Airlift

Title: Synthetic Flight Training System
Budget Activity: #4 - Tactical Program

includes a visual system to provide the aircrew with a view of the terrain outside the helicopter. The FY 1982 funding will initiate the Engineering Development of the AH-64 Combat Mission Simulator. This device will be the first training simulator capable of simulating the full combat mission to include hostile enemy interaction. All AH-64 flight and weapons systems required for aircrew training, to include the gunner's target Acquisition Designation Sensor (TADS) and the Pilot's Night Vision Sight (PNVS), will be incorporated in the simulator.

G. (U) RELATED ACTIVITIES: Program Elements 6.32.16.A, Synthetic Flight Simulators, and 6.27.27.A, Non-Systems Training Device Technology. These activities are engaged in flight simulation component research and development.

H. (U) WORK PERFORMED BY: Link Division, The Singer Co., Binghamton, NY, for development of the AH-1, CH-47, and UH-60 simulators. Developing contractor for the AH-64 Combat Mission Simulator has not been selected. Responsible developing agency is the US Army Project Manager for Training Devices collocated with the US Naval Training Equipment Center, Orlando, FL.

1. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: The first simulator developed under this program was an instrument flight and emergency simulator modeled after the UH-1 helicopter. Development was completed in FY 1972. Production is now complete, and 22 of these simulators are in service at 17 locations worldwide. The second simulator developed provides transition and combat readiness flight training for pilots of the CH-47 helicopter. The simulator underwent development and operational testing in FY 1977 and demonstrated a cumulative transfer effectiveness ratio (CTER) of .85 to 1. In FY 1978 the CH-47 flight simulator was type classified. Production of five follow-on units began in FY 1979. The third simulator, simulating the AH-1 helicopter, completed development in FY 1980 and was type classified in FY 1980. Production of the AH-1 simulator will begin in FY 1981. The UH-60 Flight Simulator prototype was accepted by the Army in the second quarter of FY 1980 and is undergoing Development and Operational Testing at the US Army Aviation Center.

2. (U) FY 1981 Program: Not funded.

3. (U) FY 1982 Planned Program: Initiate full-scale engineering development of the combat mission simulator for the Advanced Attack Helicopter. Due to the limited funds available, it is anticipated that long-lead items and government-furnished equipment (GFE) will require most of the available funds.

4. (U) FY 1983 Planned Program: Continue the development of the combat mission simulator for the Advanced Attack Helicopter. An interim device for meeting the CY 1984 training need date will be considered as a part of the overall development of the combat mission simulator for the Advanced Attack Helicopter.

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Program Element: #6.52.17.A
DOD Mission Area: #261 - Airlift

Title: Synthetic Flight Training Systems
Budget Activity: #4 - Tactical Programs

5. (U) Program to Completion: This is a continuing program. The development effort for the AH-64 combat mission simulator is expected to continue through FY 1986.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.18.A

DOD Mission Area: #261 - Airlift

Title: Airdrop Equipment Development

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	823	2533	3184	4656	Continuing	Not Applicable Not Applicable
D279	Airdrop Equipment Development	823	2533	3184	4656	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports engineering development and type classification of airdrop components and systems used by all uniformed services for airborne assault and special operations and airdrop resupply of both conventional and airborne forces. The airdrop projects are included in the Army (US Army Training and Doctrine Command (TRADOC)) critical category priority list for support of combat operations. The program directly supports the XVIIIth Airborne Corps contingency plans for the deployment of an airborne division and thus is vital to national defense. The airdrop of supplies is increasing in importance in view of the increased need for a Rapid Deployment Force and the extended distances characteristic of many contingencies that could involve the vital interests of the US. Through data exchange agreements and standardization working groups, the program fulfills essential airdrop mission and technology needs of many allied countries.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Complete development, type classify and field Personnel Maneuverable Reserve Parachute for Free-Fall and a new airdrop platform. Continue development of Two-Stage Personnel Parachute System with accompanying loads and High Altitude Airdrop Resupply System (500-pound capacity) in support of special airborne operations; initiate development of 60,000-pound-capacity airdrop system and drop zone assembly aids (visual) to provide urgently needed new airdrop capability requested by XVIIIth Airborne Corps; initiate development of High-Speed Container Airdrop System to upgrade capability to airdrop critically needed supplies from high-performance aircraft; initiate tasks to provide airdrop engineering support for air transport and airdrop of Army materiel and for the development of the Air Force C-X aircraft.

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Program Element: #6.42.18.A
 DOD Mission Area: #261 - Airlift

Title: Airdrop Equipment Development
 Budget Activity: #4 - Tactical Programs

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	823	2533	3184	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	950	2721	3665	Continuing	Not Applicable

The FY 1980 reduction of \$127 thousand reflects a reprogramming of funds to higher priority Army requirements. The decrease in FY 1981 is attributable to the application of general Congressional reductions. The \$481 thousand decrease in FY 1982 is the result of the transfer of funds to higher priority efforts outside the airdrop program.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable. (NOTE: Airdrop items are stock fund procured and managed.)

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Program Element: #6.42.18.A
DOD Mission Area: #261 - Airlift

Title: Airdrop Equipment Development
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The on-going work under this program is dedicated to the development and fielding of airdrop systems, components, and techniques which will increase the mission capabilities of airdrop operations, reduce operational costs, increase reliability of airdrop materiel, and improve the readiness posture of airborne and airlift forces. The program supports Army, Marine Corps, Air Force, Navy, and Allied Forces (as requested). The major efforts through Fiscal Year 1983 are focused on: providing a capability to airdrop heavy, outsize combat materiel up to 60,000 pounds; fielding a single platform usable for all modes of airdrop; extending capability to airdrop personnel at higher speeds/lower altitude and at large offsets from target areas with precision; improving personnel reserve parachute for free-fall; new methods and equipment for enhancing the link-up of men and material after airdrop; providing a capability to airdrop related combat materiel on linked platforms; upgrading the capability to deliver critically needed supplies from high-performance aircraft; and providing airdrop/air transport engineering support to Army materiel developers and to the Air Force C-X aircraft development program.

G. (U) RELATED ACTIVITIES: Program Element's 6.22.10.A, Airdrop Technology, and 6.32.18.A, Airdrop Equipment and Techniques; Joint Technical Coordinating Group/Airdrop; Joint Air Movements Board; North Atlantic Treaty Organization (NATO), Air Transport Working Party; Air Standardization Coordinating Group, Working Party 44; Mutual Weapons Data Exchange Agreements with France, Germany, and Korea; United States/Germany Nonmajor Items Meetings.

H. (U) WORK PERFORMED BY: Metric Systems, Inc., Ft. Walton Beach, FL; AAI Corporation, Baltimore, MD; Arthur D. Little Inc., Cambridge, MA; Pioneer Parachute Co., Manchester, CT; Irvin Industries Canada Ltd, Fort Erie, Ontario; Strong Enterprises, Orlando, FL; Army Yuma Proving Ground, Yuma, AZ; Army Electronics Warfare Laboratory, Ft. Monmouth, NJ; Naval Ordnance Station, Indian Head, MD; Army Natick Research and Development Laboratories, Natick, MA.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Twelve new and improved items were fielded during the prior four years, including MC-1 Military Free-Fall Parachute System; static line deployed Steerable Personnel Parachute; Ramp Bundle Delivery System for the C-130 Aircraft; Dragon Missile Jump Pack; Navy Emergency Air Cargo Delivery System; High-Speed, Low-Level Airdrop System (500-lb. capacity); and High-Altitude Airdrop Resupply System (2000-lb. capacity). Developed rigging procedures and qualified 128 items of priority munitions for airdrop. Fabricated test quantities of the Free-Fall Maneuverable Reserve Parachute and initiated development of High Altitude Airdrop Resupply System (500 pound capacity). Completed fabrication of test quantities of Type V Airdrop Platform. Provided airdrop and air transport engineering support to various developers of Army Materiel.

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Program Element: #6.42.18.A
DOD Mission Area: #261 - Airlift

- Title: Airdrop Equipment Development
Budget Activity: #4 - Tactical Programs

2. (U) FY 1981 Program: Continue to provide airdrop/air transport assistance to developers of Army materiel and initiate development of computer model to simulate loading Army materiel in air transport aircraft. Participate in contractor source selection, contractor design reviews and flight test planning of Air Force C-X developmental aircraft. Conduct development and operational tests of Type V Airdrop Platform. Complete development of CTU/2A High Speed Container Airdrop System and type classify. Complete development and operational tests of Free-Fall Maneuverable Reserve Parachute. Procure test quantities of components for High-Altitude Airdrop Resupply System (500-pound) and initiate development as well as operational testing.

3. (U) FY 1982 Planned Program: Design components, fabricate engineering design test quantities, and initiate design tests of critical components of 60,000-Pound Capacity Airdrop System. Continue to provide airdrop and air transport engineering assistance to developers of Army materiel and to develop computer model to simulate loading of materiel in air transport aircraft. Continue participation in the development of the Air Force C-X developmental aircraft and identify needed related Army airdrop developments. Complete development of Type V Platform and type classify. Complete fabrication of engineering check test quantities of Two-Stage Personnel Parachute components and initiate Engineering Check tests. Complete development of Free-Fall Maneuverable Reserve Parachute and type classify. Complete development and operational tests of High-Altitude Airdrop Resupply System (500-pound capacity). Initiate engineering development of Drop Zone Assembly Aids (Visual), High-Speed Container Airdrop System (1000-pound capacity), and Two-Stage Personnel Parachute Systems.

4. (U) FY 1981 Planned Program: Continue engineering development of 60,000-pound-capacity airdrop system. Complete the computer simulation model of cargo-loading operations for air transport aircraft and provide airdrop/air transport engineering assistance to developers of Army materiel. Continue to participate in design reviews, test planning and engineering evaluations of Air Force C-X developmental aircraft. Complete Engineering Check tests of Two-Stage Personnel Parachute System, fabricate development test quantities, and initiate development testing. Type classify High Altitude Airdrop Resupply System (500-pound). Complete development and operational tests of Drop Zone Assembly Aids (Visual) System and initiate development of Level II (Improved) Drop Zone Assembly Aids (Visual) System. Conduct wind tunnel tests of High Speed Container Airdrop System. Initiate development of Airdrop Controlled Exit System, Bundle Airdrop System (C-141 aircraft), and Personnel Offset/Precision Airdrop System.

5. (U) Program to Completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.20.A

DOD Mission Area: #255 - Tactical Surveillance

Title: Army Helicopter Improvement Program

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost To be determined
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	0	25939	39373	45876	48812	
D518	Army Helicopter Improvement Program (AHIP)	0	25939	39373	45876	48812	160000

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Ground commanders require highly survivable, flexible, and responsive means to conduct reconnaissance, surveillance, security, target acquisition, and target designation functions in reduced visibility conditions and all levels of intensity of warfare. This program is to adapt an existing helicopter to perform those functions. The helicopter will operate in air cavalry, attack helicopter, and field artillery units. In the antitank role the developmental system and attack helicopters will operate in close harmony as hunter/killer teams. In support of field artillery, the developmental system will provide conventional artillery spotting and precision laser designation for the COPPERHEAD. The program will provide a day/night target acquisition and laser designation capability through incorporation of a Mast-Mounted Sight (MMS) into an existing airframe. The designed system will include space, weight, and power, as well as structural considerations to incorporate a Multipurpose Lightweight Missile (MLM) system to provide a self-defense capability and the integration of an improved nap-of-the-earth communication and navigation system.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: The FY 1982 program provides for the minimum essential effort required for continuation of the full-scale engineering development of the near-term Scout helicopter/MMS integration initiated in FY81 and structured to achieve earliest possible initial operational capability (IOC). Requested funds will be used for fabrication and initial hardware integration and contractor testing.

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Program Element: #6.42.20.A
 DOD Mission Area: #255 - Tactical Surveillance

Title: Army Helicopter Improvement Program
 Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Concept Formulation Package Complete*	Oct 79	Oct 79
Special Army Systems Acquisition Review Council/Office of the Secretary of Defense Program Review*	Nov 79/Dec 79	Nov/Dec 79
ASARC Management Review	Jul 80	Not Shown
Request for Proposal (RFP) Release for Near-Term Scout Helicopter (NTSH)	Jan 81	Not Shown
NTSH Source Selection Evaluation Board (SSEB)	Apr-Jun 81	Not Shown
Engineering Development Contract Award	Aug 81	Nov 81
Initial Operational Capability (IOC)	Mar 86	Jul 85

*Performed under Project D231, PE 6.42.03.A.

The program milestones have been realigned to accelerate full-scale engineering development contract award and optimize fully integrated systems approach to meet the near-term target acquisition/designation capability requirements. August 1981 contract award and March 1986 IOC date could possibly be improved upon during upcoming contract negotiations following source selection when more definitive data are available. The change in IOC date from the FY 1981 submission was mandated by the time required to evaluate the potential airframe candidates and formulate a viable competitive acquisition strategy.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	0	25939	39373	94688	160000
Funds (as shown in FY 1981 submission)	0	5023	38000	To be determined	To be determined

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Program Element: #6.42.20.A
DOD Mission Area: #255 - Tactical Surveillance

Title: Army Helicopter Improvement Program
Budget Activity: #4 - Tactical Programs

1981 - Increase of \$20.9M permits acceleration of development program initiation to permit the possibility of fielding of the Near-Term Scout Helicopter in a reasonable timeframe. Total estimated cost of \$160000 thousand is based on a preliminary Army cost estimate. A validated baseline cost estimate is planned for completion in July 1981.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>To Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
Aircraft Procurement, Army Funds (current requirements) Funds (as shown in FY 1981 submission)	0	0	0		To be determined	To be determined
	Not Applicable					
Quantities (current requirements)	0	0	0	0	720	720
Quantities (as shown in FY 1981 submission)					720	720

The Army will address the procurement funding requirements during the FY83-87 POM formulation.

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Program Element: #6.42.20.A
DOD Mission Area: #255 - Tactical Surveillance

Title: Army Helicopter Improvement Program
Budget Activity: #4 - Tactical Programs

F. (U) **DETAILED BACKGROUND AND DESCRIPTION:** In January 1974, Headquarters, Department of the Army approved a Required Operational Capability (ROC) for an Advanced Scout Helicopter (ASH). A special task force reviewed the need for an aerial scout and conducted concept formulation efforts and trade-off analyses and evaluations during FY 1975. In February 1975, the Army Systems Acquisition Review Council (ASARC) approved the need for the ASH and the initiation of hardware development. The need and initiation of a development program was subsequently approved by the Department of Defense Systems Acquisition Review Council (DSARC) in September 1975. Both the Army and the Department of Defense concluded that some commonality between the ASH and potential future helicopters in the weight class, such as a light attack or a light utility, was probably achievable. In March 1976, the DSARC again reviewed the Army's program and reaffirmed support for a helicopter in the weight class of ASH and approved development of a Target Acquisition and Designation System (TADS) and Pilot Night Vision System (PNVS) to be common to the ASH and Advanced Attack Helicopter (AAH). Subsequent Congressional action denied the ASH FY 1977 funding request, increased the AAH funds to provide for development of TADS and PNVS, and provided guidance to disestablish the ASH Project Office. Congress indicated, however, that the ASH program would be considered later if proposed by the Army. The requirement continues, and the Army requested FY 1979 funds, which were provided by Congress, to support the analyses and system trade-off studies required to determine the best candidate systems to meet the requirement as it was being updated. A special study group was also established to refine the specifics of the requirement and to thoroughly explore all candidate systems, and the ASH Project Office was reestablished 1 June 1979. This work was completed in October 1979. A special ASH ASARC on 30 November 1979 reaffirmed the Army's need for ASH. The special ASARC also looked at the affordability issue and acknowledged that the full ROC development program could not be supported under present funding constraints. Furthermore, the special ASARC determined that mast-mounted sight (MMS) technology is sufficiently mature to apply to an existing airframe. The near-term program will furnish an urgently needed capability that is compatible with the near-term attack helicopter fleet and provide a logical step moving toward the most survivable combat force. Analyses clearly indicate when committed to battle the MMS helicopter significantly increases attack/MMS helicopter team survivability, and also improves the total force loss exchange ratio. The Aerial Scout program (Project D281) was cancelled by the Office of the Secretary of Defense (OSD) at the end of FY80 and effort redirected toward integration of a mast-mounted sight (MMS) on an existing inventory airframe to continue under a new program element (PE #6.42.20.A) and title Army Helicopter Improvement Program. The OSD decision precluded new airframe development activity and withheld commitment for any procurement. After user-developer mission profile and MMS/detectability evaluations conducted Spring 1980 an ASARC Management Review in July 1980 approved a program to compete MMS development and integration on existing inventory airframes and to include performance improvements to enhance hover-out-of-ground-effect (HOGE) capability to meet worldwide deployability requirements.

G. (U) **RELATED ACTIVITIES:** Previous aerial scout program concept and program formulation efforts were conducted under program elements #6.12.05.A, Aerial Scout, and 6.42.03.A, Aerial Scout. A portion of PE 6.42.03.A, Aerial Scout, FY 1980 funding will be used to support initial phases of MMS development. Weapon systems being developed under elements 6.46.21.A and

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Program Element: 6.42.20.A
DOD Mission Area: 255 - Tactical Surveillance

Title: Army Helicopter Improvement Program
Budget Activity: 4 - Tactical Programs

6.43.10.A, Heliborne Missile - HELLFIRE, and program element, 6.46.21.A, COPPERHEAD, when required, will use the terminal homing guidance provided by the mast-mounted laser designator on the MMS helicopter.

H. (U) WORK PERFORMED BY: Prime contractor will be determined when source selection has been completed for the Near-Term Scout Helicopter. In-house developing organization: US Army Aviation Research and Development Command, St Louis, MO.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Covered under Program Element 6.42.03.A Projects D281 and D304; FY 1979 effort encompassed overall concept formulation and requirements documentation, feasibility studies, and trade-off analyses (including North Atlantic Treaty Organization/Rationalization Standardization Interoperability (NATO/RSI) potential), and cost and operational effectiveness analyses (COEA) for the Advanced Scout Helicopter (ASH). FY 1980 effort: ASH Special ASARC on 30 November 1979, Office of the Secretary of Defense (OSD) review on 18 December 1979, ASARC management Review on 10 July 1980 and Department of the Army (DA) and US Army Materiel Development and Readiness Command (DARCOM) acquisition strategy reviews on 28 July 1980. Also, included effort for the Army Helicopter Improvement Program (AHIP) Near-Term Scout Helicopter (NTSH) ROC, COEA, Procurement Plan and draft Request for Proposal (RFP) preparation.

2. (U) FY 1981 Program: Covered by Program Element 6.42.20.A., Army Helicopter Improvement Program, includes preparation and release of final RFP, Source Selection Evaluation Board (SSEB) effort, Army/OSD decision reviews, and award of Initial Engineering Development (ED) contract.

3. (U) FY 1982 Planned Program: Continuation of Engineering Development (ED) contract; includes continuation of engineering design, fabrication and initial hardware integration and contractor testing of aerodynamic (MMS nonfunctional) prototype.

4. (U) FY 1983 Planned Program: Award of third increment to ED contract; includes system first flight, contractor flight testing, qualification and prototype delivery. Army will conduct preliminary airworthiness evaluation (PAE).

5. (U) Program to Completion: Award of final increment to ED contract; includes Producibility Engineering Planning (PEP), contractor testing and reporting. Army will conduct development testing/operational testing (DT/OT). Component production and airframe modification contracts will be awarded, leading to aircraft delivery and initial operational capability projected for late CY 1985.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.21.A Title: AN/UPD-7 Surveillance Systems
DOD Mission: #255 - Tactical Surveillance, Reconnaissance, and Target Acquisition Budget Activity: #4 Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	520	0	4000	13200	18000	35720
	QUANTITIES						
D208	AN/UPD-7 Surveillance System	520 <u>1/</u>	0 <u>2/</u>	4000	13200	18000	35720 <u>3/</u>

NOTES: 1 - This funding was contained in Program Element 6.42.01.A, Aircraft Avionics, Project DC95, Airborne Data Links in the FY 1981 Budget Request. The program has been transferred to a new Program Element to align it with the correct DOD Mission Area.

2 - FY 1981 funding of \$4,335 thousand requested in the FY 1981 Budget for this program was deferred by Congress.

3 - RDTE Program will equip one fielded OV-1D Detachment of six aircraft with four product-improved radar systems, two ground stations, and one set of ground support equipment.

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Current doctrine for fighting a theater war includes two major efforts: fighting the main battle and interdiction of the second echelon. Of decisive importance in the conduct of the main battle is the isolation of the battle area from outside influence through interdiction of the second echelon. This is a Corps mission and has the inherent requirement that the Corps commander must be able to locate, identify, and target second-echelon forces out to beyond the forward line of troops (FLOT). The inability to delay, disrupt, or destroy second-echelon forces will allow an overwhelming force to form against our frontline units, a force which could not be contained in any conventional manner. The current AN/UPD-7 Surveillance System with its AN/APS-94F side-looking airborne radar (SLAR) is in several significant areas and cannot meet the Corps Commander's needs and support successful inter-

Program Element: #6.42.21.A

DOD Mission: #255 - Tactical Surveillance, Reconnaissance,
and Target Acquisition

Title: AN/UPD-7 Surveillance Systems

Budget Activity: #4 Tactical Programs

diction of the second echelon. This program will product-improve the existing AN/UPD-7 Surveillance System to meet the Corps commander's moving target surveillance requirements. The AN/UPD-7() or electronically scanned (E-SCAN) program will enable the system to operate against the threat which the current system cannot do, will extend the surveillance range out to the required beyond the forward line of troops (FLOT) and most important, will provide continuity of surveillance by scanning the entire Corps area of influence every 90 seconds. The current system does not provide timely enough coverage of the Corps area of influence and adjacent flanks to insure that second-echelon forces do not enter the main battle area undetected. The continuity of surveillance provided by the product-improved AN/UPD-7 will detect second-echelon forces entering the Corps area of influence and will be used to cue shorter range, more accurate target acquisition systems such as Standoff Target Acquisition System (SOTAS) and PAVE MOVER as they are introduced into the force structure.

C. (U) BASIS FOR FY 1982 RDTE REQUEST:

1. (U) FY 1982 funds are required to initiate Engineering Development (ED) of four prototype electronically scanned (E-SCAN) and electronic countermeasures (ECM)-hardened versions of the AN/APS-94F side-looking airborne radar, two ground sensor terminals with electronic countermeasures-hardened data links, and one set of special test equipment. The AN/UPD-7() system engineering design will be completed, and the procurement of long-lead components will be made to support system fabrication in FY 1983.

2. (U) The FY 1981 request for this effort was deferred by Congress and is now being requested again in FY 1982. The FY 1981 deferment was based upon the battlefield surveillance capabilities to be provided by developmental systems such as the Army Standoff Target Acquisition System (SOTAS) and Air Force TR-1 ASARS II, and PAVE MOVER. Since that deferment, the Army has done an extensive relook at the Corps Commander's surveillance requirements and the ability of other Army or Air Force developmental systems to satisfy these requirements. The initial conclusions drawn from this review are that the AN/UPD-7() electronically scanned (E-SCAN) system will meet a unique set of requirements and is still an urgently needed capability. This conclusion was supported by three separate formal statements of urgency for the AN/UPD-7() system from Eighth US Army, US Army Europe, and US Army Forces Command. This review will be continued during FY 1981 in the form of a "mini" Cost and Operational Effectiveness Analysis (COEA) to further reinforce the complementary and cost effectiveness of the AN/UPD-7() system as an integral part of the SOTAS, PAVE MOVER, and ASARS II "radar mix" on the battlefield.

3. (U) The total developmental costs shown in this summary are the result of a one-year detailed engineering analysis and program structuring executed by the Army during FY 1980. These costs were developed independently by Georgia Institute

Program Element: #6.42.21.A

DDO Mission: #255 - Tactical Surveillance, Reconnaissance,
and Target Acquisition

Title: AN/UPD-7 Surveillance Systems

Budget Activity: #4 Tactical Programs

of Technology, Atlanta, GA, and the US Army Combat Surveillance and Target Acquisition Laboratory, Fort Monmouth, NJ, and were done in cognizance of the restructuring of the Standoff Target Acquisition System (SOTAS) program funding requirements that occurred concurrent with this effort. Prior to the start of the Engineering Development (ED) program in FY 1982 the total development costs will be further validated by a baseline cost estimate to be accomplished in FY 1981.

4. Major Milestones:

Current Milestone Dates:

Mini Cost and Operational Effectiveness Analysis	Jul 81
Baseline Cost Estimate	Jul 81
Antenna Proof Of Principle Demonstration	Jul 81
HQDA Engineering Development Decision	Aug 81
Engineering Development Contract Award	May 82
Developmental and Operational Testing	Sep-Dec 84
Interim Initial Operating Capability	
Production Award	May 85
Initial Operating Capability	

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	520	0	4000	31200	35720
Funds (as shown in FY 1981 submission)	595	4335	5955	0	13995

The FY 1980 funding decrease resulted from a reprogramming of funds to higher priority Army requirements. The funding

Program Element: #6.42.21.A

Title: AN/UPD-7 Surveillance Systems

DOD Mission: #255 - Tactical Surveillance, Reconnaissance,
and Target Acquisition

Budget Activity: #4 Tactical Program

required for initiation of this program in FY 1981 was deferred by Congress. In addition, the total program cost shown in the FY 1981 submission was an early estimate of program RTE requirements. During the past year the total system configuration was defined, and two independent cost estimates were made. The total RTE program cost will be further validated during FY 1981 with a Baseline Cost Estimate of the total system.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
Aircraft Procurement, Army:						
Funds (current requirements)	0	0	300	15100	102300	117400
Funds (as shown in FY 1981 submission)				15479	28479	43958
Quantities (current requirements)						
Data Links				20	70	90
Radars					32	32
Ground Stations					24	24
Quantities (as shown in FY 1981 submission)						
Data Links				90	0	90
Radars					0	0
Ground Stations					0	0
Military Construction, Army:						
Funds (current requirements)					0	0
Funds (as shown in FY 1981 submission)					0	0

Program Element: #6.42.21.A

Title: AN/UPD-7 Surveillance Systems

DOD Mission: #255 - Tactical Surveillance, Reconnaissance,
and Target Acquisition

Budget Activity: #4 Tactical Programs

The FY 1981 submission supported the procurement of an electronic countermeasures (ECM)-hardened data link for the AN/UPD-7 (APS-94F) program. The current requirements incorporate the same as a part of the AN/UPD-7() program which also includes sufficient radars and ground stations to equip the active Army OV-10 fleet. The procurement funding requirements for the AN/UPD-7() (E-SCAN) were developed from two independent cost analyses accomplished in FY 1980 by the Georgia Institute of Technology, Atlanta, GA, and the US Army Combat Surveillance and Target Acquisition Laboratory, Fort Monmouth, NJ, and will be further validated during FY 1981 with a Baseline Cost Estimate.

Program Element: #6.42.21.A

DOD Mission: #255 - Tactical Surveillance, Reconnaissance,
and Target Acquisition

Title: AN/UPD-7 Surveillance Systems

Budget Activity: #4 Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: In order to successfully conduct his mission of interdiction of the second echelon, the Corps Commander has the inherent requirement of being able to locate, identify, and target second echelon forces out to beyond the forward line of troops (FLOT). The AN/UPD-7(), electronically scanned (E-SCAN), program will product-improve the current AN/UPD-7 (AN/APS-94F) Corps surveillance system to meet this requirement. The Army currently has five Corps-level companies and two detachments of OV-10, MOHAWK, aircraft fielded worldwide. The primary sensor associated with these units is the AN/UPD-7 Corps-level surveillance system, of which the AN/APS-94F side-looking airborne radar (SLAR) is the main component. This system currently provides a valuable intelligence product to field commanders on a daily basis, but does have several major deficiencies. The current AN/UPD-7 system requires up to 10 minutes to cover a typical Corps front (not including Corps flanks) and has a range of only 100 miles beyond the forward line of troops (FLOT). Due to this lack of timely surveillance coverage of the Corps area, the system cannot maintain continuity (speed and direction) on moving targets it detects. This limited coverage will permit second-echelon forces to enter the Corps area of influence undetected. In addition both the AN/APS-94F radar and the data link (AN/ARC-164(V)12) that connects the airborne sensor to the ground station will be replaced.

This program will product-improve the existing AN/UPD-7 surveillance system to correct these deficiencies and meet the Corps Commander's radar surveillance requirements. Utilizing proven technology from other development programs, the radar will be electronically scanned to enable it to cover up to 100 miles of the Corps Commander's area of influence every 10 seconds. This timely coverage will allow the Corps Commander to maintain continuity and track moving targets as they advance into the main battle area. Current aircraft (OV-10) assets are capable of maintaining this surveillance capability around the clock during hostilities and will allow the AN/UPD-7() system to cue targeting systems such as Standoff Target Acquisition System (SOTAS) and PAVE MOVER for direct engagement as the second-echelon forces move into range. At the same time the electronically scanned (E-SCAN) radar will be replaced.

This hardening will have the additional operational benefit of extending the current range of the AN/APS-94F to the range beyond the forward line of troops (FLOT) required by the Corps Commander. This program will also replace the existing AN/UPD-7 data link with an AN/ARC-164(V)12 to provide a data link that is interoperable with the Division-level Standoff Target Acquisition System (SOTAS) ground terminal. This will be achieved by integrating the same data link that is being developed for SOTAS and the Army Remotely Piloted Vehicle (RPV) and will not involve the development of yet another new data link. Finally, the current AN/UPD-7 ground station will be replaced with a ground station that is functionally similar, if not identical, to the SOTAS Secondary Ground Station. This change is necessary to allow the surveillance information collected from the OV-10, MOHAWK, to be displayed in near-realtime in the ground station on a cathode ray tube (CRT) and to allow software-controlled time compression of the tracks made by moving targets. This is the same technique utilized by the Interim Interim (I2) SOTAS currently in operation in Europe. This engineering

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development (ED) program will result in enough hardware (4 radars, 2 ground stations, and one set of special test equipment) to equip an OV-1D Detachment. At the conclusion of fabrication, the AN/UPD-7() system will undergo a limited development and operational test and then be refurbished. The refurbished AN/UPD-7() hardware will then be fielded to an OV-1D Detachment in Europe for an interim initial operational capability (IOC) in . The program will then transition to a limited production of hardware to equip all the active Army OV-1D units. The AN/UPD-7() will have a production IOC of in Europe. The decision to continue this program after the Congressional deferment of the FY 1981 funding was made only after a careful evaluation of the operational capabilities anticipated to be achieved by other developmental radar systems. This evaluation will continue in FY 1981 in much greater detail through the AN/UPD-7() "mini" Cost and Operational Effectiveness Analysis that will include the Standoff Target Acquisition System (SOTAS), PAVE MOVER, and ASARS II. The initial results of this evaluation strongly support the need for the AN/UPD-7() as part of our "radar mix." The SOTAS cannot meet the Corps surveillance requirements without a product improvement to the current engineering development system and additional procurement. This is neither timely nor cost effective. The Air Force ASARS II system does not meet the Corps commander's surveillance requirements in several major areas. ASARS II is a fixed target radar system, not a moving target system, and its range of beyond the forward line of troops (FLOT) falls short of the required. Additionally, ASARS II is sized to support four to five Corps in an Allied Tactical Air Force support area, and as such, cannot provide the continuous coverage required to maintain continuity on moving targets in a single Corps area of influence. PAVE MOVER is also an Allied Tactical Air Force asset or possibly even a Theater asset and must support four to eight Corps. This also will preclude it from providing dedicated support to a single Army Corps. With a primary mission of target acquisition and strike control for Assault Breaker, PAVE MOVER cannot provide continuous surveillance coverage to any one single Army Corps. As the PAVE MOVER feasibility test data, operational and organizational concept and fielding data become available, its cost and operational effectiveness to meet the Corps surveillance requirements will continue to be evaluated. All of these systems, Standoff Target Acquisition System (SOTAS), AN/UPD-7(), ASARS II, and PAVE MOVER, are designed and built to perform a unique function on the battlefield and operationally complement each other on the battlefield. In addition to performing the Corps commander's radar surveillance mission, the AN/UPD-7() will perform a valuable cueing function in support of the targeting capabilities of both SOTAS and PAVE MOVER.

G. RELATED ACTIVITIES: This program is capitalizing upon the development work contained in several related programs by incorporating proven technology from them as appropriate. This approach has resulted in a low-risk development program that is largely an integration effort. The only area of the AN/UPD-7() system development assessed to have any risk is the approach to achieving an , threat environment. This approach is technologically simple utilizing a d beam concept and will be proven during FY 1981 with a proof of principle demonstration. This effort will be accomplished as a part of Program Element 6.37.19A, Surveillance,

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Target Acquisition and Night Observation (STANO), Project DK72, Radar. The AN/UPD-7() will utilize either the Modular Integrated Communications and Navigation System (MICSNS) under development in Program Element 6.47.48.A, Standoff Target Acquisition System (SOTAS), and Program Element 6.47.30.A, Remotely Piloted Vehicle (RPV), or the L-80 Microwave Data Link developed for the TR-1 and Improved GUARDRAIL V programs. The ground station to be utilized for the AN/UPD-7() capitalizes on the secondary ground control station currently being developed in Program Element 6.47.48.A, SOTAS, and will be either identical or a minimally modified version of that piece of equipment. The engineering design study for the AN/UPD-7() that was accomplished in FY 1980 also took a detailed look at the Air Force PAVE MOVER and ASARS II developments. Some of the basic components of the AN/UPD-7() antenna will be a direct application of hardware developed in the PAVE MOVER Program. The entire design concept for the AN/UPD-7() was managed by a Study Advisory Group (SAG) composed of members from the Army Standoff Target Acquisition System (SOTAS) program, Combat Surveillance and Target Acquisition Laboratory, Program Manager for Special Electronic Mission Aircraft (SEMA), Headquarters, US Army Electronics Research and Development Command (ERADCOM), and US Army Training and Doctrine Command (TRADOC). Coordination between this management group and the Air Force was accomplished through numerous visits with the PAVE MOVER and ASARS II project offices and system contractors. The primary objective of this type of continuing coordination is to insure that there is no duplication of effort within the Army or the Air Force and that the AN/UPD-7() can be rapidly developed in a low-risk, low-cost program. This integration of components developed and proven in other programs as a product improvement to an already fielded system will assure that these objectives are met.

H. (U) WORK PERFORMED BY: In-House: PM, Special Electronic Mission Aircraft, St. Louis, MO; US Army Electronics Research and Development Command (ERADCOM), Adelphi, MD; Combat Surveillance and Target Acquisition Laboratory (CS&T), Fort Monmouth, NJ. Contractors: Engineering Experiment Station, Georgia Institute of Technology, Atlanta, GA; Milibu Research Associates, Santa Monica, CA.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: During FY 1980 the Army (US Army Intelligence Center and School) developed an Organizational and Operational Concept for providing moving target surveillance of the battlefield to both Corps and Division Commanders. This concept included the complementary operation of Standoff Target Acquisition System (SOTAS) at Division Level and the AN/UPD-7() electronically scanned (E-SCAN) system at Corps level. In addition a preliminary trade-off analysis was made to determine if the Corps or Division Commander's requirements could be met solely with SOTAS or the AN/UPD-7() (E-SCAN). The initial results of this analysis clearly delineated the benefits obtained from the improved AN/UPD-7() and showed how this system and SOTAS perform unique functions and complement each other. In parallel with this

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work, an Independent Analysis was conducted that determined the baseline hardware and software configuration for the AN/UPD-7() system utilizing existing technologies from programs such as PAVE MOVER, ASARS II and SOTAS. All of these actions were reviewed at an HQDA decision briefing in October 1980. The results of this review are the FY 1981 and beyond program described below.

2. FY 1981 Program: During FY 1981, the trade-off analysis accomplished in FY 1980 will be expanded to a "mini" Cost and Operational Effectiveness Analysis (COEA) utilizing Standoff Target Acquisition System (SOTAS), ASARS-II and PAVE MOVER as baseline systems. In addition, the formal requirement for the AN/UPD-7() electronically scanned (E-SCAN) will be updated based on a review of the requirement for targeting and target classification at both Division and Corps areas of influence. In parallel with these initiatives, a proof-of-principle model for the recommended AN/UPD-7() radar Electronic Counter-Countermeasures (ECCM) approach will be developed and tested. The results of the FY 1980 Independent Analysis indicated the entire development of the AN/UPD-7() would be of low developmental risk with the sole exception of the Electronic Counter Countermeasures (ECCM) approach which is classified as a moderate risk. The proof-of-principle demonstration will eliminate the risk associated with this portion of the program. All of these actions will be reviewed at an HQDA decision briefing in August 1981 and a decision will be made on whether to proceed with Engineering Development with the AN/UPD-7() in FY 1982.

3. (U) FY 1982 Planned Program: Based on the previous two years' work and a successful review of this work by HQDA in August 1981, all necessary experimental work, and operational considerations will have been performed, and the AN/UPD-7() will be ready for full-scale Engineering Development. The FY 1982 program will then initiate development of four prototype electronically scanned (E-SCAN) and Electronic Countermeasures (ECM)-hardened versions of the AN/APS-94F side-looking airborne radar, two ground sensor terminals with ECM-hardened data links, and one set of special test equipment. System engineering design will be completed, and the procurement of long lead items will be completed to support fabrication in FY 1983.

4. (U) FY 1983 Planned Program: Based on the engineering design completed in FY 1982, the hardware modifications to the AN/UPD-7 (APS-94F) will be initiated. These will include the development and fabrication of the new electronic scanned antenna, and the ground sensor terminal will be initiated. If the Standoff Target Acquisition System (SOTAS) data link and secondary ground station have been selected for use in this system, this will be largely an integration effort vice developmental effort.

5. Program to Completion: Engineering development will be completed during the fourth quarter of FY 1984 with the subsequent fielding of the engineering development hardware to an OV-1D detachment in Europe in

FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.06-A

DOD Mission Area: #213 - Ground Air Defense

Title: STINGER

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	18827	5833	16171	To Be Determined		
	QUANTITIES						208
D646	Stinger	18827	5833	16171	To Be Determined		

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for full-scale development of a Manportable Air Defense Weapon System (MANPADS). MANPADS is a self-defense, air defense weapon system needed at the company unit level to counter enemy low-altitude, high-speed tactical aircraft and helicopter threats to company-size units operating near the Forward Edge of the Battle Area (FEBA). Stinger has been designed as the MANPADS to replace the current Redeye system, which has no forward aspect engagement capability and no Identification, Friend or Foe (IFF) system. Engineering Development (ED) of the basic Stinger system was completed with FY 1978 funds.

An advanced seeker, *Passive Optical* Seeker technique (POST), was approved for engineering development in June 1977 to significantly improve Stinger's infrared counter-countermeasures capability.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: The programed full-scale development of the advanced seeker (POST) will continue. Ground testing of the missile will be completed by the contractor as well as simulation validation. Prototype Qualification Tests (PQT) by the government, consisting of 16 rounds, will begin in FY 1982. The Stinger-POST final performance assessment will also begin during this period. Program costs and schedule are being analyzed to evaluate a possible growth in the program of approximately \$10 million because of the additional time required to complete testing and qualification related to the integration of the sealed head with the guidance electronics.

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Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Initiation of ED of the POST Seeker	June 1977	June 1977
Completion of ED of POST Seeker	July 1982	June 1981
Initial Hardware Availability	December 1985	March 1983

The Stinger-POST engineering development program was extended because of difficulties encountered with producibility, integration/assembly and testing of the POST seeker head and packaged electronics. The Stinger-POST program is currently being analyzed to more accurately define the schedule impact.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	18827	5833	16171	To Be Determined	
Funds (as shown in FY 1981 submission)	17577	9945	0	0	204710

(1) In FY 1980 \$1.25M was reprogramed to conduct a special acquisition test in Germany. (2) FY 1981 funding was reduced by \$3.5M for the FY 1981 budget amendment and by \$0.5M for the studies general reduction. (3) \$4M was added to FY 1982 to recoup the \$3.5M lost in FY 1981. An additional \$12M was included in FY 1982 amendment to resource the additional time required to conduct testing related to the integration of the sealed head with the guidance electronics.

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E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>To Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
Missile Procurement, Army						
Funds (current requirements)	81800	70600	224300	To Be Determined		
Funds (as shown in FY 1981 submission)	81000	70800	168600	-	908700	1368000
Quantities (current requirements)	1874	1356	2544	To Be Determined		30453
Quantities (as shown in FY 1981 submission)	2400	1356	1974	-	22215	30453
Military Construction, Army						
Funds (current requirements)	3300	0	2914	-	0	6214
Funds (as shown in FY 1981 submission)	0	0	0	-	0	0

Change in quantities in FY 1980 is the result of the FY 1980 contract negotiations. Other changes in the missile procurement program are due to economic changes resulting from application of new Department of Defense inflation guidance and for Stinger-POS1 development and production schedule delays resulting in stretching out completion of the procurement program. Additional funding in FY 1982 resulted from estimating changes based on prior year contract experience. Military construction in FY 1982 is to construct two moving target simulator buildings in Germany to support training of Stinger and Redeye teams. Procurement funding programed for FY 1982 includes purchase of the equipment for these building.. Military construction in FY 1980 was not included in this summary in the FY 1981 submission.

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F. DETAILED BACKGROUND AND DESCRIPTION: The currently fielded Redeye Guided Missile System exhibits serious limitations in view of the current and postulated threat posed by enemy support and interdiction jet aircraft. Redeye can attack only
Furthermore, Redeye has no Identification, Friend or Foe (IFF) capability. The purpose of this program is to produce, test, and field Stinger as the successor to Redeye, and to develop, test, and field the follow-on Stinger-POST seeker with improved counter-countermeasures to meet advanced countermeasures threats. As a successor to Redeye, Stinger will overcome the above cited deficiencies by being capable of engaging threat aircraft from any aspect at speeds

Stinger will provide an integral air defense capability to the combat maneuver company complemented by PATRIOT, ROLAND, and DIVAD GUN in the overall air defense of the field Army. Stinger will be deployed with both Army and Marine Corps forward combat elements and is expected to replace Redeye generally on a one-for-one basis. Stinger is similar to Redeye in that it is a shoulder-fired, passive infrared homing guided missile system. Stinger has a higher performance rocket motor, an advanced seeker, a separable reusable gripstock, a new launcher, and a lightweight Identification, Friend or Foe (IFF) device. The total weight of the missile and its launcher in the ready-to-basic-fire configuration is 33.9 pounds. The fire unit is a two-man team and is authorized a basic load of six missiles with six additional missiles in theater stocks. The Stinger-POST advanced seeker has demonstrated the feasibility of a two-color (infrared and ultraviolet) design which has a significantly enhanced counter-countermeasure capability. Full-scale development of POST began in FY 1977.

G. (U) RELATED ACTIVITIES: This program is a joint development with the United States Marine Corps. Production requirements for that service are fully coordinated with the Army. The program is monitored for the Marine Corps by a Marine Corps officer assigned to the Stinger program office, Redstone Arsenal, AL, and through coordination by the Army Staff with their Marine Corps counterparts.

H. (U) WORK PERFORMED BY: Development of the Basic Stinger System and the POST seeker is under the direction of the US Army Missile Command, Huntsville, AL. The prime contractor is the Pomona Division of General Dynamics, Pomona, CA. Atlantic Research Corporation, Gainesville, VA, is the developer of the rocket motor. The IFF prime contractor is Teledyne Electronics, Newbury Park, CA. Government agencies which will contribute during the development phase are the US Army Armament Research and Development Command, Dover, NJ (missile warhead), and the US Army Electronics Research and Development Command, Fort Monmouth, NJ (battery).

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Title: STINGER
Budget Activity: #4 - Tactical Programs

1. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1980 and Prior Accomplishments: In 1965, a series of advanced development efforts were begun to demonstrate the critical components required for an improved, shoulder-fired air defense missile which would engage low flying aircraft from any engagement aspect flying at speeds up to Mach 4. The effort demonstrated through firings at jet aircraft targets that such components were feasible. In June 1972 Stinger entered formal Engineering Development. The baseline design was completed in 1974. A cost reduction effort entitled STINGTHRIFT was implemented in CY 1974 resulting in an estimated \$29 million savings in procurement. In FY 1975 the Guided Test Vehicle (GTV) series of tests were completed with positive indications of system performance criteria being met. A total of 16 GTV firings demonstrated a success rate against threat representative targets. A design flight test program (18 rounds) was conducted to confirm parameters. Producibility Engineering Planning (PEP) was initiated which provided delivery of Special Acceptance Inspection Equipment and drawings for the Initial Production Facilities (IPF). In FY 1976 and FY 1977, further tests continued with the Prototype Qualification Tests-Contractor (PQT-C). These flights determined that the contractor met his contract specifications. The government initiated Prototype Qualification Tests-Government (PQT-G) to evaluate system performance independently against requirements. There were 35 flights conducted in Prototype Qualification Tests-Government (PQT-G) under varying environmental conditions. The US Army Operational Test and Evaluation Agency (OTEA) also tested the system (Operational Test 10) with both nonfiring tactical exercises and with troops firing a total of 11 rounds. An 18-round Production Prototype Test initiated in July 1977 was successfully completed in November 1977. Stinger arctic testing by US Army Test and Evaluation Command (TECOM) was completed in February 1978, and Producibility Engineering Planning (PEP) was essentially completed in September 1978. A production Technical Data Package (TDP) adequate to support initial production was completed in December 1977. This production TDP consists of documentation defining the product (tactical system and ancillary equipment), Special Acceptance Inspection Equipment (SAIE), operation methods planning data, and tooling design. SAIE to support production of the warhead section was completed in July 1978. Stinger Initial Production was begun in April 1978. Initial deliveries from the first production contract were made in March 1980 for use in the initial production firings and for instructor and key personnel training. Technical difficulties related to production and training firings and to delays encountered in hardware qualification testing caused the August 1980 IOC to be delayed. Qualification testing has now been completed, and technical problems either have been solved or modifications are now being incorporated. The system meets its designed system effectiveness. IOC was attained on 27 February 1981. A counter-countermeasures improved seeker (POST) full-scale development effort was initiated 28 June 1977 after favorable Army Systems Acquisition Review Council (ASARC) and Office of the Secretary of Defense (OSD) decisions. The design for the final configuration of the POST seeker has been completed. Engineering Evaluation Testing (EET) is underway. Fabrication of the first flight configuration hardware was initiated. Design trade-off studies and a preliminary performance assessment have been completed. Fabrication, and ground and laboratory testing of prototype hardware continues as will Producibility Engineering Planning (PEP) activities.

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Title: STINGER

Budget Activity: #4 - Tactical Programs

2. (U) FY 1981 Program: Engineering Development of POST will continue in FY 1981. System simulation activities include computer simulation validation and pre- and post-flight analyses. The 13-round contractor flight testing of Stinger-POST will be initiated; ground testing of the POST missile will also continue.

3. (U) FY 1982 Planned Program: Engineering development activities include completion of simulation validation and contractor ground testing. The 16-round government Prototype Qualification Tests (PQT) flight testing will be conducted in FY 1982. The POST final performance assessment will be completed.

4. (U) FY 1983 Planned Program: None.

5. (U) Program to Completion: None.

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Program Element: #6.43.06.A
DOD Mission Area: #213 - Ground Air Defense

Title: STINGER
Budget Activity: #4 - Tactical Programs

J. (U) TEST AND EVALUATION DATA:

1. Development Test and Evaluation: In June 1972, Stinger entered formal Engineering Development. The baseline design was completed in 1974. In July 1975, the Guided Test Vehicle (GTV) series of tests was completed. A total of 16 GTV firings were conducted to test the missile guidance against various targets and test conditions. The test resulted in 10 successes and 6 failures. The root causes of the failures, detector warm-up and system noise, were corrected by the contractor. A design flight test program consisting of 18 rounds was completed in January 1976 to confirm missile performance characteristics when shoulder-fired and after temperature conditioning. There were 12 successes, 4 failures, and 2 no-test. The failures were due to tailfin failures in a hot environment (2 rounds), wet launch motor, and a short in a battery coolant unit; all deficiencies were corrected. Prototype Qualification Testing (PQT) by the contractor began in February 1976 and was suspended in March 1976 after 6 missile firings and laboratory environmental tests indicated quality control problems and unsatisfactory reliability. After verification of the corrections, testing resumed in June 1976, and 26 more flight tests were conducted. There were 21 successes, 1 failure, and 4 no-test. These tests verified that the system met the specifications and requirements of the contract and that the system was prepared to begin government testing. Thirty-five missiles were fired in the Prototype Qualification Testing by the government; testing was completed in April 1977, with 26 successes and 9 no tests. A Production Prototype Test consisting of 18 flight tests was conducted from June through November 1977 with 14 successes, 2 no-tests, and 2 failures. The failures were isolated to a faulty missile umbilical and a broken wire in the warhead section. A cold region test was conducted at Ft Greely, Alaska, from January to February 1978. Testing included cold temperature storage, field handling and transportation, a firing phase and an operational tracking exercise. Results of the field handling testing indicated a need for better sling design. The firing phase resulted in two eject-only failures of four missiles fired, and the tracking exercise revealed operational problems with the Identification Friend or Foe (IFF). Corrective action has been taken on all problems. DT&E for basic Stinger was completed in February 1978. The required system round reliability was the demonstrated reliability was This high reliability supported the certified round maintenance concept. Stinger has proceeded into production.

(U) Development Test and Evaluation (DT&E) for Stinger-POST started in FY78 and is expected to be completed in FY 1981. Stinger-POST is an improvement to the basic Stinger seeker head assembly and guidance electronics assembly which enhances the counter-countermeasure capabilities of the basic system. The program is managed by US Army Missile Command, Redstone Arsenal, AL.

(U) DT&E for Stinger-POST includes a comprehensive program of ground testing, simulation, and flight testing.

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(U) Testing by the contractor, Pomona Division of General Dynamics Corporation, is being performed on two versions of the guidance section: a guidance verification (GV) configuration and a counter-countermeasure verification (CCMV) configuration. The GV assembly is the POST guidance section less a portion of the counter-countermeasures circuitry. The CCMV assembly is the complete POST guidance section assembly. This technique was devised to allow the development and evaluation of the new POST guidance system, which uses state-of-the-art microelectronics and microprocessors, while concurrently developing the CCM circuitry. Identical tests will be performed on both configurations during contractor testing. The CCMV version will be the prototype.

(U) Reliability testing, which began in June 1980, is designed to isolate and eliminate the root causes of malfunctions by subjecting the hardware to increasingly severe environmental tests (step stress) and to determine safety margins. Flight vibration, transportation vibrations, launch shock, and combined environments of temperature/vibration and temperature/launch shock are some of the stresses to be applied. The required system reliability is the same as for basic Stinger.

(U) Performance assessments using a flight test-validated computer simulation will evaluate the hardware design and establish the Stinger-POST performance capabilities and lethality against the full range of threat speeds, maneuvers, and countermeasures. The simulations are scheduled to be completed in CY 1982.

(U) Flight testing for Stinger-POST will be conducted at White Sands Missile Range (WSMR), NM, to verify system performance against various targets and to provide data to validate computer simulation. A total of 29 flight tests are planned. The contractor will fire 13 Guidance Test Vehicles (GTV) (5 GV and 8 CCMV vehicles), beginning in FY81. Six of the GTV's will be preconditioned at extreme temperatures. Prototype Qualification Tests (PQT) by the government, consisting of 16 rounds, will begin in late-1981. Ten rounds will undergo environmental preflight conditioning; six rounds will be fired under ambient conditions. All support equipment will be available during the test.

(U) Several special tests will also be performed. Supersonic sled tests were conducted by the contractor on the GV configuration from March through June 1980 at China Lake, CA. Fly-by tracking tests of the GV were completed in September 1978. Initial CCMV fly-by tests were conducted at Ft. Bliss, TX, in January 1980, and special CCMV tracking tests were conducted in Germany during February and March 1980. Electromagnetic radiation tests are scheduled for late 1980 at Redstone Arsenal, AL. The Office of Missile Electronic Warfare (OMEW) is conducting an independent countermeasures and vulnerability analysis of the Stinger-POST guidance assembly. OMEW will provide suggestions for countermeasure improvements as the program progresses. Countermeasure devices will also be developed for subsequent use in the flight test program.

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2. (U) Operational Test and Evaluation:

(U) Operational Test and Evaluation (OT&E) for basic Stinger has been completed; no significant deficiencies were noted and the system has proceeded into production.

(U) Operational Test I was not conducted. Instead, the US Army Operational Test and Evaluation Agency (OTEA) monitored the contractor demonstration at Ft. Bliss, TX, during Mar-Jun 75. The contractor demonstration verified the capability of Stinger in the areas of human factors, weapon performance effectiveness, preliminary weapon system reaction times, and associated command, control, and communications doctrine.

(U) Operational Test II (OT II) for Basic Stinger was performed by the OTEA in Aug 76 for the field exercise portion and Oct 76 for the live firing portion of the test. Eleven rounds were fired with 5 hits and 6 misses. Four of the misses were due to gunner error; one failure was due to reliability; and one because the target exceeded the kinematic capability of the system. The Stinger Weapon System was evaluated during OT II in terms of performance against Redeye Weapon System, which was used as the baseline. The conclusions that supported the production decision were:

(U) The Stinger Weapon System has a substantial forward hemisphere capability which can engage targets from all aspects. Redeye engages targets in an outgoing or crossover aspect only.

(U) Functional operations of the Stinger Weapon System are basically the same as those of the Redeye Weapon System. Stinger operator errors, when they occur, are similar to those made by Redeye operators.

(U) Stinger possesses an Identification Friend or Foe (IFF) system which is adequate when used as an aid for identification. Redeye does not have an IFF capability.

Infrared countermeasures are less effective against the Stinger Weapon System than against the Redeye Weapon System. However,

(U) Operational testing for Stinger-POST is scheduled concurrently with the government-conducted prototype qualification test (PQT/DT II) in CY 1982. A separate operational field/tracking exercise will be conducted by the OTEA at Nellis AFB, NV.

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The field exercise will be conducted to evaluate gunner training and operational aspects of the system in a benign and countermeasures environment. Six Tracking Head Trainers and a moving target simulator will be available for the operational tests. Six live firings will be conducted by OT gunners as part of the PQT/DT II firing program. These will be joint DT/OT firings. OTE testing will be completed by early CY 1983.

3. (U) Initial Production Testing:

a. (U) Production missile flight tests consist of six First Article Test (FAT) weapons and a sample of 20 weapons for reliability assessment from the FY78 production contract. The first of the reliability samples was delivered in March 1980 and flight testing started immediately thereafter.

b. (U) In July 1980 the six FAT weapons, after having been exposed to simulated life cycle environments, were fired. Firings were performed at extreme operating temperature limits (hot and cold). Five of these weapons performed successfully and one resulted in an eject-only failure. Analysis of this failure revealed a disconnected flight motor lanyard (a breakwire safety circuit designed to prevent flight motor ignition prior to launch motor separation in flight). Failure mode was random and attributed to inadequate quality control during assembly. Corrective action has been taken to preclude recurrence. The First Article Test results were contractually acceptable.

c. (U) The 20 weapons comprising the reliability test series are randomly selected from periodic production deliveries. The 15 reliability flights conducted to date began March 1980. The first of these successfully impacted the sub-scale target and all flight test objectives were met. The next two firings were eject-only missile failures and the flight testing was suspended. It was determined that incompatibility had developed between missile battery voltage rise characteristics and fuze input requirements causing a timing error between May 1980 which resulted in two successful firings. Ten additional missiles were fired during November and December 1980. Of these 10 missiles, one was "no-tested" due to launch without acquisition (gunner error) leaving nine scorable flights. Seven of the nine were successful and two failures occurred. One failure was an open circuit in the missile battery which will be precluded from recurrence by screening all manufacturing and inspection procedures. A second failure occurred when a missile went ballistic (no apparent guidance).

d. (U) The total production missile flight test experience to date includes the contractual flight test noted above, plus those flights conducted in troop training exercises. Several additional failures have occurred in these early training flights and immediate corrective actions were implemented. The only problem wherein the root cause has not been identified is

Program Element: #6.43.06.A

Title: STINGER

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the early detonation of the warhead. This failure has occurred three times with warheads using very early production fuzes. The last 10 missiles fired utilized fuzes from later production cycles with no recurrence of the early detonation failure. Fuze improvements have been identified and will be tested in early CY 1981. Following proof testing, these improvements will be incorporated into the second production missiles.

e. (U) The many successful firings include shots against stationary, high speed and maneuvering targets as well as targets employing infrared countermeasures and a target executing a maneuver in combination with infrared countermeasures. The demonstrated accuracy of all successful flights is 100 percent; i.e., all have been physical or tactical hits. The demonstrated system effectiveness exceeds requirements. A total of 20 reliability sample firings are required to meet contractual requirements and to establish weapon reliability and system effectiveness. Data from these firings will also support a "Suitability for Release for Issue" statement prior to IOC. The five remaining reliability sample firings are scheduled in January 1981, and Stinger IOC has been rescheduled for the second quarter FY 1981.

4. System Characteristics:

<u>Operational/Technical</u> <u>Characteristics 1/</u>	<u>Objectives</u>	<u>Demonstrated</u> <u>Performance</u>
Intercept Range 2/ Minimum (meters) Maximum (km)		
Intercept Range 90o Offset 3/ Minimum (km) Maximum (km)		
Intercept Altitude Maximum (km) 4/ Maximum Acquisition Range No Offset (km) 5/ Activation Time (Secs) 7/ System Effectiveness (Es) 8/		

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Infrared Countermeasures		
(Performance Degradation %) <u>9/ 10/</u>		
Weapon Reliability		
IFF Maximum Instantaneous		
Search Sector (Degrees) <u>13/</u>	<u>+6</u>	<u>+5</u>
Ready-to-fire weapon weight		
Including Onboard IFF antenna		
(lbs)	35	34.4 (34.8)*

* Number in parentheses reflects current estimate (CE) for POST program.

** Based on PQI-G/OT II/PPF test results and production testing will be updated pending completion of production firings.

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Summary: (U) Current performance values are based either upon prototype hardware or analyses using the final performance assessment (PA #4) computer simulation models of the missile and threat.

FOOTNOTES:

- 1/ (U) Decision Coordinating Paper (DCP) threshold allows 20% degradation for items 1 thru 7 and system ready-to-fire weight.
- 2/ Kinematic performance, no offset. Minimum intercept range varies with target speed and missile launch angle relative to the threat aircraft flight path. The values reported are derived from computer analyses. Minimum range is for directly incoming targets at speeds between Maximum range is for a zero-speed target. The current estimate (CE) for POST for maximum intercept range is based on analysis of preliminary POST data and will be updated after future POST analyses.
- 3/ The 90° offset intercept ranges are based on Stinger or preliminary POST computer simulation. The current estimate for POST will be updated following future POST computer analyses.
- 4/
- 5/
- 6/ (U) The CE for Stinger is based on measurements in ideal environments. CE for POST is based on worst case ambient temperature sensitivities at 23km visibility.
- 7/ (U) Time to ready-to-fire status.
- 8/ (U) E_s = Preuse reliability x prefire reliability x firing reliability x missile lethality for K kills. Not included in this definition of E_s is the probability of detection, evaluation, and transfer (Pd_{et}). For the purposes of engineering development, the performance of the gunner will not degrade this probability. Includes non-IRCM maneuvering and nonmaneuvering targets only and uses TACOS weighting (crossing emphasized).
- 9/ Although current estimate for Basic Stinger is as shown,
- 10/ Degradation is calculated as the percent decrease in system effectiveness (E_g) in a countermeasures environment compared to the approved program E_s , i.e., in a benign environment.
- 11/
- 12/ (U) Prefire reliability x fire reliability x warhead detonation reliability.
- 13/ (U) Characteristic is not specified by the DCP. Search sector is +6° from the antenna line of sight.
- 14/ (U) Design changes are being made to the POST seeker optics which require the seeker dome to have a larger radius of curvature. This results in a more blunt dome shape that will cause missile aerodynamic drag to be increased. The increased drag will cause the maximum intercept range to be less than the CE. The CE will be updated following future simulation analyses.

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Program Element: #6.43.07.A

Title: Patriot (SAM-D)

DDO Mission Area: #211 - Ground Air Defense

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	128718	75375	57991	To Be Determined		
D212	Patriot (SAM-D)	126218	53074	27972	To Be Determined		
D213	Patriot (ECCM Enhancement)	-	19573	28058	To Be Determined		
D291	Patriot (NATO)	2500	2728	1961	To Be Determined		

8. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Air defense for the field Army requires high- and medium-altitude air defense capable of reacting to the massive air raids expected in a conflict. In the field Army Patriot defenses will be complemented by short-range, low-altitude forward area air defense weapons and will be integrated with the US Air Force in the overall air defense of the theater of operations. Patriot is an advanced surface-to-air guided missile system with a high single-shot probability capable of operation in an Electronic Countermeasures (ECM) environment, and able to conduct multiple simultaneous engagements against the high-performance air-breathing targets likely to be encountered by deployed United States forces during the 1980's and beyond. To cope with the projected threat, Patriot will utilize a trainable, multifunction, electronically scanned phased array radar. In addition, a digital computer will be used to automatically control the system functions and provide the operator, through various displays, the ability to control and monitor operations. The guidance system combines command guidance and homing guidance (track-via-missile (TVM)) systems. Patriot (Project Number D291) is being considered by European nations as their future surface-to-air missile system. Six European NATO Nations have signed a Memorandum of Understanding with the US which established a NATO Patriot Steering Committee (PSC) and a full-time management study group for the period Oct 78-Oct 81 to study the acquisition of Patriot by these

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nations. Patriot Electronic Counter Countermeasures (ECCM) Enhancement (Project Number D213) has been initiated upon recommendations of the Defense Science Board to cope with the

C. (U) BASIS FOR FY 1982 RDT&E REQUEST:

(U) Project D212 - Development and modification of hardware and software which is needed to adapt Patriot's inherent growth capacity to evolutionary advancements in technology will continue. Efforts include continued development and testing of the Antenna Mast Set (AMS), the counter Antiradiation Missile (ARM) program and the Maintenance Enhancement Program (MEP).

Project D213 - Continue Design and testing of Patriot System enhanced capabilities in the following areas:

Project D291 - Continuation of ongoing technical/management requirements to support NATO acquisition efforts.

<u>Major Milestones</u>	<u>Current Milestone Dates</u>	<u>Milestone Dates Shown in FY 1981 Submission</u>
Completion of DT/OT Testing	Aug 80	Jun 80
Limited Production Decision DSARC III	Sep 80	Not Shown
Completion of Prototype System		
Confirmation Test	Oct 81	Not Shown
Delivery of 1st Production Fire Unit	Feb 82	Not Shown
First Battalion (FORSCOM) Activation	May 82	Not Shown
Complete Production Confirmation Test	Sep 82	Not shown
First Battalion (USAREUR) IOC		Not Shown

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D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>FY 1983</u>	<u>Total Additional To Completion</u>	<u>Estimated Cost</u>
RDTE						
I Funds (current submission)	128718	75375	57991	To Be Determined		
Funds (as shown in FY 1981 submission)	128710	51624	28699	Not Shown	42867	1902072

The additional funds are required to support the planned product improvement program for PATRIOT which will begin in FY84. This program will include production engineering of all the ECCM enhancements selected for incorporation in the system.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional To Completion</u>	<u>Total Estimated Costs</u>
Missile Procurement, Army						
I Funds (current requirement)	395950	442300 ^{1/}	820800 ^{1/}	To Be Determined		
Funds (as shown in FY 1981 submission)	395950	469600	575200	Not Shown	2004800	4092350

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DESCRIPTIVE SUMMARIES OF THE RESEARCH DEVELOPMENT TEST & EVALUA--ETC (U)
JAN 81

AD-A101 306 DEPUTY CHIEF OF STAFF FOR RESEARCH DEVELOPMENT AND AC--ETC P/O S/I
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DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)
Budget Activity: #4 - Tactical Programs

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>To Completion</u>	<u>Total</u> <u>Estimated</u> <u>Costs</u>
Quantities (current requirement)						
Fire Control Sections	5	5 <u>2/</u>	12 <u>2/</u>	To Be Determined		
Missiles	117	130	364	To Be Determined		
Quantities (as shown in FY 1981 submission)						
Fire Control Section	5	12	18	Not Shown	68	103
Missiles	155	183	391	Not Shown	2907	4273
Military Construction, Army						
Funds (current requirement)	0	0	42200 <u>3/</u>	66004	214048 <u>3/</u>	322252 <u>3/</u>
Funds (as shown in FY 1981 submission)	3800	0	42000	Not Shown	0	0

1/ (U) Cost increases caused by reduced production rate for FY81 & 82, OSD directed test program for FY81 & 82, and revised production cost estimates from negotiation of FY80 production contract.

2/ (U) Reductions in production quantities directed by OSD in SECDEF Decision Memo from DSARC III, 10 Sep 80.

3/ (U) Increases in Military Construction, Army (MCA) are added requirements for deployment of Patriot to US Army Europe (USAREUR) and US Army Forces Command (FORSCOM). NATO Infrastructure Funds will also be used for construction of operating facilities in USAREUR.

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Program Element: #6.43.07.A
DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: Patriot will replace NIKE HERCULES and Improved HAWK. Deployment of the Patriot system will reduce manpower and logistical costs and provide an improved Army air defense. In the field Army Patriot defenses will be complemented by short-range, low-altitude forward area air defense weapons and will be integrated with the US Air Force in the overall air defense of the theater of operations. The advanced features of Patriot will provide an increased capability against saturation attacks, electronic countermeasures (ECM) and maneuvering targets. Patriot is an advanced surface-to-air guided missile system with a high single-shot kill probability capable of operation in an ECM environment, and able to conduct multiple simultaneous engagements against the high-performance air-breathing targets likely to be encountered by deployed United States forces during the 1980's and beyond. To cope with the projected threat Patriot will utilize a trainable multifunction, electronically scanned phased array radar. In addition, a digital computer will be used to automatically control the system functions and provide the operator, through various displays, the ability to control and monitor operations. The guidance system combines command guidance and homing guidance (track-via-missile (TVM)) systems.

G. (U) RELATED ACTIVITIES: System commonality with the Navy AEGIS has been studied and although separate developments are required, continuous coordination insures the use of common components whenever feasible. The Patriot system, through the battalion, will be interoperable with other Army Group/Brigade-level command and control systems through the Army Air Defense Command and Control System (AN-TSQ-73). It will also be interoperable with the Air Force or Marine Corps systems when the Group/Brigade-level AN-TSQ-73 is not available.

H. (U) WORK PERFORMED BY: The Raytheon Company at Bedford, MA, is prime contractor with Martin-Marietta Corporation of Orlando, FL, as missile subcontractor. Thiokol Chemical Corporation of Huntsville, AL, is a subcontractor for the rocket motor. Teledyne Brown, Huntsville, AL, is the Software Verification and Validation contractor; Science Applications Incorporated, Huntsville, AL, has developed a Tactical Operation Simulator (TOS); Sanders Associates, Nashua, NH, is developing an Operator/Tactics Trainer (OTT). Government agency in-house work is managed by the Patriot Project Management Office, Huntsville, AL.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: The project was initiated as the Army Air Defense System for the 1970's (AADS-70's) in 1963. The program was renamed Surface-to-air missile development (SAM-D) in FY 1965. Contract Definition was completed, and a contract for Advanced Development (AD) was awarded in May 1967. SAM-D hardware was designed, fabricated, and tested in the Advanced Development program. This program proved the ability of the multifunction phased array radar to

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Budget Activity: #4 - Tactical Programs

carry out time-shared search and track functions under computer control. As a result of the successful completion of Advanced Development objectives, SAM-D was approved for entry into Engineering Development (ED) in March 1972. The SAM-D Nuclear and Antimissile Capability Study was approved in December 1972 which recommended: deletion of the nuclear warhead, programming of reduced number of fire sections for Continental United States (CONUS) air defense, and development of an improved nonnuclear warhead. After another year of ED, the program was reoriented on 10 January 1974 to emphasize greater austerity while permitting early flight verification of the track-via-missile guidance principle. A stop work order was issued to the prime contractor on 4 February 1974. As a result of this order, all effort in support of a major portion of the hardware development and some engineering activities were deferred until a Defense Systems Acquisition Review Council (DSARC) met to approve the reoriented program. Ongoing efforts remaining after the stop work order were in support of the Track-Via-Missile (TVM) demonstration and an austere development program. The DSARC met on 6 June 1974 and the Deputy Secretary of Defense directed program efforts continued in the following areas: preparation for the TVM demonstration flights, continuation of the austere development program, initiation of cost reduction efforts, development of a backup guidance. Control Test Vehicle (CTV) flights were completed on 28 August 1974. The major objectives of the captive carry flight test program, a prerequisite beginning the Engineering Development Model flights, were successfully demonstrated and repeated during November 1974. Proof-of-Principle flight tests demonstrated through missile firings that TVM guidance functions were successful against various targets. The remaining missiles were used to obtain additional engineering data. An Army Systems Acquisition Review Council (ASARC) was held in January 1976 which directed the resumption of Full-Scale Engineering Development. The Surface-to-Air Missile Development (SAM-D) program was officially named Patriot on 21 May 1976. On 4 August 1976 a contract to complete the contractor portion of the Patriot system development was awarded to Raytheon Company. The Patriot Missile System Flight program was resumed on 2 December 1976 at White Sands Missile Range (WSMR) with a firing using the tactical prototype Fire Unit (FU-1). The contractor test program from 2 December 1976 to 16 January 1980 completed 36 missile firings. A special ASARC decision was made on 17 February 1977 to accelerate the Engineering Development (ED) program. FU-3, -4, -5 were used at WSMR for training, support, and DT/OT II Tests during FY80. Nine DT II firings and nine OT II firings were conducted from 22 August 1979 to 21 July 1980. Results of these tests were used to support the DSARC III production decision. The contract period of performance has been extended to March 1981 to include producibility engineering and planning (PEP), the Counter-Antiradiation Missile (ARM) Program, and the Maintenance Enhancement Program (MEP). The PEP contract was initiated in October 1977 to produce the manufacturing data package, to complete quality assurance plans, and to design special tooling and test equipment necessary to go into the production phase. The initial production facilities (IPF) contract was signed in March 1979 to purchase long-lead special tooling and special test equipment necessary to support a production decision on the Patriot Program in FY 1980. The second IPF contract was awarded in April 1980 to acquire, in conjunction with IPF buy 3 (FY-81), the remaining IPF entities necessary to establish an initial production capability. The

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DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)
Budget Activity: #4 - Tactical Programs

scheduled award date for IPF buy 3 is in the second quarter of FY81. Following DSARC III SECDEF authorized Patriot to begin limited production. The production program was initiated on 1 Oct 80 when the contract was awarded for 5 fire units, 155 missiles, and other associated support equipment.

2. (U) FY 1981 Program: Tests planned during FY81 include the system environmental qualification test program, component tests, system performance tests, missile firing tests, tactical software reconfirmation testing, and Advanced Development ARM Decoy tests. Extensive testing of maintenance diagnostic software will be conducted to demonstrate improvements in fault detection and isolation capability.

3. (U) FY 1982 Planned Program: Tests planned to be completed during FY82 include software Tactical Build Set 2 System testing, component design confirmation, system design confirmation, and Follow-on Evaluation I. Software Tactical Build Set 2 formal tests, Follow-on Evaluation II and Production System Environmental Qualification tests are planned to begin in FY82. Three sets of tactical hardware will be used to form the first tactical half-battalion which will be activated at Ft Bliss, Texas, as a training unit. Testing of maintenance diagnostic software will continue, and development of maintenance support test equipment will begin.

4. FY 1983 Planned Program: Tests planned to be completed during FY83 include Software Tactical Build Set 2 formal tests, Follow-on Evaluation II, ARM Decoy Prototype tests and Production System Environmental Qualification tests. Training of the first half-battalion for Europe with deployment planned for early Development and testing of maintenance support equipment will continue.

5. Program to Completion: Complete system ECCM enhancements for incorporation into planned production schedules. The US will assist in the development of any US/NATO Patriot cooperation program. Production contracts will be executed until the currently programmed number of fire units are completed. Starting in FY84, development of several major product improvements will begin. These improvements will provide the system with added capabilities to counter the and also provide improved reliability and maintainability. It will also provide funding to continue updating and improving system tactical software and continue interoperability testing with other Army, Navy, Marine Corps, and Air Force air defense systems.

FY 1982 RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D212

Program Element: #6.43.07.A

DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)

Title: Patriot (SAM-D)

Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: Patriot will replace NIKE HERCULES and Improved HAWK. Deployment of the Patriot system will reduce manpower and logistical costs and provide an improved Army air defense. In the field Army Patriot defenses will be complemented by short-range, low-altitude forward area air defense weapons and will be integrated with the US Air Force in the overall air defense of the theater of operations. The advanced features of Patriot will provide an increased capability against saturation attacks, electronics countermeasures (ECM), and maneuvering targets. Patriot is an advanced surface-to-air guided missile system with a high single-shot kill probability capable of operation in an ECM environment, and able to conduct multiple simultaneous engagements against the high-performance air-breathing targets likely to be encountered by deployed United States forces during the 1980's and beyond. To cope with the projected threat, Patriot will utilize a trainable, multifunction, electronically scanned phased array radar. In addition, a digital computer will be used to automatically control the system functions and provide the operator, through various displays, the ability to control and monitor operations. The guidance system combines command guidance and homing guidance into a track-via-missile (TVM) system.

B. (U) RELATED ACTIVITIES: System commonality with the Navy AEGIS has been studied and although separate developments are required, continuous coordination insures the use of common components whenever feasible. The Patriot system, through the Battalion, will be interoperable with other Army Group/Brigade-level command and control systems through the Army Air Defense Command and Control System (AN/TSQ-73). It will also be interoperable with the Air Force or Marine systems when the Group/Brigade level AN/TSQ-73 is not available.

C. (U) WORK PERFORMED BY: The Raytheon Company at Bedford, MA, is prime contractor with Martin-Marietta Corporation of Orlando, FL, as missile subcontractor. Thiokol Chemical Corporation of Huntsville, AL, is a subcontractor for the rocket motor. Teledyne Brown, Huntsville, AL, is the Software Verification and Validation contractor; Science Applications Incorporated, Huntsville, AL, has developed a Tactical Operation Simulator (TOS); Sanders Associates, Nashua, NH, is

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Title: Patriot (SAM-D)
Title: Patriot (SAM-D)
Budget Activity: #4 - Tactical Programs

developing an Operator/Tactics Trainer (OTT). Government agency in-house work is managed by the Patriot Project Management Office, Huntsville, AL.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: The project was initiated as the Army Air Defense System for the 1970's (AADS-70's) in 1963. The program was changed and renamed Surface-to-Air Missile Development (SAM-D) in FY 1965. Contract definition was completed and a contract for Advanced Development (AD) was awarded in May 1967. SAM-D hardware was designed, fabricated, and tested in the Advanced Development program. This program proved the ability of the multifunction phase array radar to carry out time shared search and track functions under computer control. As a result of the successful completion of Advanced Development objectives, Patriot (formerly SAM-D) was approved for entry into Engineering Development (ED) in March 1972. The SAM-D Nuclear and Antimissile Capability Study was approved in December 1972 which recommended: deletion of the nuclear warhead; programming a reduced number of fire sections for Continental United States (CONUS) air defense; development of an improved nonnuclear warhead. After another year of ED, the program was reoriented on 10 January 1974 to emphasize greater austerity while permitting early flight verification of the track-via-missile (TVM) guidance principle. A stop work order was issued to the prime contractor on 4 February 1974. As a result of this order, all effort in support of a major portion of the hardware development and some engineering activities were deferred until a Defense Systems Acquisition Review Council (DSARC) met to approve the reoriented program. Ongoing efforts remaining after the stop work order were in support of the TVM demonstration and an austere development program. The DSARC met on 6 June 1974 and the Deputy Secretary of Defense directed program efforts continue in the following areas: preparation for the TVM demonstration flights; continuation of the austere development program; initiation of cost reduction efforts; development of a backup guidance. Control Test Vehicle (CTV) flights were successfully completed on 28 August 1974. The major objectives of the captive carry flight test program, a prerequisite to beginning the Engineering Development Missile flights, were successfully demonstrated and repeated during November 1974. Proof-of-Principle flight tests demonstrated through missile firings that TVM guidance functions were successful against various types of targets. The remaining missiles were used to obtain additional engineering data. An Army Systems Acquisition Review Council (ASARC) was held in January 1976 which directed the resumption of full-scale Engineering Development. The Surface-to-Air Missile Development (SAM-D) program was officially named Patriot on 21 May 1976. On 4 August 1976 a contract to complete the contractor portion of the Patriot system development was awarded to Raytheon Company. The Patriot Missile System Flight program was resumed on 2 December 1976 at White Sands Missile Range (WSMR) with a firing using the tactical prototype Fire Unit (FU-1). A special ASARC decision was made on 17 February 1977 to

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Title: Patriot (SAM-D)

Title: Patriot (SAM-D)

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accelerate the Engineering Development (ED) Program. The contractor test program from 2 Dec 76 to 16 Jun 80 has completed thirty-six missile firings. FU-3, -4, and -5 were used at White Sands Missile Range (WSMR) for training, support and DT/OT 11 during FY80. Nine DT 11 firings and nine OT 11 firings were conducted from 22 Aug 79 to 21 Jul 80. Results of these tests were used to support the DSARC 111 Production decision. The contract period of performance has been extended to Mar 81 to include producibility engineering and planning (PEP), the counter Antiradiation Missile (ARM) Program, and Maintenance Enhancement Program (MEP). The PEP contract was initiated in Oct 77 to produce the manufacturing data package, to complete quality assurance plans and to design special tooling and special test equipment necessary to go into the production phase. The initial production facilities (IPF) contract was signed Mar 79 to purchase long-lead special tooling and special test equipment necessary to support a decision on the Patriot Program in FY 1980. On 10 Sep 80 the SECDEF Decision Memorandum was signed authorizing limited production of Patriot.

2. (U) FY 1981 Program: Tests planned during FY81 include the system environmental qualification test program, component tests, system performance tests, missile firing tests, tactical software reconfirmation testing, and Advanced Development ARM Decoy tests. Extensive testing of maintenance diagnostic software will be conducted to demonstrate improvements in fault detection and isolation capability.

3. (U) FY 1982 Planned Program: Tests planned to be completed during FY82 include software Tactical Build Set 2 System testing, component design confirmation, system design confirmation, and Follow-on Evaluation I. Software Tactical Build Set 2 formal tests, Follow-on Evaluation II and Production System Environmental Qualification tests are planned to begin in FY82. Three sets of tactical hardware will be used to form the first tactical half-battalion which will be activated at Ft Bliss, Texas, as a training unit. Testing of maintenance diagnostic software will continue and development of maintenance support test equipment will begin.

4. FY 1983 Planned Program: Tests planned to be completed during FY83 include Software Tactical Build Set 2 formal tests, Follow-on Evaluation II, ARM Decoy prototype tests, and Production System Environmental Qualification tests. Training of the first half-battalion for Europe with deployment planned for early Development and testing of maintenance support test equipment will continue.

5. Program to Completion: Production contracts will be executed until the currently programmed number of fire units are completed. Starting in FY84 development of several major product improvements will begin. These will include: a new

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Title: Patriot (SAM-D)

Title: Patriot (SAM-D)

Budget Activity: #4 - Tactical Programs

bubble memory storage unit to replace the current mechanical recovery storage unit; a
an automated emplacement system; upgraded missile on-board processor; improved warhead; radar control im-
provements; improved missile fuze and improved launcher power generator. Funding of engineering development tests and produc-
tion engineering of these improvements is included in the cost estimates.

6. Major Milestones:

<u>Major Milestones</u>	<u>Current Milestone Dates</u>	<u>Milestone Dates Shown in FY 1981 Submission</u>
Completion of DT/OT Testing	Aug 80	Jun 80
Limited Production Decision DSARC III	Sep 80	Not shown
Completion of Prototype System Confirmation Test	Oct 81	Not shown
Delivery of 1st Production Fire Unit	Feb 82	Not shown
First Battalion (FORSCOM) Activation	May 82	Not shown
Complete Production Confirmation Test	Sep 82	Not shown
First Battalion (USAREUR) IOC		Not shown

7. (U) Resources (\$ in thousands):

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional to Completion</u>	<u>Total Estimated Cost</u>
RDTE						
Funds (current requirements)	126218	53074	27292	To Be Determined		
Funds (as shown in FY 1981 submission)	125718	29132	0	Not shown	0	1804114

UNCLASSIFIED

Project: #D212
 Program Element: #6.43.07.A
 DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)
 Title: Patriot (SAM-D)
 Budget Activity: #4 - Tactical Programs

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimate Cost
Quantities (current requirements)		Not Applicable				
Quantities (as shown in FY 1981 submission)		Not Applicable				

Other Appropriations:

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimate Cost
Missile Procurement, Army:						
Fund (current requirements)	395950	442300 ^{1/}	820800 ^{1/}	902200	3340900 ^{2/}	5902150 ^{2/}
Funds (as shown in FY 1981 submission)	395950	469600	575200	Not Shown	2004800	4092350
Quantities (current requirements)						
Fire Control Sections (FCS)	5	5 ^{2/}	12 ^{2/}	18	63	103
Missiles	117	130	364	465	3197	4273
Quantities (as shown in FY 1980 submission)						
Fire Control Sections (FCS)	5	12	18	Not Shown	68	103
Missiles	155	183	391	Not Shown	2907	4273

UNCLASSIFIED

UNCLASSIFIED

Project: #D212
 Program Element: #6.43.07.A
 DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)
 Title: Patriot (SAM-D)
 Budget Activity: #4 - Tactical Programs

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>To Completion</u>	<u>Total</u> <u>Estimate</u> <u>Cost</u>
Military Construction, Army(MCA)						
Funds (current requirements)	0	0	42200 ^{3/}	66004	214048 ^{3/}	322252 ^{3/}
Funds (as shown in FY 1981 submission)	3800	0	42000	Not Shown	0	0

1/ Cost increases caused by reduced production rate for FY81 and 82; OSD directed test program for FY81 and 82, and revised production cost estimates from negotiation of FY80 production contract.
 2/ Reductions in production quantities directed by OSD in SECDEF Decision Memo from DSARC III, 10 Sep 80.
 3/ Increases in Military Construction, Army (MCA) are added requirements for deployment of Patriot to US Army Europe (USAREUR) and US Army Forces Command (FORSCOM). NATO Infrastructure Funds will also be used for construction of operating facilities in USAREUR.

UNCLASSIFIED

UNCLASSIFIED

Project: #D212
Program Element: #6.43.07.A
DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)
Title: Patriot (SAM-D)
Budget Activity: #4 - Tactical Programs

E. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation:

a. (U) The Patriot System (known as Surface-to-Air Missile Development (SAM-D) until 1976) was conceived in the early 1960'S. Conceptual designs were evaluated from two contractors with Raytheon selected to continue with concept definition. The multifunction phase array radar concept was investigated until 1967 when a Milestone I decision was made to enter Advanced Development (AD). The AD contract was awarded to Raytheon Company in May 1967. AD defined a low-link engineering development (ED) program by demonstrating: the performance of the multifunction aspects of Patriot; the use of software to control the system; and the track-via-missile (TVM) concept. Prototype equipment functionally identical to that required in the tactical system was built. This demonstration model was used to accomplish analyses and tests. As a result of the successful AD program, on 31 March 1972 the Deputy Secretary of Defense approved entry into engineering development, and a contract was awarded to Raytheon.

b. (U) Four individual fire units were built during Engineering Development. Fire unit 1 was constructed in a non-mobile configuration as the radar antenna and the launcher were installed in fixed positions at White Sands Missile Range (WSMR), NM. Communications and coordination data were exchanged by cables between the equipment elements. Fire Unit 2 was the first mobile fire unit. The radar and launcher were rotatable on their separate trailers, and the control station equipment was in a van much like the final tactical design will be, but communications and coordination data was still by wire between elements. Fire Unit 3 is Fire Unit 1 upgraded to a tactical prototype. Fire Units 3, 4, and 5 are essentially in a tactical configuration as the production units will be. Communication by radio data link is used for the tests with these units. Besides their severe individual tests, Fire Units 3, 4, and 5 were included in tests of the battalion command and coordination capability. By exchanging data and receiving tactical directions from the battalion unit by tactical digital radio signals, these tests exercised multiple fire unit tactical requirements. These tests of production-like equipment provided input for a production decision.

c. (U) The engineering development (ED) test program was organized into contractor and government testing called Engineering Design Tests (EDT) and Prototype Qualification Tests (PQT). The objective of the testing was to allow maximum use of contractor data and avoid duplicative testing when possible. The contractor testing was divided into three phases: the first phase was the initial proof-of-principle and EDT firings, the second was between Feb 76-Nov 77, and the third continued until February 1980. The contractor fired 50 missiles during these phases. The government test program was original-

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Project: #D212

Program Element: #6.43.07.A

DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)

Title: Patriot (SAM-D)

Budget Activity: #4 - Tactical Programs

ly configured to fire 70 missiles. Thirty firings were reduced by the elimination of DT/OT III, and fifteen were reduced in 1978 because data from other missions would suffice, leaving 25 for DT/OT. The reduction was offset partially by adding simulation capabilities to provide a more comprehensive system evaluation. These 25 firings were reduced subsequently to 18 when a jammer could not be developed to stress the system. A total of 68 missiles were fired in ED by the contractor and government and eleven more are planned in an electronic countermeasures growth program. A summary of all firings to date is at subparagraph f below.

(1) The ED program progressed to build prototype equipment to be used in tests and firings. Ten Control Test Vehicles (CTV) were fired to prove missile aerodynamics and control. The ED program was reoriented in January 1974 to demonstrate the Track-Via-Missile (TVM) guidance concept through the Proof-of-Principle firing program. Phase I system demonstration firings comprised of fourteen missiles were initiated by the contractor in February 1975 and continued through February 1976. As a prerequisite to the live firings, Captive Carry Flight Tests were conducted. These captive tests used a missile without rocket motor mounted on an aircraft to simulate the free space guidance conditions of a missile intercepting a target. The firing phase demonstrated the Track-Via-Missile guidance, the guidance modes, and fuzing functions. Due to the success of the missile firings, the DOD objectives of the Proof-of-Principle demonstration were met with the first six Patriot guided missile flights against target aircraft. The target conditions included

formed against targets of
Five additional engineering evaluation firings were performed against targets of
An additional three missiles were fired as CTV's to complete the matrix of missile aerodynamic data. Thirteen of the missile flights were successful using an ED demonstration model system. No major deficiencies were discovered during this phase, and at the conclusion of Proof-of-Principle firings full Engineering Development status was restored.

(2) During Phase II tests, February 1976 to November 1977, the contractor demonstrated system performance and fired nine missiles using fire unit 1 against various electronic countermeasures. An extensive search/track test program was conducted to exercise the system against various electronic countermeasures (ECM) and target scenarios. These tests included benign chaff, weather and natural clutter environments were used.

In addition, the data from these tests was used to evaluate: system diagnostic capabilities; built-in test equipment (BITE); reliability, availability, and maintainability (RAM); system status monitor; system displays and controls. All missile firings were successfully conducted against targets of various intercept geometries in the presence of multiple

Project: #0212
Program Element: #6.41.07.A
DOD Mission Area: #11 - Ground Air Defense

Title: Patriot (SAM-D)
Title: Patriot (SAM-D)
Budget Activity: #4 - Tactical Programs

simultaneous engagements were performed to demonstrate the capability to control multiple missiles in terminal guidance while simultaneously conducting surveillance functions. As in Phase I, the Phase II firing tests revealed no major deficiencies; minor adjustments to equipment were made as required. During this phase an ASARC decision concurred in by OS was made to accelerate the program by moving the full-production decision from March 1983 to April 1980. This decision eliminated DT/OT III and replaced it with a Production Confirmatory Test and a follow-on evaluation. The overall success of the first 23 firings and the need for the system in the field led to this decision. The funds saved were applied to developing an improved simulation capability.

(3) (U) Phase III contractor tests were completed in February 1980. They consisted of 28 missile flights in electronic countermeasures (ECM) environments in addition to system environmental and multiple fire unit search/track tests. The Government has monitored and participated in the PQT by the contractor (PQT-C) during Phases I-III to satisfy as many go PQT-G requirements as practicable to preclude duplicative testing. Military personnel were incorporated into the program to assess critical man-machine interfaces. Development Test and Operational Test evaluators also shared test data for use during their independent evaluations.

d. (U) The OT/DT events utilized prototype FU's 3, 4, and 5 for the conduct of both tests. FU 3 was used only for specific tests during OT. The Communications Relay Set (CRS) (which provides for relaying data from Fire Units to the battalion-level system) utilized for these tests was furnished by the Army Communications Research and Development Command (CORADCOM) and is electronically equivalent to the required system. The production CRS will be functionally equivalent to the CORADCOM configuration but will be manufactured by the prime contractor. The current Antenna Mast Set (AMS) (which raises the antenna to transmit the data between FU's and the battalion system) is an Army Standard item but does not meet Patriot emplacement time requirements. A new design to meet the PATRIOT requirements will be manufactured by the prime contractor. The electronic equivalents of the CRS and AMS were available for testing in DT/OT II. The Electric Power Plant (EPP) using standard generators did not meet the reliability requirements and a new development was implemented. The CRS, AMS, and EPP will undergo development testing and production confirmatory tests (PCT) in 1980-82. One of the new development Electric Power Plants was available for OT/DT and one for environmental testing. A waiver was granted by the Department of the Army for evaluation on the complete Maintenance Support Package (MSP) and to defer complete evaluation of the CRS, AMS, and Electrical Power Plant (EPP) until the Post DSARC III evaluations. The MTSP tested in OT II provided data on how well the Patriot system performed against its RAM requirements. A maintenance enhancement program (MEP) is being developed to significantly (75% to 99%) improve the capability of organizational maintenance personnel to isolate and repair malfunctions. The Department of the Army will conduct a Maintainability Component Design Confirmation (MCDC) test as part of the post-DSARC III testing in 1981 to evaluate MEP.

Project: #D212

Program Element: #6.43.07.A

DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)

Title: Patriot (SAM-D)

Budget Activity: #4 - Tactical Programs

e. Reliability and maintainability data has been collected on Patriot firing units since early in Engineering Development (ED) beginning with factory integration testing and continuing with systems testing at White Sands Missile Range, NM. As a result of this process, reliability and maintainability problems were identified early, and corrective actions were incorporated in the later ED firing units. The Patriot firing units have demonstrated less than satisfactory growth toward specified Mean Time Between Failure (MTBF) values during the government Prototype Qualification Tests and Operational Tests. The launcher reliability growth has been less than anticipated due to a lack of operational hours to demonstrate its reliability, but production reliability is expected to meet requirements. Missile reliability for the test program to date has been satisfactory with the Patriot missile achieving a point reliability estimate of . . . There have been 32 firings since the change to the modular digital airborne guidance system (MDAGS).

f. (U) Environmental qualification tests were conducted as a coordinated government-contractor test program to determine the effects of natural and induced environments. Climatic testing has been conducted at Eglin AFB, FL, and end item testing has been done at the contractor plant facilities and WSMR. Mobility and transportability tests on the launcher and missile have been conducted at Aberdeen Proving Ground, MD. Compromising emanations testing has been conducted at WSMR.

g. (U) The development contractor for the Patriot system is Raytheon Company, Bedford, MA, with Martin Marietta of Orlando, FL, as the primary subcontractor for the missile. BG Jerry M. Bunyard is the Patriot Project Manager. The development testing is being designed by AMSAA and conducted by the US Army Test and Evaluation Command (TECOM), and the operational test is being conducted by the US Army Operational Test and Evaluation Agency (OTEA).

h. PATRIOT Flight Test Results to Date.

<u>Flt</u> <u>No.</u>	<u>Date</u>	<u>Engagement Objective</u>	<u>FU.</u>	<u>Mission</u> <u>Results</u> ^{1/}	<u>Reliability</u> <u>Scoring</u> ^{2/}
1	27 Feb 75			DM *	
2	31 Mar 75			DM	
3	19 Jun 75			DM	
4	18 Jul 75			DM	
5	15 Aug 75			DM	
6	16 Sep 75			DM	

Project: #D212

Program Element: 16.43.07.A

DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)

Title: Patriot (SAM-D)

Budget Activity: #4 - Tactical Programs

<u>Flt</u> <u>No.</u>	<u>Date</u>	<u>Engagement Objective</u>	<u>FU</u>	<u>Mission</u> <u>Results</u>	<u>Reliability</u> <u>Scoring</u>
7	30 Sep 75		DM		
8	5 Nov 75		DM		
9	26 Nov 75		DM		
10	19 Dec 75		DM		
11	16 Jan 76		DM		
12	22 Jan 76		DM		
13	6 Feb 76		DM		
14	19 Feb 76		DM		
15	2 Dec 76		1		
16	28 Jan 77		1		
17	18 Feb 77		1		

<u>Flt</u> <u>No.</u>	<u>Date</u>	<u>Engagement Objective</u>	<u>FU</u>	<u>Mission</u> <u>Results</u>	<u>Reliability</u> <u>Scoring</u>
18	30 Mar 77		1		
19	21 Apr 77		1		
20	21 May 77		1		
21	21 May 77		1		
22	2 Jun 77		1		
23	4 Nov 77		2		
24	9 Feb 78		2		
25	23 Feb 78		2		
26	27 Mar 78		2		
27	24 Apr 78		2		

Project: #D212
 Program Element: #6.43.07.A
 DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)
 Title: Patriot (SAM-D)
 Budget Activity: #4 - Tactical Programs

Flt No.	Date	Engagement Objective	FU	Mission Results	Reliability Scoring
28	17 May 78		2		
29	31 May 78		2		
30	31 May 78		2		
31	31 May 78		2		
32	22 Jun 78		2		
33	31 Aug 78		2		
34	4 Oct 78		2		
35	4 Oct 78		2		
36	4 Oct 78		2		
37	28 Sep 78		2		
38	12 Oct 78		2		
39	17 Nov 78		2		
40	19 Jan 79		2		
41	24 Feb 79		2		
42	6 Mar 79		3		
43	27 Apr 79		3		
44	2 May 79		3		
45	17 May 79		3		
DT-G2	22 Aug 79		2		
46	28 Aug 79		3		
47	8 Nov 79		3		
48	14 Nov 79		2		
49	1 Dec 79		3		
50	16 Jan 80		3		
G22/23	8 Feb 80		4		
G20/21	29 Feb 80		5		

Project: #D212
Program Element: #6.43.07.A
DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)
Title: Patriot (SAM-D)
Budget Activity: #4 - Tactical Programs

Flt No.	Date	Engagement Objective	FU	Mission Results	Reliability Scoring
G24/25	18 Mar 80		5		
G14/18/	25 Mar 80		5		
19					
G8	19 Apr 80		5		
G13	5 May 80		5		
G1	23 May 80		5		
G6	5 Jun 80		5		
G13a	13 Jun 80		5		
G-6a	16 Jul 80		5		
G-26	18 Jul 80		5		
G-27	21 Jul 80		5		

* DM-Advanced Development demonstration model.

**First attempts to launch the above missiles resulted in launch aborts. These were not scored for flight test results. However, both were scored launch reliability failures. Results shown above for these missiles are for second launch attempts.

***Missions combined to demonstrate a capability to achieve terminal guidance

1/ Mission results based on criteria of project manager for contractor firings, AMSAA for DT firings, and OTEA for OT firings.

2/ Reliability scoring based on test community scoring criteria.

2. (U) Operational Test and Evaluation:

Project: #D212

Program Element: #6.43.07.A

DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)

Title: Patriot (SAM-D)

Budget Activity: #4 - Tactical Programs

a. (U) The US Army Operational Test and Evaluation Agency (OTEA) is conducting Operational Test II (OT II) from November 1979 to March 1980 and will conduct a Follow-on Evaluation (FOE) prior to deployment. Nine of twenty-five Government test missiles were fired under the control of OTEA. An independent evaluation report was provided by OTEA. OT II was conducted at White Sands Missile Range and Ft Bliss, TX, on prototype equipment manned by soldiers from an active Juty battalion. These soldiers were selected by the US Army Training and Doctrine Command (TRADOC), were trained by the project management office for these tests, and underwent collective training by TRADOC.

b. (U) The Patriot OT II was a ten-month, two-phase test with a Patriot Battalion minus (consisting of two firing units, a command and coordination set (CCS), and associated government equipment) which conducted field exercises, tactical evaluations, nonfiring exercises, and live firings. Phase I began in Jan 79 and covered approximately eight months. It included the new equipment training for operator and maintenance personnel and unit collective training. Phase II was delayed from 31 Aug to 19 Nov 79 by software integration problems. Subtest 1 was a Tactical Effectiveness Evaluation (TEE) conducted under scenarios realistically depicting the threat environment to assess operator/machine capabilities. During Subtest 2, the Patriot units deployed, and conducted movements under realistic operational field conditions to include simulated chemical environments. During Subtest 3 conducted 8-14 January, the Patriot units engaged manned targets during ten repetitions with approximately 46 aircraft each during nonfire search/track exercises. Subtest 4 was a series of four live fire exercises with one or two fire units launching nine missiles in four separate firings during multiple simultaneous engagements (three firings of two missiles and one firing of three missiles). All firing missions were completed by the end of March 1980. All testing during OT II was conducted in an ECM environment using Standoff Jammers (SOJ) and/or Self-Screening Jammers (SSJ). Chaff was included during selected tests. The Patriot CCS was interfaced with an Air Defense Group Command and Control System, the AN/TSQ-73, when the battalion operated in the centralized or decentralized methods of control for both live fire and nonfire exercises.

c. (U) OT II soldier training was an eight-month phase that primarily addressed the New Equipment Training (NET) and collective training required to qualify personnel to operate Patriot system elements. The US Army Training and Doctrine Command (TRADOC) designated the number of personnel and positions required to operate the Patriot Battalion slice to be tested in OT II, and these personnel attended NET provided by the Patriot Project Manager. The instruction in NET included launcher and fire control operations, crew actions, initialization, operator functions, and organizational maintenance procedures. Training on the operation and maintenance of government-furnished equipment (GFE) incorporated into Patriot was also included. TRADOC provided approximately one month of collective training in addition to NET. Evaluations of the scope and quality of training, as well as test performance data and debriefings administered throughout the test, were used to obtain information on the adequacy of training. OTEA monitored the training phase.

Project: #D212

Program Element: #6.43.07.A

DOD Mission Area: #213 - Ground Air Defense

Title: -Patriot (SAM-D)

Title: Patriot (SAM-D)

Budget Activity: #4 - Tactical Programs

d. (U) The equipment utilized for OT II was preproduction prototype configuration Fire Units 4 and 5 except for the CRS and AMS. These latter items will be fully evaluated during the production confirmatory test and follow-on evaluation and will have minimal impact on collecting operational data for a full production decision. The entire Patriot system will be evaluated in the FOE which will be conducted by OTEA in two parts. The first part will be conducted during the Collective Unit Training of the 1st Battalion to be deployed to FORSCOM. The second will consist of maneuver, search/track and missile firings.

3. System Characteristics: The essential system requirements at the confidential level are provided below.

Operational/Technical
Characteristics

Objectives

Range (km) - Max
Min

Altitude (km) - Max
Min

Target - Max Velocity (m/s)
Target Maneuver (g)
In formation

Availability - Inherent
Missile
MTBF (hrs)

Reaction Time (Auto) (Sec)

PSSK
Reload Time (Minutes)

Project: #D212
Program Element: #6.43.07.A
DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)
Title: Patriot (SAM-D)
Budget Activity: #4 - Tactical Programs

4. (U) PATRIOT Verification Program:

a. (U) An extended R&D phase will be conducted in which preproduction prototype configuration fire Units will be modified and tested to performance values that will ensure that deficient areas found in DT/OT II have been corrected.

b. (U) Periodic reviews will be held to review results from four units of evaluation. Units 1 and 2 will be those development-type evaluations/events to be conducted by the contractor and Project Manager. Units 3 and 4 are to be formal tests of the PATRIOT system under the test direction and control of TECOM and OTEA respectively. Independent Evaluation Reports (IER) are to be rendered for these two tests. AMSAA will provide an IER for Unit 3, and OTEA and AMSAA will provide IER's for Unit 4 testing. At the completion of each of these four units, progress reports will be provided to USDKE (DDTE) for his use in evaluating development progress and in reporting his evaluation to the DSARC principals. Each series of tests will be evaluated against predetermined criteria.

c. (U) The complete test program will be conducted in accordance with a revised Test and Evaluation Master Plan (TEMP). The TEMP will be structured along the lines of the tests and reviews of DDTE Memo, subject: Test and Evaluation Assessment of PATRIOT (U) , dated 15 Aug 80.

5. (U) Test Schedule Summary:

<u>Test</u>	<u>Dates</u>	<u>Equipment</u>	<u>Equipment Type</u>
Unit 1	Jul 80-Jan 81	FU's 3, 4, 5	Production Prototype
Unit 2	Jan-Jun 81	FU's 3, 4, 5	Production Prototype
Unit 3	Jun-Oct 81	FU's 4, 5	Production Prototype
Software	Jun 81-Dec 82	FU's 3, 4	Production Prototype
Component Design			
Configuration (CDC)	Feb-Mar 82	CS 1	Production
System Design			
Configuration (SDC)	Apr-May 82	CS 1, 2	Production
Unit 4	Nov 82-Apr 83	CS 1, 2, 3	Production
Environmental Qual-			
ification Test (EQT)	Aug 82-Oct 83	CS 4	Production

FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D213

Title: PATRIOT Electronic Counter-Countermeasure (ECM) Enhancement

Program Element: #6.43.07.A

Title: PATRIOT (SAM-D)

DOD Mission Area: #213 - Ground Air Defense

Budget Activity: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: The PATRIOT system is being developed to replace NIKE HERCULES and HAWK in the Field Army. PATRIOT's engineering development has been keyed to an Electronic Countermeasure (ECM) threat postulated of the threat.

Improvements from this program will
and software enhancements will be made to achieve the improved performance. Hardware improvements are:

Both hardware

Software improvements include:

B. (U) RELATED ACTIVITIES: None

C. (U) WORK PERFORMED BY: The Raytheon Company at Bedford, MA, is the prime contractor. Teledyne Brown, Huntsville, AL, is a Software Verification and Validation Contractor. Government agency in-house work will be done by Harry Diamond Laboratory, Adelphi, MD, and the project will be managed by the PATRIOT Project Management Office, Huntsville, AL.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Not Applicable

2. (C) FY 1981 Program: Conceptual design, initial definition of performance trade-offs, and initial design efforts will begin on those items having a significant improvement in performance against the advanced threat. The emphasis will be to provide specific hardware and software requirements so that detailed design and evaluation can be started. Initial eval-

Project: #D213

Program Element: #6.43.07.A

DOD Mission Area: #213 - Ground Air Defense

Title: PATRIOT Electronic Counter-Countermeasure (ECCM) Enhancement

Title: PATRIOT (SAM-D)

Budget Activity: #4 - Tactical Programs

utions will be made to demonstrate concepts, integrate software and hardware designs, and refine requirements. Modifications to system-level performance simulations will be made to provide the tools required to evaluate design changes. Emphasis will be placed on

3. FY 1982 Planned Program: Continue design and testing of modifications to hardware and software identified in requirements analysis. Simulations and breadboard tests will be performed on Engineering Development equipment at White Sands Missile Range (WSMR). Search/track tests will be made to evaluate performance and demonstrate successful integration of software and hardware changes. Documentation of proposed hardware and software design changes will begin. Development of Fuze and warhead improvements will begin.

4. FY 1983 Planned Program: Tests to be performed will include Engineering Ground to Air tests, Search/Track tests and missile firings. Simulations using results of live testing will continue to validate software and hardware performance against numerous threat scenarios. Modification of production line procedures to accommodate design changes will be initiated in a production engineering task. Complete development of tasks initiated in FY81 and FY82 and continue further development of the system performance in Continue tasks to improve

5. Program to Completion: ECCM enhancements will be integrated into systems-level tests and evaluations. Production release occurs and improvements are incorporated into production

6. (U) Major Milestones: Not Applicable to this project.

7. (U) Resources (\$ in thousands):

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Project: #0213
 Program Element: #6.43.07.A
 DOD Mission Area: #213 - Ground Air Defense

Title: PATRIOT Electronic Counter-Countermeasure (ECCM) Enhancement
 Title: PATRIOT (SAM-D)
 Budget Activity: #4 - Tactical Programs

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
ROUTE						
Funds (current requirements)	0	19573	28058 ^{1/}	To Be Determined		
Funds (as shown in FY 1981 submission)	0	19606	24780	Not Shown	27177	71563
Quantities (current requirements)						Not Applicable
Quantities (as shown in FY 1981 submission)						Not Applicable

Other Appropriations: Improvements are to be folded into currently programmed production contracts when system design finalized and tested.

^{1/} (U) Increases result from a more detailed analysis of tasks to be performed and evaluation of design changes necessary to counter the evolving threat.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.09.A

Title: ROLAND

DOD Mission Area: #213 - Ground Air Defense

Budget Activity: #4 - Tactical Program

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	11299	12613	4000	12419	11377	32670
	Quantity - Fire Units						4
	Quantity - Missiles						90
D647	ROLAND	11299	12613	4000	12419	11377	32670

8. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for design transfer of the French/German ROLAND II All-Weather Short-Range Air Defense (SHORAD) missile system to the US; modifications to meet required system performance; and development of the ROLAND Institutional Trainer (classroom trainer) and Maintenance Institutional Trainer (maintenance simulator). A US ROLAND all-weather system has been fabricated and tested. In October 1979, a US production base began producing US ROLAND to meet the Army's all-weather SHORAD missile requirement. This system is required to fill the Army's urgent need for an all-weather SHORAD missile system capable of defending critical targets against the growing Soviet all-weather, low-altitude, high-performance aircraft threat. The Army does not now have such an all-weather system.

C. BASIS FOR FY 1982 RDTE REQUEST:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Defense Systems Acquisition Review Council I/II	FEB 74	FEB 74

Program Element: #6.43.09.A
DOD Mission Area: #213 - Ground Air Defense

Title: ROLAND
Budget Activity: #4 - Tactical Program

Source Selection Evaluation	JAN 75	JAN 75
Joint US/European Test (Completed)	NOV 78	NOV 78
Defense Systems Acquisition Review	MAY 79	MAY 79
Council III		
Low Rate Production	OCT 79	OCT 79
Defense Systems Acquisition Review	TBD	-
Council IIIB		
Initial Operational Capability(IOC) (Tactical Unit)		

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	11299	12613	4000	23816	326790
Funds (as shown in FY 1981 submission)	11299	12638	0	0	299049

An increase of \$.120 million in FY81 was the result of revised Department of Defense inflation guidance; \$.0 million in FY82 funding initiates US share of the trinational Joint ROLAND Improvement Program to counter the advanced post-FY85 threat; \$23.8 million in outyear funding continues Joint ROLAND Improvement Program design/development efforts.

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E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
Missile Procurement, Army:						
Funds (current requirements)	299702	428900	529300	To Be Determined		
Funds (as shown in FY 1981 submission)	296900	412000	551030	124000	0	1607200
Quantities - Fire Units:						
(current requirements)	18	17 ^{1/}	31	60	51	180
(as shown in FY 1981 submission)	18	23	51	0	0	95
Quantities - Missiles:						
(current requirements)	410	400 ^{1/}	795	1200	3306	6186
(as shown in FY 1981 submission)	410	600	1230	0	824	3139

Notes:

1/ Award of the FY 1979 and FY 1980 production contracts was delayed more than four months because procurement funds could not be released until the FY80 authorization issue for US ROLAND was resolved by the Congressional joint authorization conference. Award of the FY81 production contract was delayed more than two months due to uncertainties surrounding program continuation within early FY82 budget guidance. The impact of these delays and inflationary economic conditions was handled by reducing FY81 hardware quantities.

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Program Element: #6.43.09.A
DOD Mission Area: #211 - Ground Air Defense

Title: ROLAND
Budget Activity: #4 - Tactical Program

F. DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is to transfer technology and fabricate hardware for the conduct of engineering development tests on a US-built ROLAND air defense system. The US ROLAND system will provide an all-weather surface-to-air missile capability for use in defense of forward airbases and other critical assets. The US ROLAND will replace the presently deployed European and CONUS nondivisional CHAPARRAL/VULCAN units. The US ROLAND system consists of a fire unit module (two missile launchers, internal missile storage compartment for 8 missiles, acquisition and tracking radars, electro-optical sight, and other fire control equipment) mounted on a single M1975 tracked vehicle. The US system can engage low-flying targets at ranges out to 10 km and altitudes up to 10 km. The US ROLAND missile may be launched in the tracking radar mode for an all-weather capability or in the optical mode without using the tracking radar. At intercept, warhead detonation can be initiated by either a proximity or an impact fuze.

G. (U) RELATED ACTIVITIES: Evaluations to verify the technical performance of three foreign-developed air defense systems (the German/French ROLAND II, the United Kingdom RAPIER, and the French CROTALE) were conducted under Project 0699 (Evaluations of Foreign Weapon Systems) of Program Element 6.33.01.A (Advanced Forward Air Defense Systems). Close liaison is maintained with the development/production efforts of the French/German ROLAND II program. The development program for the US ROLAND conforms to the provisions of specific license agreements and Memorandums of Understanding which closely control the configuration, joint test management and international interchangeability. The Joint ROLAND Control Committee (JRCC) was organized to administer these provisions.

H. (U) WORK PERFORMED BY: The program is managed by the US Army Missile Command (MICOM), Huntsville, AL. Hughes Aircraft Company (HAC), Canoga Park, CA, and Boeing Aerospace Company (BAC), Seattle, WA, are associate prime contractors for system production. HAC and BAC are colicensed to produce the system in the US by Euromissile, the European consortium responsible for the European ROLAND II system.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1980 and Prior Accomplishments: The Short-Range Air Defense (SHORAD) Requirements Study concluded that a requirement existed for an all-weather, low-altitude SHORAD missile system. This requirement was approved by the Army Staff in August 1973 and revalidated in April 1979 at the ROLAND Army Systems Acquisition Review Council (ASARC) III. The SHORAD Missile Program was approved by the Defense Systems Acquisition Review Council (DSARC) in February 1974. Four contractors responded to the Army's request for proposals: (1) Philco-Ford for the all-weather CHAPARRAL missile system, (2) Rockwell International for the CROTALE missile system, (3) United Aircraft for the RAPIER system, and (4) Hughes Aircraft Company for the ROLAND II system. A Cooperative Test Program was initiated in 1975 with the German Government. This program was designed

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ned to reduce the technical and schedule risk of the engineering development phase of the program. In August 1975 the Army's contractor (Hughes Aircraft Company) projected a cost growth in the technology transfer, fabrication, and test contract. A special Army Systems Acquisition Review Council (ASARC), on 17 October 1975, directed that the program be restructured to provide an opportunity for the European system design to stabilize and to provide an opportunity to reassess the Army's program. During FY 1976 the contractor's program was closely monitored by issuing funds in monthly incremental allotments sufficient to permit completion of the design transfer. Fabrication of electrical and mechanical subcomponents of the missile and fire units began. The Cooperative Test Program was completed in February 1976 at Patrick AFB, FL. A restructured contract proposed by Hughes Aircraft Company was negotiated in August 1976, and a special ASARC was held in September 1976. The ASARC recommended continuation of the program to a Special Defense Systems Acquisition Review Council (DSARC) which met 24 September 1976. During FY 1977 and 1978, fabrication of 4 fire units and 90 missiles to be used in testing was completed. Full system testing consisting of a coordinated operational and developmental test program commenced in November 1977 and was completed in April 1979. Design and fabrication of a US National Field Maintenance Test Set (FMTS) was initiated in FY 1977. Cooperative efforts on the international interchangeability continued with more than 550 field replaceable subassemblies approved by the Joint (Germany, France, and US) ROLAND Control Committee. Initial Production Facilitation (IPF) funds were released in mid-FY78 by the Department of Defense. Design effort was initiated in FY 1979 to incorporate modifications into the track radar and to provide the FMTS with a support capability for the Organizational Maintenance Test Set's (OMTS) Surveillance Radar Test Set. A DSARC III was held 31 May 1979 for the purpose of authorizing production of the US ROLAND. On 6 June 1979, approval was granted by the Secretary of Defense to proceed with the FY 1979 and FY 1980 low-rate production programs as presented to the DSARC. Award of the FY79 and FY80 low-rate production contracts was delayed, however, until October 1979 and January 1980, respectively, as a result of an FY80 Congressional authorization issue which required joint authorization conference resolution. Activities incident to technology transfer close-out and design/test efforts to incorporate modifications and provide support capability were continued in FY80. FY80 initiated design/test effort on the modification and the problem and initiated development/prototype fabrication of the ROLAND Institutional Trainer (classroom trainer).

2. FY 1981 Program: 1980 saw low-rate production continued after a two-month delay due to uncertainties surrounding program continuation within early FY82 budget guidance. December saw award of production contracts totaling over \$275 million, and completion of Reliability Evaluation Testing initiated in November. Modifications design/test efforts will be completed as will the ROLAND Institutional Trainer development. Development of the Maintenance Institutional Trainer (Maintenance Simulator) will begin as a productivity-enhancing capital investment initiative. DSARC III will be held to review system reliability and improvement prior to full-rate production approval.

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3. (U) FY 1982 Planned Program: Continue production to attain the Army's minimum essential all-weather SHORAD requirement of four US Roland battalions; begin confirmatory testing in December 1981. Initiate US share of the tri-national Joint Roland Improvement Program to counter the post-FY85 threat.
4. (U) FY 1983 Planned Program: Continue production and confirmatory testing. Continue design and development of Joint ROLAND Improvement Program modifications with Europeans to meet the post-1985 threat.
5. Program to Completion: Complete confirmatory testing in January 1984 and deploy first tactical unit in

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J. (U) Test and Evaluation Data

1. (U) Development Test and Evaluation: The US ROLAND, an adaptation of a French-German-developed system, has completed the Technology Transfer, Fabrication, and Test (TTF&T) phase. This phase contained test programs equivalent to developmental/operational tests (DT/OT) and included joint tests with the Europeans, as well as national testing of the US-built system. The objectives of these tests were: (1) to determine if the European technology had been successfully transferred, (2) to evaluate system performance versus requirements, and (3) to collect sufficient data to validate system simulations. Completion dates of the various tests follow.

System Integration	- Completed January 1978
Mobility Test	- Completed September 1978
Arctic Test	- Completed March 1979
Environmental Test	- Completed April 1979
Performance Test (Missile Firings and Tracking Missions)	- Completed April 1979

With the successful completion of the TTF&T program, a Defense Systems Acquisition Review Council (DSARC) III was held in May 1979, and approval was granted to enter into low-rate production. A requirement for three additional major tests was presented by the Army and endorsed by the DSARC. The first is a separate special evaluation test program which will be conducted during July 1980-June 1981 for the purpose of evaluating modifications to correct deficiencies found in TTF&T testing. These tests will be conducted by the developer. The second was a combined reliability evaluation test that was conducted during November-December 1980 to evaluate system reliability growth as a result of improved components. This test, which included a realistic and vigorous field test, was managed by the US Army Operational Test and Evaluation Agency (OTEA). The third major test to be conducted is the confirmatory test program which is scheduled to start December 1981 and run through January 1984. Production hardware will be used in confirmatory testing, which will include developer as well as extensive operational testing. The major objectives of these combined tests are as follows:

Developer Testing

- . Verify production hardware performance in clear and adverse weather conditions.
- . Evaluate maintenance support equipment.

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- . Verify US missile safety.
- . Accept tactical missiles.
- Operational Testing
 - . Evaluate production equipment performance in an operational environment under clear and adverse weather conditions.
 - . Assess ROLAND training program.
 - . Assess adequacy of the support concept.
 - . Assess tactics, doctrine, and safety that affect training, maintenance, and employment.

The US ROLAND Technology Transfer, Fabrication, and Test (TTF&T) program consisted of missile firings, tracking tests, environmental tests, and maintenance demonstrations. The missile firing program included a joint European/US test (EJT) program as well as US national tests. The US fired 64 missiles in the national tests; 43 missiles were fired in the European joint test (EJT) program for a total of 107 missile firings. Seventy firings were successful, and 31 (18 US and 13 EJT) were unsuccessful. However, on 11 of the 31 total flights considered unsuccessful, sufficient test data was gathered to meet the primary test objectives. Six firings (5 US and 1 EJT) were scored as no test. Major problems which resulted in failures were caused by either design deficiencies or inadequate acceptance procedures. The design deficiencies were common to both the US and European design. However, by using a test-fix-test philosophy, the deficiencies were corrected, the fixes were retested, and successfully demonstrated prior to the completion of the test program. The tracking, environmental, and maintenance demonstration test results indicate that ROLAND met all major requirements with two exceptions, and system reliability. Modifications to improve follow.

. A modification has been designed in coordination with the Europeans which incorporates an The complete modification will be subjected to system testing from July 1980-February 1981 as part of the special evaluation test program.

. The Europeans have taken the lead to incorporate a Hardware Similarly, the US has taken the lead on the track radar's with these modifications will be available for testing during the special evaluation test timeframe.

. A joint US/European will be tested during fiscal year 1981, November 1980 to June 1981.

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(U) During the test program, seven items were identified that require improved reliability. These items are the environmental control unit, prime power unit, logic unit, track radar local oscillator and signal processor, and the surveillance radar transmitter and receiver. The reliability evaluation portion of the reliability improvement program, underway since March 1979, was completed 15 December 1980.

The hardware to be tested in the remaining major test phases will be of the following configurations. The special evaluation tests will use an updated Technology Transfer, Fabrication & Test (TTF&T) fire unit and missiles which incorporate the confirmatory tests will use hardware delivered from the production line. At this time, all required subsystems and support equipment are expected to be available for these test programs.

(U) The development contractor on US ROLAND was the Hughes Aircraft Company, with the Boeing Aerospace Company as the major subcontractor. Hughes and Boeing will provide test support during the remaining tests. The development tester is the US Army Test and Evaluation Command and the operational test agency is the US Army Operational Test and Evaluation Agency (OTEA). The operational test portion of the confirmatory test program will be conducted by OTEA. The following are the major test facilities, ranges, and types of personnel that will conduct and/or participate in the testing.

<u>Test</u>	<u>Facility</u>	<u>Type of Personnel</u>
Special Evaluation	White Sands Missile Range, NM	Government and contractor civilians
Confirmatory	Boeing Aerospace Company, Seattle, WA	US Army troops, Government and contractor civilians
	White Sands Missile Range, NM	US Army troops, Government and contractor civilians
	Aberdeen Proving Ground, MD	US Army troops, Government and contractor civilians
	Redstone Arsenal, AL	US Army troops, Government and contractor civilians
	Fort Clayton, Panama	US Army troops, Government and contractor civilians

(U) The test schedule and major milestones follow.

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. Special Evaluation Test	Start July 1980 Complete June 1981
. Confirmatory Tests	
.. Developer Testing	
... Logistics Evaluation	Start December 1981 Complete September 1982
... Performance Testing	Start January 1982 Complete May 1982
... First Article/Initial Production Tests	Start June 1982 Complete June 1993
.. Operational Testing	Start September 1983 Complete January 1984

(U) The number of units scheduled to undergo testing follows.

- . Special Evaluation Test - One fire unit and five to nine missiles for firing.
- . Confirmatory Tests - 12 fire units, 40 missiles for firing, 3 field maintenance test sets, 3 organizational maintenance test sets, and 3 operator proficiency trainers.

Below is a tabulation of missile firings of the US Technology Transfer, Fabrication, and Test (TTF&T) program.

<u>Objective</u>	<u>Successful</u>	<u>Unsuccessful</u>	<u>No Test</u>
Establish System Baseline			
Maneuvering Target			
Countermeasures			

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Objective	Successful	Unsuccessful	No Test
Formation Targets			
Environmental			
Helicopter			
Arctic			
Total			

(U) Hardware configurations for all Technology Transfer, Fabrication and Test (TTF&T) tests were identical. ROLAND has not been previously tested by another Department of Defense component. Test requirements during TTF&T established the need for the special evaluation test and the reliability test. The test environments for the previous and future tests are as follows.

	Previous	Future
Special Evaluation Test	White Sands Missile Range. System ground tests, tracking and firing tests in an electronic counter-measures environment.	Same

(U) The WSMR portion of the Special Evaluation Test has been underway since July 1980. This program consists primarily of ECM, IRCM, and chaff testing of modifications to be included in the production hardware. The IRCM and ECM ground tests have been completed, as well as the ECM tracking tests (including chaff). Seven missile firings have been completed to date and the remaining are scheduled to be completed in March 1981. The final evaluation report will be available June 1981.

	Previous	Future
Reliability Evaluation	Combination of factory and development tests conducted at White Sands Missile	In Combination with confirmatory testing at White Sands Missile

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Previous

Future

Range and an operational test Range, NY, Ft. Bliss,
at White Sands and Vandenberg TX, Aberdeen
AFB, CA. Proving Ground, MD.

Reliability, availability, and maintainability (RAM) testing is a primary ingredient in testing. The major objective of the reliability demonstration (November-December 1983) was to determine system reliability improvement in terms of average mean time between failure (MTBF). A goal of _____ hours fire unit average MTBF was set for this test. A Technology, Transfer, Fabrication and Test (TTF&T) fire unit was upgraded with production configuration hardware for those items which exhibited unacceptable failure rates in TTF&T. The Reliability Evaluation Test at Fort Lewis, Washington, was completed on 15 December 1983. The test was conducted by the Air Defense board for OTEA using FORSCOM troops as operators and organizational maintenance personnel. The total test system test time was approximately 560 hours of operation against the tactical scenario. Test results confirmed that the established test goal was successfully demonstrated, and that the reliability growth achieved indicates that the system MTBF goals can be met. The OTEA final report is scheduled for completion in late March 1984.

The confirmatory tests (December 1981-January 1984) will include a complete evaluation of reliability, availability, and maintainability (RAM) in both developer and operational testing. Additionally, an evaluation will be made of the logistics support concept to be used during deployment. The RAM requirements to be demonstrated during confirmatory testing are as follows.

- . Fire unit average MTBF - _____ hours (after 500 confirmatory test hours)
- . Mean time to repair - _____ hours
- . Operational availability - _____
- . In-flight missile reliability - _____

All hardware used in confirmatory testing will be production units. US Army troops will conduct the tests and maintain the system hardware. Production hardware planned for future testing and deployment is functionally identical to that used during development testing except for the inclusion of modifications for _____ and reliability as previously discussed. All subsystem qualification and environmental tests have been completed, with the exception of tropic testing. The system successfully completed the roadability/transportability testing at Aberdeen Proving Ground, MD, which involved approximately 1500 miles of road travel, arctic testing at the Cold Regions Test Center in Alaska, and electromagnetic radiation

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effects testing at White Sands Missile Range. Fixes to all qualification problems identified during these tests will be incorporated into the low-rate production hardware and requalified in the confirmatory tests. During confirmatory testing, the production units will be subjected to the same type of vigorous tests to assure no degradation from the development hardware. Tropic testing, which is a part of confirmatory testing, is scheduled to be held at the Tropic Test Center, Fort Clayton, Canal Zone, from April through October 1982. This testing will be in three phases. In the first phase, the US ROLAND fire unit, support equipment, and tactical missiles will be stored in a tropic environment, after which the system will undergo a functional checkout. In the second phase, the fire unit and support equipment will be subjected to a 1000-kilometer durability and mobility test over secondary roads and cross-country terrain. The final phase will consist of target tracking tests to evaluate system performance and gunner capabilities in a tropic environment.

2. (U) Operational Test and Evaluation: The US ROLAND has completed the Operational Test II (OT II) portion of the Technology Transfer, Fabrication, and Test (TTF&T) phase of life cycle testing. OT II was completed in two phases--firing and nonfiring. The firing phase was conducted at White Sands Missile Range, New Mexico, using military crews performing the mission and contractor personnel performing maintenance. The nonfiring phase was conducted at Vandenberg Air Force Base, California, to take advantage of the frequent occurrence of fog and low-level cloud cover. The objectives of the test were to: (1) assess the capability of the system to engage and destroy threat targets in an operational environment including adverse weather and enemy countermeasures, (2) assess the survivability of the US ROLAND in a hostile environment, (3) assess system personnel requirements, (4) assess the effectiveness of doctrine and tactics as they affect the employment of the system, (5) assess the reliability and obtain information on the availability and maintainability characteristics of the system, (6) obtain information on the integrated logistics support concept, and (7) obtain information on the program. Significant milestones of the Operational Test II of the TTF&T phase were:

. Firing Phase	-	Completed August 1978
. Nonfiring Phase	-	Completed November 1978

(U) An Independent Follow-on Evaluation as part of the confirmatory test program will be conducted by the US Army Operational Test and Evaluation Agency (OTEA) during September 1983-January 1984 to (1) evaluate production equipment performance in operational environment, (2) verify correction of operational deficiencies from prior testing, (3) evaluate missile durability under field handling conditions, (4) evaluate reliability, availability, and maintainability (RAM) of fire unit and peculiar support equipment, (5) assess Army ROLAND training program, (6) assess adequacy of the integrated logistics support concept, and (7) assess tactics, doctrine, safety, and human factors engineering that affect training maintenance and employment.

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(U) As previously stated, Operational Test II (OT II) was conducted by the US Army Operational Test and Evaluation Agency (OTEA) in two parts. The first part was the firing phase conducted at White Sands Missile Range using military crews and a military test conductor. During this phase a US ROLAND platoon (two fire units) fired both warhead (US and European) and telemetry missiles at high performance drones considered to be hostile aircraft to demonstrate operational effectiveness. All firings were double target presentations, i.e., eight presentations of two targets. For four of the presentations, one fire unit was to engage both targets and during the other four presentations, two targets were engaged by two fire units. The target aircraft flew profiles that were as tactically realistic as possible within the limits of the range. The second part of the OT II, the nonfiring phase, was conducted at Vandenberg Air Force Base. During this phase a series of field exercises were held, and tactical jet aircraft and helicopters were flown to assess the mission performance of the US ROLAND. Particular emphasis was placed on the crew's ability to overcome limitations imposed by adverse weather and electronic countermeasures. The tactical scenarios and mission profiles used during the test were developed by the US Army Training and Doctrine Command (TRADOC). Events were replicated during the tactical exercises as required in an operational environment to obtain essential data for analysis. During the test, the system, supported by the necessary command and control and maintenance support elements, conducted a series of tactical operations. As a result of OT II, OTEA came to the following overall conclusions concerning the operational effectiveness of the US ROLAND system.

(U) . US ROLAND has demonstrated the capability to perform the all-weather, low-altitude air defense mission.

(U) . Demonstrated reliability of US ROLAND is insufficient to support completion of a 72-hour consecutive operational mission period with only organizational maintenance.

(U) . Maintainability has not been tested.

(U) . System effectiveness, with emphasis on performance under threat level electronics countermeasures (ECM), system reliability, and system maintenance concepts should be further examined in the battery-level Follow-on Evaluation (FOE) now planned.

(U) The reliability evaluation testing (previously discussed in paragraph J.1.), conducted November-December 1980, provided over 500 hours of testing and confirmed improved reliability. At the outset of the US ROLAND program, a testing philosophy was adopted which provided for the production decision to be supported by sufficient testing to demonstrate US ROLAND performance, assure successful technology transfer, and validate system operational performance. The evaluation of the maintenance concept was consciously deferred. The maintenance concept and system effectiveness will be further examined by OTEA in the Follow-on Evaluation (FOE) scheduled for September 1983-January 1984 during confirmatory testing as pointed out

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previously. As stated before, the test-fix-test philosophy corrected other deficiencies, retested the fires, and successfully demonstrated correction prior to completion of the test program. Identification friend or foe (IFF) was not adequately tested due to hardware availability. During the FOE, IFF testing will be emphasized.

(U) The FOE portion of the confirmatory tests will use hardware delivered from the production line. At this time, all required subsystems and support equipment are expected to be available for the test program. Currently, there are no contractor firings and 16 service firings planned for the FOE. These firings, to include those in adverse weather if possible, will be conducted tactically (within the constraints of range safety) to evaluate production equipment performance in an operational environment. The reliability evaluation test has been completed, and confirms that full-production reliability goals can be met.

1. System Characteristics:

Operational/Technical
Characteristics

Objectives

Demonstrated
Performance

- * Forward Intercept Range
 - Maximum (KM)
 - Minimum (M)
- * Intercept Altitude
 - Maximum (KM)
 - Minimum (M)
- * System Reaction Time (Sec)
- * Reload Time (Sec)
- * System Operational Availability (Ao)

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Operational/Technical
Characteristics

Objectives

Demonstrated
Performance 1/

- ° System Operational Effectiveness (EsO)
 - Benign (nonelectronic countermeasures (ECM)), nonmaneuvering single target
 - Benign (non-ECM), maneuvering single target
 - Benign (non-ECM), multiple target formation
 - ECM environment, nonmaneuvering, single target
 - ECM environment, multiple target formation
- ° Antiradiation Missile (ARM) Survivability
- ° Missile Reliability
- ° Inherent Availability (AI)
- ° Target Speed
 - Maximum (MPS)
 - Minimum (MPS)
- ° Engagement Target Maneuvers (g's)

FOOTNOTES:

- 1/ (U) Demonstrated during developmental/operational testing (DT/OT II).
- 2/ (U) To be retested during confirmatory testing.
- 3/ (U) Limited by White Sands Missile Range requirements and not by system capability.
- 4/ Demonstrated in European Joint testing with European system; the maximum demonstrated by the US ROLAND system was

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- 5/ (U) In cases where demonstrated reliability, availability, and maintainability (RAM) performance has not met the Army's goal, improved system operational availability is expected as technical deficiencies are corrected, system improvements demonstrated, and additional testing is completed during the reliability demonstration test and confirmatory testing.
- 6/ (U) To be recalculated based on results obtained from the special evaluation test (July 1980-February 1981), the reliability demonstration test (October-December 1980), and confirmatory testing (December 1981-April 1983).
- 7/ (U) Based on computer simulation and analysis, not on a demonstration test.
- 8/ Based on tracking tests; the firing maximum target speed was ... which was constrained by the speed of the drone available and not system capability.
- 9/ Demonstrated in European Joint testing with European system; the maximum demonstrated by the US ROLAND system was

FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: 06.44.10.A

Title: Heliborne Missile - HELLFIRE

DOD Mission Area: 011 - Close Combat

Budget Activity: 04 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	58000	45002	24791	19671	0	320313 229
D074	Heliborne Missile - HELLFIRE	58000	45002	24791	19671	0	320313

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: HELLFIRE is a heliborne antitank terminal homing modular missile system which uses a shaped charge warhead to defeat individual hardpoint targets with minimal exposure of the delivery vehicle to enemy fire. HELLFIRE will initially utilize semiautomatic laser terminal homing guidance and has been designed to accept various other guidance packages. The missile system will be employed from Advanced Attack Helicopters (AAH's) against heavily armored vehicles at longer standoff ranges and with greater lethality than missiles currently in the inventory. HELLFIRE will provide accurate fire on targets acquired and autonomously designated by the attack helicopter or remotely designated by ground observers, other attack helicopters, and aerial scout helicopters. HELLFIRE can be employed in a wide variety of firing modes in day or night operations. It is being developed to meet the armored vehicles and other hardpoint target threats of the timeframe. HELLFIRE will provide greater versatility than missile systems currently in the inventory. The mission engagement capability will be enhanced by the variety of methods of designation and firing techniques. The system is needed to counter the expanding armor threat. It has been designed to be adaptive, to be highly lethal and to reduce launch aircraft vulnerability.

C. (U) BASIS FOR FY 1982 RDTE REQUEST:

1. (U) Engineering Development of the HELLFIRE Modular Missile System will continue through FY 1983. The Defense Systems Acquisition Review Council (DSARC) III production decision review will be conducted early in FY 1982 and the production contract will be awarded. Hardware that has been exposed to environmental storage will undergo laboratory testing.

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DOD Mission Area: #211 - Close Combat

Title: Heliborne Missile - HELLFIRE
Budget Activity: #4 - Tactical Programs

Work to be done by the system prime contractor will include correction of deficiencies revealed by the M164 operational tests. Test program sets for the USM 410 test equipment will be completed for launcher test support. Development of the warhead marker charge will continue into FY 1982. Engineering design and fabrication of the minimum smoke motor will be completed in FY 1982, and flight testing of the prototype models will begin.

2. (U) The UH-60 Feasibility Demonstration, project number D069, which was included in the FY 1981 submission under this Program Element (P.E.), has been removed from this program element and is now included in P.E. 6.43.06.A, BLACK HAWK, in order to facilitate program management. Funding under project number D069 in the FY 1981 submission was \$3 million in FY 1980 and \$5.42 million in FY 1981.

3. (U) Development costs included in this Congressional Descriptive Summary have been validated by the Office of the Comptroller of the Army.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Army Systems Acquisition Review Council/Defense Systems Acquisition Review Council (ASARC/ DSARC II)	Feb 76	Feb 76
Engineering Development (ED) Contract Award	Oct 76	Oct 76
Operational Test (OT) II Start	Apr 80	Apr 80
Initial Production Contract Award	Nov 81	Nov 81
Missile & Launcher Availability	Jul 83	Jul 83
Initial Operational Capability (IOC) on Advanced Attack Helicopter (AAH)	Oct 84	Jan 85

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The IOC date for the AAH has been changed to January 1985.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	58000	45002	24791	19671	120309
Funds (as shown in FY 1981 submission)	61000	54844	21289	0	109978

The decrease in FY 1980 is due to the transfer of Project Number D069, UH-60 Feasibility Demonstration, from this Program Element (P.E.) to P.E. 6.42.06.A, BLACK HAWK, to facilitate program management. The decrease, in FY 1981 is also due to the transfer of Project Number D069 (\$-5420), Congressional reduction (\$-4897) which deleted additional RDTE funding requested when production start was delayed, and added inflation (\$+475). The FY 1982 increase reflects added inflation (\$+2498); additional effort for shelf life surveillance, countermeasures/counter-countermeasures and enhancement programs for the warhead, seeker, and propulsion section (\$+13848); and deferment of the Production Validation Test (PVT), Design-To-Unit Production Cost (DTUPC) award fee and risk capital funding to FY 1983 due to production schedule slip (\$-12844). The increase in cost to complete reflects a continuation of the efforts initiated in FY 1982 (\$+5753) and the deferred efforts from FY 1982 and associated inflation (\$+13918).

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E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
Missile Procurement, Army						
Funds (current requirements)		20995	96540	120726	1094888	1333149
Funds (as shown in FY 1981 submission)		20800	126000	-	529986	676786
Quantities (current requirements)			502	1213	22885	24600
Quantities (as shown in FY 1981 submission)			2760	-	21840	24600

The FY 1981 increase reflects added inflation. The decrease in FY 1982 is due to a reduction in procurement funds in final preparations of the FY82-86 budget (\$-36000) and added inflation (\$+6540). The increase in the total estimated cost for this program element is due to the application of new inflation indices (\$49741), a revised production estimate (\$466492), and two-year schedule stretchout imposed by internal Army funding constraints in FY 1983 and FY 1984 (\$140100). The increases due to the revised production estimate are attributed to hardware cost increases in the missile bus (\$123364), seeker (\$139023), and launcher (\$11789); engineering services (\$21381), contractor system project management (\$115737), an additional requirement of 240 launchers (\$7083), increased test costs for first article and fly-to-buy tests (\$11633), inclusion of allowances for cost of money and government warranty parts (\$13614), and other refinements (\$22368). Decrease in the FY 1982 quantities is due to the reduction of procurement funds and a resulting less economical rate of production.

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F. DETAILED BACKGROUND AND DESCRIPTION: This program began with exploratory development in laser guidance. Previous work by the Army, Navy, and Air Force established the technical feasibility of using lasers to designate targets for terminal homing of laser seeker equipped ordnance. The Army conducted a successful prototype flight test program using the Air Force HORNET missile modified with laser terminal homing capabilities. The flight tests reduced the developmental risk and demonstrated the feasibility of helicopter-launched laser-guided missiles. During exploratory flight tests, fifty-six missiles were fired from ground and aerial launch platforms using ground and airborne designation. Forty-one were successful. Competitive Advanced Development (AD) contracts for system design concepts were awarded to Hughes Aircraft Company and Rockwell International Corporation in June 1974. In October 1976 Rockwell was selected as the prime contractor for Engineering Development (ED). Earlier in 1974 the Air Force was designated by the Department of Defense as the executive agent for the Tri-Service Laser Seeker. An Air Force contract was awarded for the Engineering Development of seekers to be used on the Air Force MAVERICK missile and the Army's HELLFIRE missile. Due to the projected high production cost of this tri-Service seeker, the Army and Air Force pursued a joint cost reduction effort. In addition, the Army initiated a low-cost seeker program with Martin-Marietta Corporation to provide competition in the seeker development with the purpose of reducing production seeker costs. In November 1978, the Army selected the Martin-Marietta seeker to be used for missile system qualification and cancelled the Army requirement for the Rockwell developmental prototypes. HELLFIRE will be effective against targets at ranges up to _____ in the direct fire mode and to _____ in the indirect mode. The longer standoff range and the ability of the helicopters to mask behind terrain features provide a significant increase in helicopter survivability over antiaircraft helicopters currently in the inventory. The lethality against _____, longer range, less time of flight, and versatility of HELLFIRE provide the Army a significant improvement to defeat armor compared to TOW. The 7-inch-diameter missile will weigh 98.5 pounds, penetrate a minimum of _____ of semi-infinite rolled homogenous steel and be capable of defeating potential enemy tanks of the _____ timeframe. This system will provide the Army with a common missile airframe capable of accepting a family of terminal homing seeker modules to engage a variety of targets. The initial seeker module will be a laser seeker which provides the capability to deliver accurate fire on hard point targets which have been designated by a laser designator. Other seeker modules may include a fire-and-forget infrared seeker and an air defense suppression seeker.

G. (U) RELATED ACTIVITIES: The HELLFIRE missile system is related to Air Force, Navy, and other Army systems which utilize similar technology. Coordination to preclude duplication of effort is effected through technology coordination groups, frequent liaison visits, exchange of components and subsystems, and exchanges of analyses, simulation, and hardware test results. The exploratory prototype program was conducted under Program Element (P.E.) 6.23.03.A, Missile Technology, and the Advanced Development effort was conducted under P.E. 6.33.10.A, Heliborne Missile - HELLFIRE. Work on the infrared seeker,

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will be done under P.E. 5.43.16.A, Fire-and-Forget HELLFIRE, currently programed for funding in FY 1981. The US Air Force portion of the tri-Service development was funded under P.E. 6.46.08.F, Close Air Support Weapon Systems. The Advanced Attack Helicopter is funded under P.E. 6.42.07.A. There is no duplication of effort between HELLFIRE and other Army or DOD systems within the same size, weight, range, and mission requirement classification.

H. (U) WORK PERFORMED BY: Contractors are Rockwell International Corporation, Columbus, OH, for missile development, and Martin Marietta Corporation, Orlando, FL, for laser seeker development. The Army program manager (PM) is PM, HELLFIRE at Redstone Arsenal, AL.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Exploratory development work commenced in FY 1971. The FY 1972 program initiated concept formulation activities. This effort included work on fire control integration, laser measurements, countermeasure investigations, and warhead design. Exploratory flight tests were conducted with 5-degree and 40-degree field-of-view seekers to obtain information on the achievability of terminal and designator tracking accuracy. The funding provided exploratory configuration hardware for operational tests. The FY 1973 program provided for completion of a cost-effectiveness study and two phases of Military Potential Tests (MPT). These efforts were designed to provide a basis for a decision to enter full-scale development of a laser-guided missile in FY 1974. The results from the MPT and Cost and Operational Effectiveness Analysis (COEA), however, revealed some operational uncertainties that warranted further investigation. These uncertainties were demonstration of different modes in varied battlefield conditions and assessment of system vulnerability, command and control requirements, and reaction times. Consequently, during the 3rd quarter of FY 1974 it was decided to retain the laser missile program in Advanced Development (AD) for two more years. These uncertainties were resolved in further exploratory tests. Rockwell International Corporation and Hughes Aircraft Company were selected in 1974 to continue development of modular missile technology for eventual competitive selection of one Engineering Development (ED) contractor. Efforts during FY 1974 included follow-on technical tests, field tests, and extensive use of simulation to resolve the operational questions. Additional firings using the earlier experimental hardware were accomplished at Redstone Arsenal, AL. The two contractors were awarded contracts to conduct HELLFIRE modularity/verification flight tests. Because of FY 1976 funding constraints, the flight tests were not conducted. The contractors performed hardware-in-loop simulation and alternate missile design concept effort in FY 1976. In-house effort in FY 1976 and FY 1976T supported the Cost and Operational Effectiveness Analysis (COEA), Army Systems Acquisition Review Council/Defense System Acquisition Review Council

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(ASARC/DSARC), and preparation for award of the Engineering Development (ED) contract. In FY 1977 the ED contract was awarded, the contract performance baseline established, the design effort initiated, major subcontracts awarded, and test plans developed. In FY 1978 the first ballistic and programed rounds were fired. Component and subsystem performance tests were completed, and the new equipment training was initiated. The system was flight certified for the AH-1 testbed aircraft. Procurement, fabrication, and testing of hardware were continued in FY 1979. The Engineering Design guided flight test program was initiated. Three programed rounds were successfully tested, and eleven of thirteen guided flights were successful. Integration of HELLFIRE with the YAH-64 helicopter was successfully demonstrated in FY 1979. The Martin Marietta low-cost seeker was integrated with the HELLFIRE missile and successfully flight tested. The AAH/HELLFIRE battlefield obscuration testing which was initiated in FY 1978 was continued in FY 1979 and FY 1980. Government and contractor testing was intensified in FY 1980. Engineering Design Flight Tests (EDT) and component and system Prototype Qualification Tests conducted by the contractor (PQT-C) were continued. Environmental storage tests began. Thirty-one tactical prototype missiles, including five with live warheads, were flight tested in the HELLFIRE EDT and PQT flight test programs. Seventeen development and tactical prototype missiles were fired from the YAH-64 helicopter including day and night launches with laser designation from its Target Acquisition Designation Sight. Operational Tests (OT) were conducted by the Operational Test and Evaluation Agency (OTEA) and supported by the system prime contractor. The AH-1 (COBRA) was used as the testbed aircraft and 33 tactical prototype missiles were flight tested in operational tests.

2. (U) FY 1981 Program: HELLFIRE engineering development testing and contractor system qualification tests will be completed during FY 1981 and efforts to correct technical problems will continue. Testing of warheads against advanced armor will be completed by the Ballistics Research Laboratory. The Technical Data Package (TDP) will be finalized to incorporate changes resulting from operational tests. Technical improvement efforts will include initiation of the minimum smoke motor development and changes in the laser seeker section which are expected to enhance producibility. The Production Engineering Planning (PEP) effort will be completed, and environmental storage tests will continue. The YAH-64 Helicopter OT II tests will be supported with hardware and technical support. Contracts for Initial Production Facilities (IPF) and procurement of long-lead items will be awarded to the system prime and seeker contractors. Preparations will be made for the Milestone III production decision reviews and for award of production contracts.

3. (U) FY 1982 Planned Program: Development and testing of the minimum smoke motor will continue in FY 1982. Test program sets for launcher test support will be completed. Environmental storage missiles will be laboratory tested. Deficiencies revealed in the YAH-64 operational tests will be corrected. Development of the warhead marker charge will be completed in FY 1982. The Defense Systems Acquisition Review Council (DSARC) III decision review will be held in the first quarter of FY 1982 with subsequent award of the first production contract.

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4. (U) FY 1983 Planned Program: Testing of the minimum smoke motor will be completed in FY 1983 and missiles with the improved motor will be included in the third production buy; six missiles that have been subjected to environmental storage will be flight tested early in FY 1983. The first production hardware will be delivered, Production Validation Tests (PVT) will be conducted, and the Configuration Item Verification Review (CIVR) will be completed in FY 1983. HELLFIRE is scheduled to be operational on the AH-64 Helicopter in January 1985.

5. (U) Program to Completion: This program is scheduled for completion in FY 1983.

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J. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation:

a. (U) Summary of test phases and objectives.

(1) Evaluation of the HELLFIRE system concept started in 1969, and the Terminal Homing Accuracy Demonstration (THAD) Program was started in 1970. A modified HORNET missile (7") with a modified Falcon motor was used as the testbed missile to demonstrate feasibility. Technical feasibility of laser homing missiles was demonstrated during the THAD Program (May 1971 through January 1972). This exploratory prototype program demonstrated a circular error probability (CEP) of based on 14 missile firings. Missile flight tests, using the testbed 7" missile, of the wide field-of-view laser seeker and the Army laser seeker were conducted at US Army Missile Command (MICOM) from November 1971 through January 1974. Combined results from these tests and the THAD tests (paragraph 1.a.(1) above) were used to support Development Tests (DT-1). Further technical tests were conducted at MICOM test range from 24 April 1974 through 26 June 1975 to demonstrate the feasibility of the ripple, rapid, night, airborne indirect, and ground indirect modes of operation for the HELLFIRE. Countermeasure susceptibility testing was conducted at White Sands Missile Range, New Mexico, during the second and third quarter FY74 and the second and third quarter FY75 to qualitatively and quantitatively assess the capability of the Army laser seeker (plus counter-countermeasures options) to successfully complete their missions in a hostile environment. Feasibility testing of 6-inch-diameter tandem liner warheads for the HELLFIRE missile was conducted by Firestone Tire and Rubber Company during FY75. Two tandem liner configurations, were tested. The Department of the Army requested that the HELLFIRE project manager investigate improving the performance of the warhead by scaling up the 6"-diameter design to 7" and 8" diameters. The seven-inch configuration was selected to be continued into Engineering Development (ED).

(2) (U) Testing in ED consists of a series of Engineering Design Tests (EDT-C) and Prototype Qualification Tests (PQT-C) conducted by the contractor and EDT-G and PQT-G conducted by the government to provide data necessary for determining the HELLFIRE Modular Missile System's (HMMS) readiness to transition into production. Testing was initiated by selecting and testing components and subsystems using an orderly progression through performance demonstrations with prototype models of the entire HMMS system. Additionally, testing will include participation of representative user personnel and "environmental proofing" through simulated and actual environmental testing. Reliability, availability, and maintainability (RAM) will be evaluated throughout development. Tests will allow the materiel developer to progressively evaluate and refine component, subsystem, and system design to assure that system performance requirements are being

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achieved. Development tests are planned to be conducted so that important system characteristics will be tested and deficiencies corrected prior to the Army Systems Acquisition Review Council (ASARC III). Six modified AH-1G helicopters, four basic and two equipped with the Airborne Target Acquisition and Fire Control System (ATAFCS), are being utilized as "testbed" aircraft to qualify the HELLFIRE Modular Missile System (HMMS). HELLFIRE missiles are also being launched from the YAH-64 as part of the Advanced Attack Helicopter (AAH) developmental testing. Contractor Component/Subsystem Tests were initiated in January 1978 with contractor laboratory testing of selected piece parts and will include subsequent testing of components, subassemblies, and assemblies of each HELLFIRE end item. Results from these tests will substantiate performance of components when integrated with other components and subsystems of their end items and validate their selection as part of the HMMS. Samples of critical components will be independently tested and evaluated by the Government. Unguided missile (ballistic) flights were conducted early in the development program to provide data for missile airframe/propulsion and launcher design as it relates to missile launch parameters and helicopter safety. Preprogramed missile flight tests were conducted to provide missile integration. Guided flight tests are being conducted to demonstrate performance of end items as the configuration progresses toward final design. Contractor Component Qualification Tests were initiated in December 1978 to determine if critical components meet their performance requirements while operating under or after being subjected to the environmental extremes necessary for system functions. System Qualification Tests will be conducted to determine if system end items meet their performance requirements while operating under or following exposure, as appropriate, to natural combinations of environments specified for the system. Environmental/Storage Tests will be conducted to demonstrate HMMS performance in the varied adverse environments.

(3) (U) In accordance with Department of the Army direction, the Army Missile Command (MICOM) Laboratory is conducting a program to evaluate and characterize Advanced Attack Helicopter (AAH)/HELLFIRE performance in battlefield obscuration environments. The effort to gather field test data for simulation model development to predict the performance of the target acquisition and designator system for the AAH, the HELLFIRE seeker, and the Ground Laser Locator Designator, was completed during FY80. This data, time correlated to carefully measured obscuration environments, will be the primary input to the Battlefield Environment Laser Designator Weapon System Simulation (BELDWSS). During the last quarter of FY80, trial runs with BELDWSS to predict system performance were initiated. During the second quarter of FY81, the simulation predictions will be validated by system tests including HELLFIRE flight tests in obscuration. In the latter part of FY81 the validated BELDWSS simulation will be used to characterize system performance across the entire spectrum of obscuration conditions, to provide data for the AAH/HELLFIRE ASARC/OSARC evaluations. There are no Defense Systems Acquisition Review Council-directed tests or demonstrations.

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b. (U) Seventy-three guided missiles, 58 with telemetry, have been launched in the current developmental testing programs for both HELLFIRE and the AAH. Included in these launches were six live warhead missiles, all of which hit their targets. One of these was the first airborne launch of a live warhead HELLFIRE missile from a YAH-64. Test results, parameters, and malfunctions of developmental guided launches are tabulated below:

(U) Results:

(U) Program

(U) Prototype Missiles
(Success/Fired)

HELLFIRE	42/49
YAH-64	13/24
<u>Total</u>	60/73

(U) Parameters:

Direct Fire

Indirect Fire

Lock-on before launch (LOBL)

Maximum range of

Lock-on after launch (LOAL)

Designation of GLLD

Maximum range of

Low and high trajectories

15-degree offset

Moving target

Day-Night

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Designation by GLLD and TADS

Rapid and ripple fire

(U) Malfunctions:

- (1) (U) Gyro circuit board short circuit: resolved.
- (2) (U) Actuator potentiometer short circuit: resolved.
- (3) (U) Launcher release mechanism for missile separation malfunctioned resulting in a hang-fire: resolved.
- (4) (U) Defective integrated circuit: random failure. A high reliability component was not available for use in this test because of long-lead item requirements.
- (5) (U) FLIR sighting system on COBRA malfunctioned: data indicated nominal missile performance.
- (6) (U) Short impact: incorrect offset angle: resolved.
- (7) (U) Short impact: smoke decoyed Seeker. A seeker modification which employs last pulse logic has resolved the problem. Successful tests with the modified seeker have validated the correction.
- (8) (U) Immediate excessive pitch-up rate: a lock-on-after-launch firing in which thrust misalignment was compounded by premature turn-on of the designator. A repeat of this launch was successful but investigation is continuing.
- (9) (U) TADS FLIR broke track: TADS design deficiency. Correction has been implemented.
- (10) (U) Roll gyro tumbled: low stability margin. Autopilot has been modified.
- (11) (U) Short impact: a combination of launch elevation and pitch reference errors. Corrections have been implemented on the YAH-64 to preclude similar errors.

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(12) (U) Short impact: seeker design deficiency that allows "direction of track reversal" when target acquisition occurs at unusually high energy levels at the edge of the field of view. Seeker design was changed. Retest with modified seeker was successful.

(13) (U) Missile broke track before target impact: thrust alignment malfunction. Missile turn rate was faster than the seeker track rate. Investigation continuing.

c. (U) Description of equipment being tested. The HELLFIRE missile system is a high-explosive antitank (HEAT) missile with a laser seeker, fire control system, launcher, and container. The HELLFIRE launcher carries four missiles and is compatible with the armament stations of both the YAH-64 and AH-1 (COBRA). A gas storage system (on the launcher) is provided for cooling infrared detectors in follow-on seekers. It is anticipated that there will be no significant differences between the prototype and the production configurations.

d. (U) All subsystems and support equipment will be available during required test periods.

e. (U) Developing/Testing Organizations.

(1) (U) Development Contractor: Rockwell International Corporation
Missile Systems Division
4300 East Fifth Avenue
Columbus, OH 43216

(2) (U) Service Program Manager: Project Manager, HELLFIRE/GLD
US Army Missile Command
Redstone Arsenal, AL 35809

(3) (U) Development Test Agency: US Army Test and Evaluation Command
Aberdeen Proving Ground, MD 21005

(4) (U) Independent Operational Test Agency: US Army Operational Test and Evaluation Agency (OTEA)
5600 Columbia Pike
Falls Church, VA 22041

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- f. (U) Major Test Facilities.
- (1) (U) US Army Missile Command, Redstone Arsenal, AL - Contractor and government personnel are conducting the missile flight, captive flight, component qualification, system qualification, and electromagnetic radiation tests.
 - (2) (U) Eglin AFB, Florida - Contractor and government personnel are conducting missile flight tests.
 - (3) (U) Yuma Proving Ground, Arizona - Contractor and government personnel are conducting YAH-64/HELLFIRE integration tests to include missile flight tests.
 - (4) (U) Hunter Liggett Military Reservation, California - Government personnel conducted and participated in the operational testing.
- g. (U) Overall test program schedule.
- (1) (U) Missile flight tests, Oct 78 - Jun 81.
 - (2) (U) Component Qualification Tests, Dec 78 - Jan 81.
 - (3) (U) System Qualification Tests, Jan 80 - Jan 81.
 - (4) (U) Environmental Storage Tests (PQT-G), Aug 80 - Jul 82.
- h. (U) Tabulation of developmental firings in HELLFIRE and Advanced Attack Helicopter programs.

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	Type Missile	No. Flights		
		Planned/Completed/Successful		
(1) Exploratory Development	Modified Hornet	56	56	41
(2) Terminal Homing Accuracy Demonstration (THAD)	Modified Hornet	15	15	15
(3) HELLFIRE Engineering Development				
Ballistic Rounds	-	3	3	3
Programed Rounds	-	4	4	4
Guided Missiles	ED	74	49	42
Advanced Attack Helicopter Engineering Development				
Ballistic Rounds	-	6	6	6
Guided Missile	ED	50	24	18

i. (U) The HELLFIRE Modular Missile System has not been previously tested by another DOD component.

j. (U) HELLFIRE Modular Missile System reliability, availability, and maintainability - durability (RAM-D) performance requirements are to be verified by test, demonstration, and analysis prior to full-scale production using valid data from the guided flight test and system qualification test programs. The test program for mission-critical components includes demonstration of high reliability under critical environments. RAM-D trade-offs will be performed within allowable limits for achievement of maximum system effectiveness at minimum cost.

k. (U) The items being tested during development are not significantly different from the hardware for operational tests and production.

l. (U) Tests will be conducted to determine if system and items meet their performance requirements while operating under or following exposure to natural and induced environments as specified for the system. This portion of the HELLFIRE test program began in the 2nd quarter of FY80.

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2. (U) Operational Test and Evaluation:

a. (U) Summary of Test Phases and Objectives

(1) (U) Laser-Guided Missile System (LAGUMS) Military Potential Tests were conducted in 1972 and 1973. These tests evaluated the ability of the helicopter gunner during target engagement and examined the tactical employment of LAGUMS-equipped helicopters. The tests also provided information on exposure and detectability of the launch aircraft and target designators. The results of these tests were used in lieu of Operational Test (OT I). Additional operational tests were conducted by the US Army Combat Developments Experimentation Command (CDEC) during August-December 1974. These tests measured the vulnerability of the ground target designator. They also compared the mission effectiveness and operational performance of HELLFIRE versus extended range TOW.

(2) (U) The Operational Test (OT) was conducted May-July 1980 with Tactical Prototype hardware to validate the operational capability of HELLFIRE using the COBRA helicopter as the testbed vehicle. Data was obtained in an operational environment to assess the operational effectiveness to include command and control, hit performance, human factors, and safety. Information was obtained on the reliability, availability, and maintainability (RAM) of the system during this test. This test was conducted at Hunter Liggett Military Reservation, CA, and was managed by the US Army Operational Test and Evaluation Agency (OTEA).

b. (U) Summary of Test Results.

(1) (U) Testing to satisfy the OT I requirements is described in subparagraph E.2.a.(1) above. The recently completed operational test described in subparagraph E.2.a.(2) was not designated as an OT II because it evaluated only the operational capability of the HELLFIRE missile and not the total weapon system as it will be fielded. That weapon system will be evaluated during the AAH OT II in June-August 1981.

(2) (U) Thirty-three HELLFIRE missiles were fired in the operational test completed 11 July 1980. A combination of direct, indirect, rapid and ripple firing modes were used in a battlefield environment which included dust and smoke. The Independent Evaluation Report has not been published to date; however, preliminary results of a scoring conference evaluation show 23 target hits out of 33 missiles fired. Results of the HELLFIRE operational test live firings:

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(U) System reliability
33 Missiles launched
3 Scored no-test
3 Scored missile failure
27 Scored reliable out of 30
Reliability = 90%

Accuracy given a reliable missile
27 Reliable attempts
3 Scored no-test
1 Target miss
Hits out of 24 reliable attempts
Probability of hit =

(3) (U) Missiles were scored as "no test" due to limitations of the surrogate launch system, the AH-1 (COBRA), and crew error.

c. (U) Description of equipment being tested.

(1) (U) The HELLFIRE missile system is a high-explosive antitank (HEAT) missile with a laser seeker, fire control system, launchers, and container. The HELLFIRE launcher carries four missiles. A gas storage system is provided for cooling IR detectors for follow-on seekers.

(2) (U) The HELLFIRE missile and launcher being tested in the engineering development program have no significant differences from the planned production hardware configuration.

d. (U) All HELLFIRE subsystems and support equipment were available during the required test period.

e. (U) Developing/Testing Organizations. Same agencies listed in paragraph E.1.e.

f. (U) Major test facilities - Operational Testing (OT) was conducted at Hunter Liggett Military Reservation. Tests were conducted by government personnel with participation by contractor personnel.

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g. (U) Overall test program schedule - Operational Testing (OT) was conducted May-July 1980. The preliminary results are discussed in subparagraph E.2.b. above.

h. (U) Additional service firings will be conducted during OT II in the Advanced Attack Helicopter (AAH) program as part of the total weapon system evaluation. Twelve guided flights are planned.

i. (U) Operational tests (OT) to date have been those conducted to support OT I. The Laser-Guided Missile System (LAGUMS) Military Potential Tests (MPT) evaluated the ability of the soldier or helicopter gunner to place and hold a laser beam on a target during target engagement and missile flight. The MPT were also used to examine the tactics, organization, and command and control for employment of LAGUMS-equipped helicopters. In subsequent tests, the operational performance of HELLFIRE was evaluated against extended range TOW (XRTOW) in a series of realistic, simulated battles.

j. (U) Operational tests have been conducted with the current HELLFIRE prototype missile which is to be the same as the production missile.

k. (U) A missile reliability point estimate of .88 has been demonstrated on Engineering Development firing attempts to date. The Materiel Need (MN) requirement band is .92-.95. The project estimate, based on missile improvements and OT results, meets this requirement. Reliability verification includes a test-to-failure program to determine the reliability design margin of critical missile system components and assemblies; the laser seeker program includes a reliability mean-time-between-failure demonstration test. All valid flight test data from the development program is scored for reliability. The development program also includes a formal maintainability demonstration utilizing trained military personnel.

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3. System Characteristics:

Operational/Technical
Characteristics

Objectives

Demonstrated Performance

Range

Direct Fire

Indirect Fire

Kilometers

Kilometers

Kilometers

Kilometers

Time of Flight

3 Kilometers

Probability of Hit

(Given Reliability)

Stationary Targets

Moving Targets

Seconds

Seconds

Missile Weight, Max

99.5 pounds

98.5 pounds

FY 1982 RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.11.A

Title: PERSHING II

DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in Thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	145765	147378	154107	106895	22771	669835* 34
D599	PERSHING II	145765	147378	154107	106895	22711	669835*

* Does not include \$18.0M received from AF PE 6.33.17.F (Theater Ballistic Missile Program) in FY 1979

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: PERSHING II is an evolutionary modernization of the currently deployed PERSHING Ia system. PERSHING II will provide vastly improved performance over PERSHING Ia: increased range (kilometers versus kilometers); higher accuracy (meters versus meters); use of lower yield warheads, thereby reducing unwanted collateral damage/civilian casualties; increased versatility through the use of the subburst/surface-burst warhead; superior military effectiveness and survivability; and manpower savings. The PERSHING II development includes an improved maneuverable reentry vehicle which includes radar terminal guidance; new propulsion sections to achieve the longer range and ground support equipment changes that provide enhanced system reliability, accuracy and targeting flexibility; plus reduced operating and support costs. Five missile flight tests were conducted during the Advanced Development phase in FY 1978. Based on the success demonstrated during these tests, the system was approved to enter Engineering Development in FY 1979. Deployment to Europe is planned to begin in December 1983. PERSHING II is planned to be the ballistic component of the NATO Long-Range Theater Nuclear Force (LRTNF) modernization based on extensive negotiations with the NATO Alliance. The rapid fielding of extended range PERSHING II is a program of national urgency needed to fill the land-based ballistic missile

Program Element: #6.43.11.A

DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Title: PERSHING II

Budget Activity: #4 - Tactical Programs

void in the NATO LRTNF. This is particularly critical in view of the unilateral expansion of the Soviet threat to NATO epitomized by the SS-20 missile and the Backfire bomber. In addition, there appears to be a continuing trend on the part of the Soviet Union and non-Soviet Warsaw Pact (NSWP) countries to harden their military installations, necessitating increased accuracy in weapons to effectively defeat them. The Soviet/NSWP buildup is independent of NATO actions because their buildup has preceded NATO LRTNF modernization by several years. In recognition of the critical need for PERSHING II, the President has designated the system a program of highest national priority.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: During FY 1982, the fabrication of the prototype Ground Support Equipment (GSE) will be completed, and fabrication of the prototype missile will continue. The first six (6) of the planned 28 DT/OT II missile firings will be conducted in FY 1982. During this period, qualification testing and preflight rating testing on the motors will be completed, and system environmental testing will be initiated. The Phase I Captive Test Program (i.e., captive testing of prototype hardware on a fixed-wing aircraft) will be completed during FY 1982. Long-lead procurement for the production phase will be conducted early in FY 1982, and following DSARC III, the full-production decision will be made.

Major Milestones	Current	Milestone Dates	
	Milestone Dates	Shown in FY 1981	Submission
Start Development Test I	Nov 77		Nov 77
Complete Development Test I	May 78		May 78
Defense Systems Acquisition Review Council II	Dec 78		Dec 78
Award Engineering Development Contracts	Feb 79		Feb 79
Start Development/Operational Test II	Apr 82		Apr 82
Long-Lead Procurement	Dec 81		Dec 81
Defense Systems Acquisition Review	Jun 82		Jun 82
Start Full-Scale Production	Jun 82		Jun 82
Production (Buy 2)	Oct 82		Oct 82
Complete Development/Operational Test II	Aug 83		Aug 83
Initial Operational Capability	Dec 83		Aug 83
Production (Buy 3)	Oct 83		Oct 83
Production Deliveries Complete	Aug 86		Jul 86

Program Element: #6.43.11.A

DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Title: PERSHING II

Budget Activity: #4 - Tactical Programs

(U) In FY 1979 the decision was made to accelerate the IOC from December 1984 to August 1983. This acceleration was initially planned to be accomplished by compressing the Engineering Development program by four (4) months and pulling in the production decision by 12 months. To accomplish this ED compression, FY 1979 supplemental funding was required. Failure to receive these supplemental funds made it necessary to accomplish the 16-month acceleration by accelerating the production decision by 16 months. The entire acceleration is, therefore, accomplished by overlapping the development and production program. The initial production rate is being kept at a minimum (5 missiles per month) until DT/OT II completion to reduce cost exposure. Following DT/OT II, the production rate will increase to a maximum of 13 missiles per month.

(U) As a result of continuing negotiations with our NATO allies, the US Government has agreed to make the European Initial Operational Capabilities (IOC) of PERSHING II and Ground-Launched Cruise Missile concurrent. Accordingly, on 26 November 1980 the Army was directed by the Office of the Secretary of Defense to delay the European IOC of PERSHING II from August 1983 to December 1983. The directive emphasized that the change to the IOC was for policy reasons and that the basic program would not change nor would funding profiles be changed.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (Current Requirements)	145765	147378	154107	129666	669835*
Funds (as shown in FY 1981 submission)	144800	145985	150032	130127	663844*

* Does not include \$18.0 million received from AF PE 6.33.17.F (Theater Ballistic Missile Program) in FY 1979. The change from the FY 1981 submission reflects the adjustment to incorporate a more realistic rate of inflation, increased test range costs (FY 1980), and the termination of the earth penetrator warhead program in FY 1982 and beyond. The above total development cost is approximately \$8 million below the originally planned costs when they are escalated according to current DOD inflation indices. Consequently, the total development cost may be understated by that amount.

Program Element: #6.43.11.A
DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Title: PERSHING II
Budget Activity: #4 - Tactical Programs

E. OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
Missile Procurement, Army:						
Funds (current requirements)	0	0	207700	349800		
Funds (as shown in FY 1981 submission)	0	0	179200	326800		
Quantities (current requirements)						
Quantities (as shown in FY 1981 submission)						

Change from FY 1981 submission reflects a more realistic inflation projection, addition of funds for the procurement of shelters for housing the Platoon Control Central and the Reference Scene Generation Facility, and a transfer of funds from OMA to MIPA for conducting the PII SWAP program (cost associated with swapping the PII system for the Pla system). This submission also reflects an addition of FY 1982 funds for Department of Energy reimbursables. Not shown in this submission is an additional \$1.9 million in FY 1981 funds which will be reprogramed for Department of Energy reimbursables.

Program Element: #6.43.11.A

DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Title: PERSHING II

Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: In order to meet the Supreme Allied Commander, Europe's (SACEUR's) expressed need for an improved, mobile, surface-to-surface missile system, a Special Task Force was formed in January 1973 to validate the need for an improved PERSHING system and to develop a Concept Formulation Package for the system. In October 1973 the Decision Coordinating Paper (DCP) for PERSHING II was presented to and approved by the Army Systems Acquisition Review Council (ASARC) and forwarded to the Defense Systems Acquisition Review Council (DSARC) on 22 January 1974. As a result of a favorable DSARC recommendation, the Deputy Secretary of Defense directed the Army to proceed with the Advanced Development (AD) of PERSHING II. Five missile flight tests were conducted during the AD phase in FY 1978. These flights demonstrated the capability of the new terminal guidance technique to achieve the required system accuracy. All objectives of the AD program were met. The Army, on 18 July 1978, conducted an ASARC II and concluded that PERSHING II was ready for Engineering Development (ED). In the FY 1980 Amended Program Decision Memorandum (APDM), the Secretary of Defense directed the Army to proceed to DSARC II as soon as possible with the extended range option of PERSHING II. A DSARC II was conducted 21 December 1978. As a result, the program was authorized to proceed into ED with extended range PERSHING II and two warheads--airburst/surface burst and an earth penetrator. This directed extended range decision represents a substantial increase in the range over the currently fielded PERSHING Ia (PIa) version. A contract was awarded to the PERSHING prime contractor in February 1979 for engineering development of the PERSHING II program. The FY 1982 APDM canceled funding for the earth penetrator warhead program in FY 1982 and beyond based on budget constraints and priorities. The Army is supporting Department of Energy efforts in FY 1981 to conclude the program in a logical manner. PERSHING II, a product improvement of the currently fielded PERSHING system, uses a new propulsion system to accommodate the greater range and modified ground support equipment that eliminates and/or consolidates hardware to reduce firing platoon response times by a factor of more than 50%, achieve greater flexibility, and reduce operating personnel. PERSHING II incorporates a new reentry vehicle that uses Radar Area Correlation Terminal Guidance to provide accuracy in the range of meters Circular Error Probable (CEP). This high accuracy represents an order of magnitude improvement over the currently fielded PIa system and provides the capability to effectively use low yield or specialized warheads. During ED phase, the tactical configuration of the reentry vehicle, propulsion stages, and ground support equipment will be developed, fabricated and tested. This phase will culminate with the firing of 28 missiles during Development/Operational Test II. During FY 1978, significant factors were illuminated by the North Atlantic Treaty Organization (NATO) High Level Group discussions on Theater Nuclear Forces Modernization.

Thus, they prefer an evolutionary approach, such as PERSHING. PERSHING is currently fielded by both US and West German forces, is politically acceptable to the NATO Alliance, and is not involved in current SALT negotiations. Thus, extended range PERSHING II offers an opportunity to introduce improved Theater Nuclear Force capability with minimum adverse political involvement. Based on the NATO High

Program Element: #6.43.11.A

DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Title: PERSHING II

Budget Activity: #4 - Tactical Programs

Level Group recommendation, SACEUR's stated need, existing policy and weapons available, PII has been identified as a system to insure consistency with the DOD Nuclear Policy and provide improved military effectiveness for the Long-Range Theatre Nuclear Force (LRTNF). The rapid fielding of extended range PERSHING II is of national urgency to fill the land based ballistic missile void in the NATO LRTNF. This is particularly critical in view of the expansion of the Soviet threat to NATO epitomized by the SS20 missile and the Backfire bomber. In addition, there appears to be a continuing trend on the part of the Soviet Union and non-Soviet Warsaw Pact (NSWP) countries to harden their military installations necessitating increased accuracy in weapons to effectively defeat them. The Soviet/NSWP buildup is independent of NATO actions because their buildup has preceded NATO LRTNF modernization by several years. PERSHING II will have a range capability from _____ km thus providing an immediately responsive firing capability covering the region from the forward edge of the battle area into the Western Military Districts of the Soviet Union. PERSHING II is a mobile, survivable ballistic missile with terminal guidance that provides rapid response, assured penetration to the target area, high accuracy, minimum collateral damage, and thus the ability to attack mobile and fixed time-sensitive targets. PERSHING II has a rapid retargeting capability that makes it responsive to both the SACEUR and the Theater Army Commander. Initial Operational Capability (IOC) in Europe is planned for December 1983. Mobility and survivability are improved because of decreased ground support equipment which improves employment flexibility.

G. (U) RELATED ACTIVITIES: Close coordination is maintained with the Air Force on advanced ballistic reentry developments. Prior year efforts in surface-to-surface missile PERSHING (Program Elements (PE) 2.21.62.A and 2.22.54.A) and Radar Area Correlation (PE 6.33.06.A) under the US Army Materiel Development and Readiness Command have been conducted by the same Project Manager (PM) selected to develop this project. These efforts have been closely coordinated with the US Army Missile Command funded under PE 6.23.03.A, Missile Technology. This program is coordinated with all Services by the Office of the Secretary of Defense (OSD). The technology employed in PERSHING II terminal guidance is unique to PERSHING. PERSHING II is responsive to targeting requirements from the forward edge of the battle area to its maximum range. This, plus its tactical mobility which provides sustained operations without constraining dependence on a main operating base, makes the system unique.

H. (U) WORK PERFORMED BY: US Army Missile Command, Redstone Arsenal, AL; White Sands Missile Range, NM; Martin Marietta, Orlando, FL; Goodyear Aerospace Corporation, Akron, OH; Singer Company (Kearfott Division), Little Falls, NJ; Bendix Corporation (Navigation and Control Division), Teterboro, NJ; Hercules, Inc., Salt Lake City, UT.

Program Element: #6.43.11.A
DOB Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Title: PERSHING II
Budget Activity: #4 - Tactical Programs

1. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1980 and Prior Accomplishments: The PERSHING II program started in FY 1975. The primary effort during that year was directed toward design of the reentry vehicle (RV) for the missile flight program in FY 1978. The RV underwent design changes during FY 1975 as a result of the Radar Area Correlation fixed-wing flight demonstration program. The US Army Armament Research and Development Command, Dover, NJ, was tasked with the responsibility for developing the adaption kit for the airburst/surface-burst warhead section. The Department of Energy (DOE) was tasked with developing the earth penetrator warhead. The earth penetrator integrated design, less nuclear physics package, was completed and successfully tested at high velocities into hard targets. The major prototype missile components were delivered; RV fabrication and ground/captive testing was completed for the Advanced Development (AD) missile flight hardware. The five-missile flight demonstration program was conducted in FY 1978. The capability of the Radar area Correlation Guidance Systems to attain the desired accuracy in a missile flight environment was proven during AD culminating with flight five, which recorded a miss distance. The payload was an earth penetrator (EP) vehicle, and the capability of the EP to withstand missile flight environments, impact, and penetration was also demonstrated. All PERSHING II Advanced Development objectives were met. Defense Systems Acquisition Review Council (DSCARC) II was held in December 1978 and gave approval for entering into engineering development. The Engineering Development (ED) contract was awarded to the PERSHING prime contractor in February 1979. Design of ED prototype critical hardware was initiated in FY 1979. The initial phase of ED wind tunnel testing was conducted during FY 1979, and preparation for fixed-wing captive tests was initiated. During FY 1980, fixed-wing captive flight tests were conducted to evaluate the correlator hardware. Prototype air vehicle and Ground Support Equipment (GSE) material procurement was initiated, and reentry vehicle prototype fabrication was started. The wind tunnel program initiated in FY 1979 continued, and the development test on the propulsion sections was initiated. Procurement of tooling material occurred, and fabrication of production tooling was initiated. Major design effort was initiated on the Reference Scene Generation Facility (RSGF) and the airburst/surface burst warhead adaption kit with award of contracts by Engineering Topographic Laboratory and Army Armament Research and Development Command, respectively. In February 1980, the President granted PERSHING II a BRICKBAT (DX) status, making it a program of highest national priority.

2. (U) FY 1981 Planned Program: In FY 1981, prototype procurement activities will be completed and fabrication of the prototype ground support equipment will be initiated. Fabrication of the Reentry Vehicle and propulsion section will continue, and prototype testing will be initiated. The development testing of the propulsion section will be completed, and Preflight Rating Test will be initiated. The wind tunnel test program will be completed during this fiscal year, and fixed-wing captive tests to evaluate hardware and reference imagery will be initiated. Numerous system, subsystem, and environmental tests will be conducted during this period. During FY 1981, reference scene preparation will be completed for the ED missile flight targets. The earth penetrator warhead program will be terminated.

Program Element: #6.43.11.A

DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Title: PERSHING II

Budget Activity: #4 - Tactical Programs

3. (U) FY 1982 Planned Program: During FY 1982, fabrication of the prototype ground support equipment will be completed, and fabrication of the missile will continue. Static testing of the propulsion section will be completed, and the flight units will be delivered. The first six of the planned 28 Development Testing/Operational Testing (DT/OT) II missile flights will be conducted during this period. Long-lead procurement for the production phase will be conducted early in FY 1982 and following DSARC III, the full production decision will be made.

4. (U) FY 1983 Planned Program: The ED phase will culminate in FY 1983 with the completion of the 28 DT/OT II missile flights. The DT/OT II hardware will be made on production hard tooling, and this tooling will be used in production as the line will remain open and in continuous operation between the ED prototype units and the production units. The second production buy will occur in FY 1983, and the Initial Operational Capability (IOC) in Europe will occur in December 1983, providing US troop units in Europe and the Continental United States with a modernized system designed to meet the threat of the 1990's.

5. (U) Program to Completion: A third and fourth production buy will occur in FY 1984 and FY 1985 to provide PERSHING II hardware for deployment of all PERSHING II battalions and support the general missile firing programs. Production deliveries will be completed in 1986.

Program Element: #6.43.11.A
DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Title: PERSHING II
Budget Activity: #4 - Tactical Programs

J. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation:

a. (U) During the engineering development phase of the PERSHING II Development Program, extensive testing is being conducted. Wind tunnel testing is being conducted to verify the aerodynamic characteristics of the missile design. The first phase ended in July 1979. The second phase was started in October 1979 and will end early in FY81. No design difficulties have been identified as a result of this testing. In order to simulate the missile reentry environment (with the exception of velocity), the PERSHING II reentry vehicle pod was attached to the wing of a FJ4B aircraft and flown at targets. These captive flight tests were conducted to verify that the terminal guidance system can achieve the required accuracy and verify that the reference scenes are adequate for correlation. The captive flight tests were conducted at White Sands Missile Range, NM, the Watertown, NY, area, and the Huntsville, AL, area. Tests will be conducted in two phases. The early phase was completed in mid-FY 1980. The second phase will start in late 1981 on the prototype reentry vehicle and continue through late FY 1983. The prime objective of the second phase will be to evaluate the prototype hardware and verify the reference scenes that will be used in the missile flight program. Six static firings of the prototype first and second stage motors have been completed and have been judged successful. To date all testing has been successful and has provided initial verification of required performance. System environmental testing will be initiated in early FY 1982 and will continue through mid-FY 1983. These tests will include road shock and vibration, high-low temperature, temperature shock, snow, ice, humidity, wind, rain, dust, drop, salt, rail hump, EMP, etc. The purpose of these tests is to verify that the system remains operational throughout various specified environments. System marriage testing will start in early FY 1982. It will demonstrate the ability of the system to work properly as a system rather than as individual components. This will be the first time that all hardware is tested as a system. Fourteen missiles will be flown in the DT II flight test program. Tests will start in mid-FY 1982, and missiles will be flown against targets at short, medium, and long ranges. These tests will demonstrate the capability of the system to achieve the required accuracy and range. The airburst/surface-burst warhead adaption kit will be tested in a flight environment. All of these tests are to be conducted by Martin Marietta and monitored by government agencies.

b. During Advanced Development (1974-1978), system test and fixed-wing captive tests were conducted in preparation for Advanced Development (AD) missile flights. The missile flights were conducted at White Sands Missile Range, NM, using an earth penetrator warhead as the payload. The planned sixth flight was canceled because of the success demonstrated through flight five. All flights were tested at a range of 60 nautical miles, since the combination of inertial and radar correlation guidance techniques is independent of range. The overall flight test program at White Sands Missile Range was successful, and all objectives were demonstrated.

Program Element: #6.43.11.A

DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Title: PERSHING II

Budget Activity: #4 - Tactical Programs

FLIGHT OBJECTIVE	AD MISSILE FLIGHT NO.				
	1	2	3	4	5
c Deliver RV to Acquisition Basket	*	*	1/	*	*
o Demonstrate RV Maneuver Capability	*	*		*	*
o Demonstrate Required PII System Accuracy		*		*	*
o Demonstrate EP Structural Integrity					
During Penetration	*	*		*	*
o Verify EP Functional Performance	*	*		*	*

1/ In-flight failure - no test

Specific Goals in Advanced Development:

	Objectives	Status
Inertial Measuring Unit (IMU)	CEP without terminal guidance	Analytically Demonstrated
Sensor Correlator Subsystem (SCS)	CEP	Demonstrated in Captive and Missile Flights
Reentry Vehicle (RV)	RV will withstand the flight environment	Demonstrated in Missile Flight Tests

c. (U) Due to the limited production numbers of the PERSHING Weapon System, the engineering development prototype hardware will be made with the same tooling to be used in the production program. Therefore, the prototype hardware used in the DT/OT II flight test program, and in testing prior to the flight test program, will be the production configuration. The hardware testing during this program includes the missile (reentry) vehicle, first and second stage propulsion section) and ground support equipment (erector launcher, Platoon Control central, reference scene generation facility, system component test station, etc.). All subsystems and support equipment will be available for scheduled tests during DT/OT II.

d. (U) The prime contractor for PERSHING II, Martin Marietta Aerospace, Orlando, FL, will be responsible for the development and testing of PERSHING II. The PERSHING program is managed by the PERSHING Project Manager, COL William Fiorentino, of the Army Missile Command, Redstone Arsenal, AL. The independent test evaluation agencies for PERSHING II will

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Program Element: #6.43.11.A

Title: PERSHING II

DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Budget Activity: #4 - Tactical Programs

be the Army Materiel Systems Analysis Agency (AMSAA) and the Army Operational Test and Evaluation Agency (OTEA). OTEA will perform both ground and flight tests as described in paragraph 2 below.

e. (U) All testing, with the exception of the OTEA ground test, flight test, wind tunnel test, and fixed wing captive test, will be at the contractor/developer facility. Facilities for these tests are:

<u>Test</u>	<u>Facility</u>
Fixed Wing Captive Test	White Sands Missile Range (WSMR), NM Huntsville, AL Watertown, NY Pope AFB, NC
Wind Tunnel Test	LTV, Dallas, TX AEDC, Tullahoma, TN Naval Systems Weapon Center
OTEA Ground Test	Fort Sill, OK
Missile Flight Test	Eastern Test Range, FL WSMR *

Troops to perform the OTEA ground test and the DT/OT II flight tests will be from the PERSHING Battalion at Ft. Sill, OK. Contractor personnel will participate in the DT portion of these tests.

* The long-range firings will be conducted from the vicinity of Boise, Idaho, and impact within WSMR.

f. (U) The major tests with planned spans are shown below:

Wind Tunnel	Jan 79 - Jul 79 (Phase I)	Oct 79 - Feb 81 (Phase II)
Captive Test	Oct 79 - Apr 80 (early)	Jul 81 - Sep 82 (Phase I)

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Program Element: #6.41.11.A

DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Title: PERSHING II

Budget Activity: #4 - Tactical Programs

System Marriage Test	Jan 82 - Jan 83
Structural Test	Oct 81 - Mar 82
Environmental Test	Jan 82 - May 83
DT II (14 missile flights)	Apr 82 - Feb 83
Operational Ground Test	Feb 83 - Apr 83
OT II (14 missile flights)	Apr 83 - Aug 83

g. (U) 28 missile firings (14 DT, 14 OT) are planned at the end of the ED program. In addition, six ground missiles are planned for ground test purposes. Eight erector launchers, four Platoon Control Centrals, five reference scene generation facilities, and four system component test stations are also planned for tests during the ED phase.

h. (U) The currently planned missile firings for the DT II flight program scheduled for April 1982 through February 1983 are as follows:

<u>Flight No.</u>	<u>Range *</u>
1 & 2	Long
3 - 6	Short
7 - 10	Medium
11 - 14	Long

* Achievement of accuracy will, of course, be an objective of all flights. Specific objectives will be assigned to each flight as the test program is more fully defined. There has been no prior testing by other DOD components.

i. (U) Reliability assessments will be conducted using the data obtained from all testing conducted during the ED program. This assessment will start with the early captive test results and continue throughout the 28 missile flights. Construction of the reliability growth curve for PERSHING II is currently in process with the goal of obtaining the required

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Program Element: #6.43.11.A
DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Title: PERSHING II
Budget Activity: #4 - Tactical Programs

reliability following the development missile firings. Maintainability is a parameter that is considered in any design decision on PERSHING II. A maintainability demonstration and evaluation is planned for early FY 1983. This demonstration/evaluation will be conducted by the contractor and monitored by TECOM/AMSAA. The demonstration/evaluation will use prototype hardware from production tooling. Units for development test, operational test, and production requirements will be produced on the same "hard" production tooling and will be made of the same configuration. Extensive environmental tests will be conducted on the missile and ground support equipment. Tests will include road shock and vibration, high-low temperature, temperature shock, snow, ice, humidity, wind, rail hump, drop, EMP, etc. These tests will be conducted by the contractor at the contractor's facility.

2. (U) Operational Test and Evaluation:

a. (U) The US Army Operational Test and Evaluation Agency (OTEA) is the independent operational tester and evaluator for PERSHING II and has access for monitoring purposes to all testing conducted during engineering development. In addition, OTEA will conduct an independent operational missile firing program of fourteen missiles. OTEA will have full independence and control over these ground and flight tests.

b. (U) During Advanced Development, OTEA concluded that a separate Operational Test (OT) I was not necessary. However, OTEA did participate in the DT I tests by observing with a broad view toward refining operational issues. OTEA has reviewed DT I test data and concurred that the system was ready to enter engineering development.

c. (U) Hardware planned for OTEA Operational Test II flight tests will be of production configuration using "hard" production tooling. All subsystems and support equipment will be available for scheduled tests. OTEA ground and flight tests will use facilities at Ft. Sill, OK, and White Sands Missile Range. Troops from the PERSHING Battalion at Ft. Sill will be used in conducting these tests. The fourteen missiles to be fired during the OT II flight program included four that will be used during the ground test phase. Three erector launchers and associated firing battery hardware will also be available for use.

d. (U) The currently planned missile firings for the OT II flight program scheduled for April 1983 are as follows:

<u>Flight No.</u>	<u>Range</u>
15 - 24	Long
25 - 28	Short

Program Element: #6.43.11.A

DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Title: PERSHING II

Budget Activity: #4 - Tactical Programs

e. (U) Reliability and Maintainability assessments will be made by OTEA based on the DT II monitoring and OT II ground and flight tests. However, the detailed tests, plans, and procedures have not been established.

f. As directed by the Secretary of Defense, the PERSHING II program is currently pursuing a schedule that results in an acceleration of the IOC by 16 months. This acceleration is accomplished by obtaining full-production approval after the first two DT missile firings. This decision date occurs prior to the planned OTEA ground or flight tests. OTEA participation prior to the production decision is limited to observing the development test phase of the engineering development program. OTEA testing will be conducted prior to system fielding. The first 19 missiles of the missile total buy will have been produced prior to the completion of testing.

g. (U) PERSHING II is an evolutionary improvement to the currently fielded Pla system. Therefore, PERSHING II is not unlike PERSHING Ia, and a great deal of operational information is available.

3. System Characteristics:

<u>Operational/Technical Characteristics</u>	<u>Objectives</u>	<u>Demonstrated Performance</u>
Maintainability (mean time to repair)		To be determined
Range Requirements	100 - km	To be determined
Accuracy	CEP	Less than

1/ Capability demonstrated in captive and missile flight tests during Advanced Development and captive tests during Engineering Development.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.13.A

DOD Mission Area: #213 - Ground Air Defense

Title: GRASS BLADE

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	30215	46713	29919	To be determined		
D112	GRASS BLADE	30215	46713	29919	To be determined		

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Program content is SECRET "Limited Distribution - Special Access Required," precluding further description in this summary. Access to GRASS BLADE information is controlled by the Deputy Chief of Staff for Research, Development, and Acquisition, Department of the Army.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Continue RDTE effort.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	30215	46713	29919	To be determined	
Funds (as shown in FY 1981 submission)	30215	35784	13324	Not Shown	137645

Details on funding increases are available upon request in accordance with paragraph B above.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

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Program Element: #6.43.13.A
 DOD Mission Area: #213 - Ground Air Defense

Title: GRASS BLADE
 Budget Activity: #4 - Tactical Programs

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>To Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
Missile Procurement, Army:						
Funds (current requirements)	0	29100	151000	To be determined		
Funds (as shown in FY 1981 submission)	0	11100	100200	292900	Not Shown	404200

Details on procurement increases are available upon request in accordance with paragraph B above.

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Program Element: #6.43.13.A
DOD Mission Area: #213 - Ground Air Defense

Title: GRASS BLADE
Budget Activity: #4 - Tactical Program

F. (U) DETAILED BACKGROUND AND DESCRIPTION: Program content is SECRET "Limited Distribution - Special Access Required," precluding further description in this summary. Access to GRASS BLADE information is controlled by the Deputy Chief of Staff for Research, Development, and Acquisition.

G. (U) RELATED ACTIVITIES: This project is related to work in other Army technology programs. Duplication of effort is avoided due to access to the project being strictly controlled and limited to specific service and Department of Defense individuals involved in managing related technologies.

H. (U) WORK PERFORMED BY: Both in-house and under contracts.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS: Details may be provided upon request in accordance with paragraph B and F above.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.14.A

Title: Multiple Launch Rocket System (MLRS) Formerly Known As
General Support Rocket System (GSRS)

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
D564	Multi Launch Rocket System	69209	68054	38291 ^{1/}	17330	0	318373 ^{2/}
Quantities:							
	ROCKET/SPL ^{3/}	257/10	0/0	0/0	0/0	0/0	504/10

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The MLRS is a free-flight, area fire, artillery rocket system being developed to offset the existing deficiency in conventional fire support. The primary mission is counterfire and suppression of enemy air defenses. It supplements cannon artillery fires by delivering large volumes of firepower in a short time against critical, time-sensitive targets. The basic warhead carries improved conventional submunitions. The Germans, one of four partners in an international development program, are developing a scatterable mine warhead. Growth potential exists to add a Terminal Guidance Warhead (TGW)--to defeat armor--and other warheads. Activities leading to a Joint United States/United Kingdom/Germany/France Concept for a TGW Program definition were initiated in FY 1980 under the terms of the MLRS Memorandum of Understanding, signed in July 1979.

C. (U) BASIS FOR FY 1981 RDTE REQUEST:

1. (U) Continuation of Maturation R&D which is being conducted concurrently with low-rate production. Completion of production qualification tests, live firing tests, force development test and evaluation and operational test (OT) III.

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Program Element: #6.43.14.A

Title: Multiple Launch Rocket System (MLRS) formerly known as
General Support Rocket System (GSRS)

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

2. (U) A comparison of current milestones with those shown in the FY 1981 summary is shown below.

<u>Major Milestones</u>	<u>Current Milestone Dates</u>	<u>Milestone Dates Shown in FY 1981 Submission</u>
Start Operational Test (OT)	Dec 79	Dec 79
Complete Development Tests/OT	Feb 80	Feb 80
Army System Acquisition Review Council (ASARC) III	Apr 80	Mar 80 ⁴ /
Defense Systems Acquisition Review Council (DSARC) III	May 80	Apr 80 ⁴ /
Maturation/Production Contract Award	Apr 80	May 80 ⁵ /
Complete Production Qualification Test	Sep 82	Sep 82
ASARC IIIa	Sep 82	Oct 82 ⁶ /
DSARC IIIa	Nov 82	Nov 82
Initial Operational Capability (IOC)	Nov 82	Nov 82

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Costs</u>
RDTE ⁷ /					
Funds (current requirements)	69209	68054	38291	17330	31837
Funds (as shown in FY 1981 submission)	69225	64191	39652	11874	31044

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Program Element: #6.43.14.A

Title: Multiple Launch Rocket System (MLRS) Formerly Known As
General Support Rocket System (GSR::)

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Cost
Missile Procurement, Army						
Funds (current requirements)	61900	113700	179300	410900	3091800	3857600
Initial Spares	1700	2800	25500	8900	6700	45600
Funds (as shown in FY 1981 submission)	61900	114200	150200	N/A	3169100	3495400
Initial Spares	400	2800	3600	N/A	6000	12800
Quantities (current requirements)						
Rocket/Launcher 9/	1374/12	2340/32	2496/68	25968/72	330654/92	362832/276
Quantities (as shown in FY 1981 submission) Rocket/Launchers 10/ (Launchers not shown in FY 1981)	1764/32	2340/48	2496/93	N/A	356622/0	362832/173
Other Procurement, Army (Resupply Vehicles and Trailers)						
Funds (current requirements)						
Trucks		13900	12100	16900	55800	98700
Trailers		1200	1300	1700	6100	10300
Funds (as shown in FY 1981 submission were not broken out by item)		16500	23000	N/A	82200	121700
Quantities (current requirements)						
Trucks and Trailers	0	72	66	84	258	480
Quantities (as shown in FY 1981 submission)	0	72	100	N/A	347	519

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Program Element: #6.43.14.A

Title: Multiple Launch Rocket System (MLRS) Formerly Known As
General Support Rocket System (GSR)

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

NOTES:

1. This number (\$38291) corresponds to the amount budgeted for FY82. The actual requirement for FY82, however, is \$61667. The difference (\$23376) will be made up by allied contributions.
2. US share only. Addition of allied share (\$23376) increases total to \$341749.
3. Self-propelled launcher loader.
4. Milestone delayed one month to permit more time to analyze test results.
5. Contract awarded one month earlier than planned.
6. Changed to correspond to Defense Systems Acquisition Review Council (DSARC) III goals established in May 1980.
7. Changes shown in FY81 are to fund the Force Development Test & Experimentation (FDTE) program not previously programmed. The original request for FY82 in the FY82 budget was \$36.0M. There was an increase to \$38.3M to fund completion of the FDTE & OT III. \$5 million in "Additional to Completion" was deferred from FY 1982 to FY 1983 to reduce the possibility of forward financing. Remainder is inflation adjustment.
8. Actual field trials conducted during Operational Test (OT I) invalidated the engineering estimates for initial spares. Increase in requirement also due to expanded force structure.
9. Total program quantities were revised to support the adjusted force structure and employment concept. The FY 1981 descriptive summary was written based upon a force structure of 24 batteries each with 6 launchers. This structure required procurement of 173 launchers. The revised force structure of fourteen separate batteries, each with 9 launchers, and four battalions, each with 27 launchers, has increased the requirement to 276 launchers.
10. Procurement quantities in FY80 were lower than planned (1374 vs 1764 for rockets and 12 vs 32 for launchers). These decreases were essential in order to remain within monetary appropriation constraints. Decreases resulted because the initial engineering estimates for the launcher proved to be too low and because of cost growth of the Self-Propelled Launcher Loader.

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Program Element: #6.03.14.A

Title: Multiple Launch Rocket System (MLRS) Formerly Known As
General Support Rocket System (GSRS)

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: This MLRS is the result of a continuing effort begun in FY 1971. In a study of the 1980-1990 battlefield, the Institute for Land Combat and the Army Materiel Concept Agency identified the need for a rapid-fire, area-saturation weapon system. A Training and Doctrine Command Joint Working Group was established in February 1974 to assess the use of an MLRS for counterbattery fires and suppression of enemy air defense. In order to expedite a decision on the proposal to develop an artillery rocket system, the Assistant Secretary of the Army (R&D) requested that the Army conduct a design and evaluation study of future study of future artillery capabilities. This study, Task Force BATTLEKING, was completed in December 1974. The conclusions reached indicated that improvements were needed if artillery was to provide effective counterfire, efficient attack of deep targets, responsive direct support fires, and fires to disrupt the enemy's command, control, and maneuver. One of the weapons which was judged to be capable of making a major contribution toward improvement of the field artillery system was MLRS. These study efforts led to concept development and a technology demonstration of the MLRS. In December 1975, a Special Study Group was organized to conduct an in-depth investigation of the MLRS concepts, study possible alternative systems and to recommend an approach to fulfill the system need. The study was completed in November 1976. The conclusion reached was that the addition of an MLRS to the artillery force would be more cost and operationally effective than any other alternative considered. In February 1977, the Secretary of Defense authorized the Army to proceed with the development of the MLRS with a dual-purpose improved conventional munition warhead.

G. (U) RELATED ACTIVITIES:

1. Terminal Guidance Warhead (TGW). Development of the Terminal Guidance Warhead for the MLRS continues under Program Element 6.33.03.A, Project D216. The Defense Advanced Research Projects Agency "Assault Breaker" demonstrations will provide a technology baseline for both the MLRS TGW and the Army's Corps Support Weapon System antiarmor warhead. The TGW effort is managed by the MLRS Project Manager, and under the provisions of the quadrilaterally approved memorandum of understanding, the program is planned as a joint development (US/UK/GE/FR) through concept definition.

2. Heavy Expanded Mobility Tactical Truck (HEMTT). Procurement of 480 trucks with trailers is being accomplished by the Commander, Tank Automotive Command. This effort was originally included in the MLRS program element. Each of these 10-ton resupply vehicles with trailers is designed to carry 8 launch pod containers each containing six rockets.

H. (U) WORK PERFORMED BY: The US Army Missile Command, Redstone Arsenal, AL, has the overall responsibility for development of the MLRS. Vought Corporation of Dallas, TX, was selected as the prime contractor in May 1980. The Army also has contracts with FMC Corporation, San Jose, California, for development of the self-propelled carrier vehicle. The war-

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Title: Multiple Launch Rocket System (MLRS) Formerly Known As
General Support Rocket System (GSRSS)

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

head fuze is developed by the US Army Electronics Research and Development Command at its Harry Diamond Laboratories, Adelphi, Maryland. The dual-purpose improved conventional munition is provided by the US Army Armaments Research and Development Command, Dover, New Jersey.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: The Defense Systems Acquisition Review Council (DSARC) 1 actions were completed in January 1977. In February 1977, the Secretary of Defense authorized the Army to proceed with development of the MLRS. At the same time he also directed the Army to study alternatives to accelerate the acquisition process, to solicit NATO participation in the development, prepare a plan for development of terminal homing options and investigate the potential to deliver scatterable mines. In April 1977, a special Army Systems Acquisition Review Council (ASARC) approved an accelerated development program which reduced the acquisition cycle from 84 to 63 months. Fuze development began in May 1977 and carrier development was initiated in June 1977. Competitive system development contracts were signed in September 1977. The program was restructured in January 1978 to enable the system to deliver the German-developed scatterable mine warhead. The Validation Phase was increased from 29 to 32 months and the RDTE cost increased about 20 million dollars in order to accommodate the new warhead. The Maturation Phase was simultaneously shortened to prevent any slip in the Initial Operational Capability date. On 14 July 1979, the US formally executed a Memorandum of Understanding (MOU) with France, Germany, and the United Kingdom for joint development of the MLRS system. This agreement calls for the US to underwrite the R&D costs for the basic program. The US funds will be supplemented by \$15 million contributions each from France and the United Kingdom during the FY80-82 period. The United Kingdom and France have made this initial payment of \$5 million. Germany's contribution to the joint development effort is to fund the development of the scatterable mine warhead. On 23 July 1980, the US and its three allied partners executed an agreement to negotiate the terms and conditions for joint development of a Terminal Guidance Warhead (TGW). All parties agreed to share the cost to support concept definition studies.

2. (U) FY 1981 Planned Program.

- (U) Conduct 63 Maturation Flight Tests
- (U) Complete Component Qualification Tests
- (U) Complete Major Engineering Design Activity
- (U) Fabricate FY82 Test Hardware

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Budget Activity: #4 - Tactical Programs

3. (U) FY 1982 Planned Program.

- (U) Conduct 42 Maturation Developed Flight Tests.
- (U) Complete System Qualification Tests
- (U) Complete Production Qualification Tests (PQT includes 114 rocket Flight Tests).
- (U) Conduct Force Development Test & Evaluation (FDTE) and Operational Test (OT) III (FDTE and OT III include 198 Flight Tests).

4. (U) FY 1983 Planned Program.

- (U) Achieve IOC in the first quarter by fielding one firing battery at Fort Riley, KS. An additional training battery will also be fielded at Fort Sill, OK.
Field one firing battery

5. (U) Program to Completion. RDTE program will be completed in FY 1983.

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Title: Multiple Launch Rocket System (MLRS) Formerly Known As
General Support Rocket System (GSRS)

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Program

J. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation:

a. (U) Test Phases:

(1) (U) Validation Phase. Because the validation phase results also served as the basis for source selection, competitive testing between Boeing and Vought was more extensive than that normally required during a more traditional Demonstration and Validation Phase. Testing was intended to demonstrate that all technical risks were identified, that solutions were achievable and to provide documented proof of the MLRS military utility and operational suitability. In addition to these objectives, competitive data were collected to support a decision to enter low-rate production. Validation Phase testing consisted of two subphases: Engineering Design Tests and Advanced Development Verification Tests.

(a) (U) Engineering Design Tests (EDT). These tests provided reliability and safety data, determined natural and induced environmental effects, established performance levels, environmentally tested components, provided selected hazard analyses, and identified technical risks and achievable solutions. Contractor Engineering Design Tests (EDT-C) examined the feasibility of the MLRS hardware design. Components, subsystems and systems were tested to investigate the ability of the hardware design to satisfy the requirements of the system specification in a cost-effective manner. As problems were encountered, the components were improved and retested. Government Engineering Design Tests (EDT-G) included the tests of a number of critical parts, components, subsystems, and systems. These tests were performed by the government because of the unique government-owned test facilities and expertise required. This approach necessitated that government officials acquire an intimate knowledge of the hardware. Data from EDT-G were made available to respective contractors and the independent evaluators.

(b) (U) Advanced Development Verification Tests (ADVT). These tests provided human factors and ground support equipment performance data in a simulated arctic and desert environment; identified system emission, effluents, and wastes; and required system demonstration flights. ADVT data were used by the independent government evaluators to officially score system performance and reliability.

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DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

1 (U) Advanced Development Verification Tests-Contractor (ADVT-C):

These tests verified that the design approach was capable of evolving into a ruggedized weapon system that could achieve necessary reliability and performance goals during the Maturation Phase. ADVT-C included performance testing of subsystems and systems plus flight tests. Self-propelled launcher loaders with launch pod containers were exercised while exposed to high and low temperature extremes, high humidity, rain, sand, and dust, and icing conditions. The testing assured that the system was potentially capable of passing further Government testing such as Government Advanced Development Verification Test and Operational Test I.

2 (U) Advanced Development Verification Tests-Government (ADVT-G). The government tested subsystems and systems that were considered critical to individual design. ADVT-G provided the final quantitative data points and included ground and flight tests. Complete Launch Pod Containers with rockets were subjected to tropic, arctic, and desert stockpile-to target environmental life sequences, and the rockets were flight tested to demonstrate performance in extreme weather conditions. Additional rockets were flight tested to determine accuracy and effectiveness at the required minimum, medium, and maximum ranges. Launcher mobility and endurance tests were conducted for the purpose of collecting reliability, availability, and maintainability data for the independent government evaluators.

(2) (U) Maturation Phase. The Secretary of Defense directed that special emphasis be placed on testing of built in test equipment to include additional testing and demonstration of hardware maintenance features. These tests are to be concluded by FY 1982. Testing will be conducted on all components/subsystems which were not fully tested or qualified during the Validation Phase. Included are the ten-ton truck with trailer, software, and hardware for the Position Determining System, Platoon Leader's Digital Message Device, and integration with ancillary systems such as the fire direction system and automatic test equipment. Testing will also assure the adequacy of the system design as it is matured. Development testing will be a joint contractor/government effort as opposed to independent contractor and government testing. The contractor will prepare test plans for government coordination and approval, conduct tests at contractor and government facilities, as appropriate, accommodate government test monitors, and use independent or mixed contractor/government test crews as test conditions warrant. Testing will consist of two phases: Maturation Development Tests and Production Qualification Tests.

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DOD Mission Area: #212 - Fire Support

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(a) (U) Maturation Development Tests (MDT). This test program will start with component evaluation and progress through total system demonstration. Test hardware will be produced by Vought in its low-rate production facility. The following tests will be included:

1 (U) Component/subsystem/system performance.	7 (U) Human Factors.
2 (U) Rocket flight tests (including environmental).	8 (U) Maintainability demonstration.
3 (U) Safety.	9 (U) Transportability.
4 (U) Countermeasures.	10 (U) Component/subsystem qualification.
5 (U) Electromagnetic radiation.	11 (U) Computer software.
6 (U) Nuclear hardness.	12 (U) Reliability.

(b) (U) Production Qualification Tests (PQT). PQT will be jointly conducted by the contractor and the government using low-rate production hardware and will be divided into four categories: Environmental Qualification Tests, Rocket Performance Tests, Mobility and Endurance Tests, and Command, Control and Communications Tests.

1 (U) Environmental Qualification Tests. These tests are being designed to demonstrate performance and reliability of the design in simulated and actual operational environments. Test hardware will be produced by Vought in its low-rate production facility. The Self-Propelled Launcher and other end items will be tested in simulated arctic, temperate, desert, and tropic environments to demonstrate acceptable hardware and man-machine performance. The purpose of this test is to verify that MLRS will perform as required over the required operational extremes. The launcher pod container and rockets will be subjected to environmental sequential testing and then fired in flight tests. Both the launcher pod container and rockets will be temperature conditioned and flight tested to demonstrate performance at intermediate and extreme temperatures.

2 (U) Rocket Performance Tests. Rocket flight tests will demonstrate rocket and Launch Pod Container reliability and accuracy versus range. End items used in these tests will be the low-rate production hardware. Flight tests will be conducted at White Sands Missile Range using contractor, government, or mixed launch crews. Launch procedures will simulate tactical employment of MLRS.

3 (U) Command, Control and Communication Tests. This test program will use Battery Computer Unit, a Platoon Leader's Digital Message Device, and three Self-Propelled Launchers to demonstrate that the MLRS battery is a totally integrated system and capable of performing its intended purpose. MLRS hardware will originate from the Vought production line.

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The Battery Computer Unit will be produced by Norden Corp.

b. (U) Test Summaries.

(1) (U) Rocket Flight Tests.

TEST	LOCATION	SCHEDULE	NUMBER	STATUS
Engineering Design Tests - Contractor (EDT-C)	White Sands Missile Range (WSMR)	Dec 77 - Dec 79		Nonscored
Advanced Development Verification Test - Contractor (ADVT-C)	WSMR	Sep 79 - Nov 79	36	one fin opening problem. Others were successful
Advanced Development Verification Test - Government (ADVT-G)	WSMR	Nov 79 - Feb 80	48	two fin opening problems; one pod cover problem; others were successful
Operational Test (OT) I (performed by soldiers)	WSMR	Jan 80- Feb 80	24	successful
Early Maturation Flight Tests (contractor)	WSMR	Nov 80 Jan 81	6	Successful. Test objectives focused upon attaining correct warhead burst patterns.

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TEST	LOCATION	SCHEDULE	NUMBER	STATUS
Maturation Development Flight Tests	WSMR	Mar 81 - Jan 82	100	
Production Qual Tests	WSMR	Feb - Sep 82	114	
Operational Test III	Canada	Jun - Aug 82	144	
Developer/Opnl Tests Flight	WSMR	Sep 82	54	

(2) (U) Self-Propelled Launcher Loader (SPLL) Tests.

TEST	LOCATION	SCHEDULE	STATUS
Govt. Eng. Dev. Tests (Mobility & Endurance)	Aberdeen Proving Ground, (APG), MD	Jul 79 - Sep 79	Test complete No major problems were encountered
Contractor Advanced Dev Verification Tests (Environmental)	Eglin AFB, FL	Jul - Nov 79	Climate testing and human factors tests were completed with no major problems.

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Title: Multiple Launch Rocket System (MLRS) Formerly Known As
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TEST	LOCATION	SCHEDULE	STATUS
Tests for determining human, environmental, electromagnetic, nuclear training, & flight factors	WSMR, NM; Eglin AFB, FL, Redstone Arsenal, AL	Feb 81 - Jan 82	
Command, Control and Communication tests to verify hardware and software compatibility.	Fort Sill	Jan 82 - May 82	
Production Qualification Tests	WSMR, Eglin AFB APC, Redstone	Feb 82 - Sep 82	
Operational Test III	Canada	Jun - Sep 82	

(3) (U) Summary: Validation phase development testing was completed on schedule. The planning, conduct and results of the contractor Engineering Design Tests were closely monitored by the government but were not evaluated for reliability and accuracy. During this testing the total system was demonstrated. Firings included single, double, triple, and six-round ripple firings. Design changes were made to the rocket as a result of data collected during this phase. Government-scored firings began with the Advanced Development Verification Tests. All scored tests were conducted in accordance with the government-approved test plan. Developmental testing conclusively demonstrated that the MLRS system was ready to enter a maturation and low-rate production phase. These conclusions were affirmed at the DSARC III in May 1980, and Vought Corporation was selected as the prime contractor. The following data relate to the performance of the launcher and rocket:

(4) (U) Launch Pod Container and Self-Propelled Launcher Loader Performance: The Launch Pod Container, rocket, and Self-Propelled Launcher Loader tests confirmed that the system was safe for operational testing. Single and ripple firings with a crew in the cab have been successfully demonstrated. The Self-Propelled Launcher Loader has performed well as a

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launch platform. 177 rockets have been fired from the launcher with no adverse effects on the vehicle. Launcher and carrier performance was good during the facility vehicle testing and the Mobility and Endurance Tests. Problems encountered were identified for corrective action during Maturation Testing. The launcher performed well in the simulated arctic, desert, and tropic environments with only minor problems noted at low temperature. No problems were encountered during the loading tests of the launcher and launch pod containers into the C141 aircraft. Indications are that the Launch Pod Container can perform the three intended roles of transportation, storage, and launch pod. Rail transportation testing of the Launch Pod Container and rocket is complete and no significant problems have been noted.

(b) (U) Firing Cycle Results: Both contractors accumulated 9792 km and 3996 firing cycles on six launchers. Vought fired 127 rockets (60 scored). Testing of both the launcher and rockets included environmental conditioning and rocket firing at temperature extremes (+140° and -25°F) with rockets exposed to expected life cycle dynamic environments. Although sample size was limited, the results compare favorably with requirements for this stage of development testing.

(c) (U) Rocket Performance: The Vought rocket reliability includes results of 62 scored firing attempts. There were two prefire failures associated with open firing circuits. Of 60 rockets fired, there were three failures (one was removed after a validated design change), and there was one "no test" due to failed range tracking radar. All fuzes and warheads functioned.

c. (U) Description of Equipment Being Tested.

(1) (U) The MLRS is a surface-to-surface, free-flight rocket launcher system with the capability to launch up to 12 rockets in a ripple-fire mode. The MLRS is comprised of three major components: the self-propelled launcher loader (SPLL), the launch pod containers, and the rocket.

(2) (U) The SPLL consists of the carrier, the fire control system, and the launcher loader module.

(a) (U) The carrier is a tracked vehicle derived from the XM2 Infantry Fighting Vehicle.

(b) (U) The automated fire direction system for the MLRS is the Battery Computer Unit which will communicate with the MLRS Fire Control System via encoder radio link. The MLRS fire control system contains a microprocessor that is capable of computing fire mission data.

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(c) (U) The Launcher Loader Module provides an armored housing for two Launch Pod Containers.

(3) (U) The Launch Pod Container serves as a shipping and storage container, as well as a launch pod for six rockets. In a tactical environment the Launch Pod Container will be discarded after the rockets are fired.

(4) (U) The MLRS rocket is a spin-stabilized, free-flight rocket. The warhead fuze contains an electronic timer that is set by the Fire Control System just before launch. The fuze initiates the warhead airburst dispensing system over the target area to dispense approximately 600 submunitions.

d. (U) Test Management: The MLRS Maturation Phase testing is being conducted under the Single Integrated Development Test Concept. Results obtained during testing are being evaluated by the Army Materiel Systems Analysis Activity, US Army Operational Test and Evaluation Agency, and the Project Office.

e. (U) For all subsystems and components, the contractor is required to produce a design with reliability, availability, and maintainability (RAM) characteristics which are consistent with meeting performance effectiveness requirements at lowest possible life-cycle costs. An important result of the Validation Phase was the establishment of firm RAM system requirements which were converted to appropriate goals and threshold values.

f. (U) Source of Hardware: Units tested during Production Qualification Testing and OT III will be manufactured on the production line.

2. (U) Operational Test and Evaluation:

a. (U) Validation Phase. The MLRS Operational Test (OT) I was an integral part of a combined Development Test/Operational Test (DT/OT). The OT portion of the test lasted for six weeks, and the equipment was tested by active duty soldiers. Two firing sections, each manning an MLRS candidate system, conducted a series of firing and nonfiring operational exercises in a tactical environment. OT focus was directed toward man-machine interfaces and was conducted in three phases. Phase I was a three-week phase that was devoted to training and pilot testing at Fort Sill, OK. Phase II, also conducted at Ft Sill, consisted of two weeks of nonfiring field exercises in a simulated tactical environment. Phase III was a one-week combined Development Test/Operational Test live fire exercise conducted at White Sands Missile Range (WSMR), NM. During that phase, 12 rockets were fired from each of the candidate systems. The OT provided data to assess operational effectiveness, reliability, availability, and maintainability (RAM), operational survivability human factors, safety,

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Budget Activity: #4 - Tactical Programs

training, doctrine, organization, tactics, and the adequacy of the proposed logistics concepts. All data and associated analyses were provided to the Army Systems Acquisition Review Council (ASARC) III and were used as a basis for a favorable DSARC decision to enter the Maturation and low-rate Production Phase. Additional operational testing will be conducted during the design Maturation Phase. This testing will assess performance of production hardware including components and equipment that were not available during the Validation Phase (Battery Computer Unit, on-board Position Determining System, Platoon Leader's Digital Message Device, 10-ton resupply vehicle) and to resolve any remaining operational test issues.

(1) (U) OTI Test results were evaluated by the Army Materiel Systems Analysis Agency, the Operational Test and Evaluation Agency (OTEA), and the Project Manager, COL Monte Hatchett. OTEA conducted the operational testing.

(2) (U) Test facilities used during operational testing included Ft Sill, OK and White Sands Missile Range. Two Launcher Sections, a Fire Direction Center section, Maintenance Section, Ammo Section, and Direct/General Support Maintenance section participated in the operational testing.

(3) (U) Operational Test I was used to establish the RAM system requirements approved at DSARC III.

(4) (U) Operational Test I was completed prior to the low-rate production contract award.

b. (U) Maturation Phase. In addition to the normal Operational Test (OT) III, HQ TRADOC has elected to conduct its own system evaluation during the period February-May 1982. This testing will assess the suitability of the system to enter into Operational Test III. Test objectives are essentially the same as those stated for OT III.

(1) (U) Testing will be conducted to address the interoperability of command, control, and communications in a realistic electronic warfare environment with respect to:

(a) (U) MLRS Fire Direction Unit.

(b) (U) Launcher Fire Control System.

(c) (U) Platoon Leader's Digital Message Device

(d) (U) TACFIRE - the Army's Tactical Fire Direction System

Program Element: #6.43.14.A

Title: Multiple Launch Rocket System (MLRS) Formerly Known As
General Support Rocket System (GSRS)

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

(e) (U) FIREFINDER (AN/TPQ-36 and/or AN/TPQ-37: The Army's Counterfire radars)

(2) (U) Testing will also be conducted to address reliability, availability, maintainability, and supportability to include the impact of the built-in test equipment. Testing will also focus upon the TRADOC operational and organizational concept as it applies to a complete MLRS Battery.

3. (U) System Characteristics:

<u>Operational/Technical</u> <u>Characteristics</u>	<u>Objectives</u>	<u>Demonstrated</u> <u>Performance</u>
System Accuracy		
Maximum Range		
Reaction time		
- Prepare to Fire		
- Displace		
- Total Mission		
(U) Reliability, Availability, Maintainability		
Reliability		
- rocket	.95-.97	.93
- SPL	.88-.92	.84
Availability		
- MLRS Operational Availability	.60-.75	1/
- Essential unscheduled maintenance actions per 1000 hours of launcher		
- loader module operation	50	1/
- Performance of Built-In Test Equipment		

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Program Element: #6.43.14.A

Title: Multiple Launch Rocket System (MLRS) Formerly Known As
General Support Rocket System (GSRS)

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

(U) Operational/Technical Characteristics

Objectives

Demonstrated Performance

- % of items removed with no evidence of failure 7%
- % Fault Isolation 90%
- % Maintenance Actions Corrected within specified mean time to repair TBD

1/
1/
TBD

(U) Maintainability

- SPL (MTTR/Hours)

Organizational 1.10
Direct/General Support 4.40

.7-.85
1.5-2.1

NOTE:

1/(U) To be verified by the developer and independent test agency.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6,43,16,A
DOD Mission Area: #211 Close Combat

Title: Fire and Forget - HELLFIRE
Budget Activity: #4 - Tactical Programs

THIS DESCRIPTIVE SUMMARY WILL BE SUBMITTED UNDER A SEPARATE COVER.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.18.A

DOD Mission Area: #213 - Ground Air Defense

Title: Division Air Defense (DIVAD) Con

Budget Activity: #4 - Tactical Program

THIS DESCRIPTIVE SUMMARY WILL BE SUBMITTED UNDER A SEPARATE COVER.

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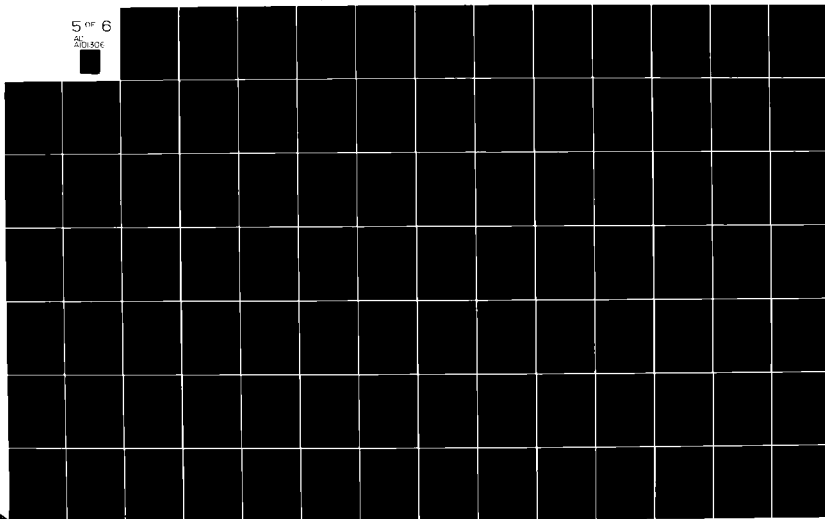
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FY 1982 RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.41.21.A

DOD Mission Area: #255 Tactical Surveillance, Reconnaissance
and Target Acquisition

Title: Joint Tactical Fusion Program

Budget Activity: 14 - Tactical Programs

A. RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate To be de- termined (TBD)	Additional to Completion TBD	Total Estimated Cost TBD
	TOTAL FOR PROGRAM ELEMENT	7900	10260				
D926	All Source Analysis System (ASAS) QUANTITIES	7900	10260		Not Shown	Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The past decade has witnessed major technical advances and the introduction of increasingly sophisticated intelligence gathering and weapons systems into the strategic and tactical operations of military forces--both friendly and opposing. Commanders at all echelons must have an intelligence system which will provide early detection, identification, correlation, and location of these enemy critical nodes in order to employ our own forces and weapons for effective enemy attrition. The objective of this program is to develop and field an All-Source Analysis System (ASAS) which will provide the tactical commander with a highly automated capability at Division, Corps, and Echelons above Corps to analyse, correlate, fuse and report intelligence data from numerous tactical and strategic sensor systems; provide target nominations; and manage and control intelligence/electronic warfare assets.

C. (U) BASIS FOR FY 1982 REQUEST: Includes funds to support Congressional redirection of the Battlefield Exploitation and Target Acquisition (BETA) Project, the All-Source Analysis System (ASAS) and related Air Force projects into a Joint Tactical Fusion program, and the continuation of that program toward fielding of service systems. Total development costs have not been validated due to timeframe since official program initiation (December 1980). Total funding profile and major milestones will be developed as part of program acquisition strategy to be completed by June 1981.

Program Element: #6.43.21.A

DOD Mission Area: #255 Tactical Surveillance, Reconnaissance
and Target Acquisition

Title: Joint Tactical Fusion Program

Budget Activity: #4 - Tactical Programs

D. COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	7900	10260		To be determined (TBD)	TBD
Funds (as shown in FY 1981* submission)	4200	10167			

*In FY 1981 and prior, these funds were included in P.E. 6.47.45.A., Tactical Electronic Support Measures Systems, under Project D926, Tactical EMI Command and Control Systems.

FY 1980: \$1700 was reprogramed into this project as a result of Congressional approval for project BETA requirement.

FY 1981: The funding level difference is attributable to internal budget adjustments.

FY 1982: The funding level difference is attributable to the initiation of the Joint Tactical Fusion (JTF) Program and costs incident to supporting JTF program management, JTF simulation efforts, operational testing and joint exercises participation, fabrication of RDTE prototypes, and continued software development.

E. (U) OTHER APPROPRIATION FUNDS: Not applicable.

Program Element: #6.43.21.A

DOD Mission Area: #255 Tactical Surveillance, Reconnaissance
and Target Acquisition

Title: Joint Tactical Fusion Program

Budget Activity: #4 - Tactical Programs

F. **DETAILED BACKGROUND AND DESCRIPTION:** The employment of highly mobile and technologically advanced weapon systems by opposing tactical military forces requires early detection, identification, and location. To support this requirement, sophisticated intelligence sensor systems which can detect and locate basic elements (such as electronic emitters) are being increasingly employed. There is a critical need to rapidly exploit this time-sensitive and high volume of sensor information and effectively control and manage organic sensor and electronic warfare assets. The purpose of this program is to develop and field an All-Source Analysis System (ASAS) which will correlate and aggregate the large number of elements

detected by various sensor systems; reduce them to force structures; provide ground battle situation displays; provide target nomination and intelligence support; and manage and control sensor/electronic warfare assets. The Services have submitted a Joint Tactical Fusion Development and Acquisition Program Plan to the Office of the Secretary of Defense (OSD) which combines the Battlefield Exploitation and Target Acquisition (BETA) Project, The Air Force Automated Tactical Fusion Division (ATFD) Program, the Army All-Source Analysis System (ASAS)/TCAC-D Programs, and associated simulation projects into a joint acquisition effort, now called the Joint Tactical Fusion Program. The plan, approved by OSD and submitted to Congress in December 1980, describes a program to acquire systems for the Services at the earliest possible date through a joint effort to ensure interoperability within and among Services. The joint acquisition effort will make maximum use of the investments in the BETA, ASAS, and Technical Control and Analysis (TCAC) projects by incorporating their architecture and technologies into the development of the joint fusion system. The joint Tactical Fusion Development and Acquisition Program Plan will become the basis upon which to generate a program development plan and a system acquisition strategy under the Army--the designated lead Service. Subject to modification as a result of the Joint Fusion Program strategy, the evolution of the ASAS will be based upon incremental improvements that are supported by technological advances and field experience, and are in consonance with DOD Directive 5000.1 and Instruction 5000.2. (For further information see Program Element 6.37.45.A., Tactical Electronic Support Measures Systems, Project D925, Tactical EMI Command and Control Systems.)

G. (U) **RELATED ACTIVITIES:** Related Service activities will be combined and redefined upon implementation of the Joint Tactical Fusion Program. These activities include BETA, ATFD, ASAS, Technical Control and Analysis Center (TCAC) and Associated Simulation Projects. The following current related services/agencies program elements (PE) apply: 6.43.21.F, Joint Tactical Fusion Program; 2.74.31.F, Tactical Air Intelligence System Activities; 6.47.10.F, Reconnaissance/Electronic Warfare Equipment; 6.27.11.E, Experimental Evaluation Major Innovative Technology; 6.47.45.N, Navy Integration/BETA; 6.37.45A, Tactical Electronic Warfare and Intelligence Command and Control Systems; and 3.58.85G, Tactical Cryptologic Program.

Program Element: #6.43.21.A

DOD Mission Area: #255 Tactical Surveillance, Reconnaissance
and Target Acquisition

Title: Joint Tactical Fusion Program

Budget Activity: #4 - Tactical Programs

H. (U) WORK PERFORMED BY: Current major contractors are: TRW, Incorporated, Redondo Beach, CA; BDM, Incorporated, McLean, VA; Bunker-RAMO Corporation, Westlake Village, CA; RCA Corporation, Burlington, MA; HIRB-Singer, State College, PA; Analytics, McLean, VA; and the Mitre Corporation, Bedford, MA. In-house development and contract monitoring are conducted by US Army Materiel Development and Readiness Command (DARCOM), Alexandria, VA; the BETA Joint Project Office, Adelphi, MD; and Project Manager, All-Source Analysis Systems, Vint Hill Farms, Warrenton, VA.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1980 and Prior Accomplishments: A joint service and Defense Advanced Research Projects Agency (DARPA) project, Battlefield Exploitation and Target Acquisition (BETA), was initiated to develop and demonstrate the feasibility of automated correlation and display of sensor-derived information to support near-realtime target nomination and battle management at Army Corps, Division, and in the Air Force Tactical Air Control Center. Specifications were prepared and approved for fabrication of Division Level Technical Control and Analysis Centers (TCAC(D)) on a Quick Reaction Capability (QRC) basis to provide an initial semiautomated signals intelligence/electronic warfare control and analysis capability pending fielding of the All-Source Analysis System. The TCAC(D) is scheduled for a deployment, and field experience gained with it will contribute to the engineering development phase of ASAS. Project BETA testbeds were scheduled to be deployed to Europe to conduct an operational evaluation. However, the testbeds were not stable and did not successfully pass the systems integration test. As a result OSD and Congress opted not to deploy. The remaining project focus will be on correcting testbed deficiencies and completion of software development.

2. (U) FY 1981 Program: The Joint Tactical Fusion Program will be initiated. Development and acquisition strategy will be finalized and implemented. All efforts and funding will be directed towards joint Service development and acquisition of tactical systems for earliest possible fielding. The FY 1981 effort will focus on performing systems engineering/integration functions; generating the Statement of Work and specifications and preparation of the requests for Proposals for hardware; continuing software development; and continuing development of the simulation program to support development during testing and operational exercises. Service operational testing on the fusion testbed will be conducted to refine requirements for their systems (ASAS/ATFD).

3. FY 1982 Planned Program: Pending revisions based on the Joint Tactical Fusion Program strategy, the request for proposal will be released. Simulation development will continue. The fusion testbeds (BETA) will be available for use in Joint Service exercises to evaluate techniques, procedures, and benefits of multiservice sensor data distribution and correlation for development of software to be used in the ASAS and ATFD. Engineering development will begin on the initial

Program Element: #6.43.21.A

DOD Mission Area: #255 Tactical Surveillance, Reconnaissance
and Target Acquisition

Title: Joint Tactical Fusion Program

Budget Activity: #4 - Tactical Programs

ASAS and ATFD. Authorization for full-scale development is essential even though all prescribed conditions have not been met if an initial ASAS capability is to be fielded in support of highly automated sensors by 1985. This decision is appropriate because sufficient conditions will have been met to demonstrate, test, and accept the ASAS SEWS/TCAC(D)/BETA software and hardware technology such that an engineering development (ED) contract can be awarded for the integration and fusion of these software increments into the initial ASAS and the ATFD.

4. (U) FY 1983 Planned Program: Pending revisions based on the Joint Tactical Fusion Program strategy, a contract to develop production prototype hardware sets of the Initial ASAS will be awarded. Development of the terminal and software will continue.

5. Program to Completion: Pending revisions based on the Joint Tactical Fusion Program strategy, development of production prototypes of the Initial All-Source Analysis System (IASAS) will be completed, fielded, and tested. Limited production of the IASAS will be initiated and completed. Software evolution will continue. Objective ASAS evolution and acquisition will begin with projected IOC.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.01.A
 DOD Mission Area: #211 - Close Combat

Title: Infantry Support Weapons
 Budget Activity: #6 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion Continuing	Total Estimated Cost Continuing *
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	4546	3878	11973	6183		
D029	Lightweight Company Mortar Systems (LWCMS)	975	216	1130	1368	1281	32082
D030	Multipurpose Ammunition	0	1025	1368	1405	0	3798
D144	Smoke Mortar Rounds	0	0	2543	1717	Continuing	Continuing
D227	Battalion Mortar System	3571	2637	4226	0	0	19133
D031	25mm Ammo PIPS	0	0	2706	1693	0	4399

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports development to improve the performance and effectiveness of Army mortar systems and other Infantry support weapons. Mortar systems provide the small unit ground commanders at the company and battalion levels with their own responsive, high-angle, indirect fire support capability. The 60mm Lightweight Company Mortar System (LWCMS) provides the company commander in nonmechanized Infantry units with a lightweight, responsive, easily transportable indirect fire weapon capable of delivering both high explosive (HE) and illumination fires in offensive and defensive missions. The 81mm battalion mortar system will provide the battalion commander in nonmechanized units and the company commander in mechanized units with a weapon capable of achieving greater range, greater lethality, a higher sustained rate of fire, improved stability, and enhanced illumination over the current 81mm mortar. The current smoke cartridges for the 81mm mortar and 4.2" battalion heavy mortar, in use since the 1940's, are lacking in screening capability. The addition of a long-lasting screening smoke cartridge at the battalion level will provide the ground commander with a greatly improved battlefield obscuration capability. Multipurpose ammunition employs a fuzeless technology developed in Norway to provide a significant increase in explosive and incendiary effects against light armor and aircraft targets at a reduced cost. Rights to produce this ammunition have been obtained to facilitate application of the technology to US weapons. This fuzeless ammunition technology will be developed in 25mm and other caliber sizes for triservice application. Project D031, a new start in FY82, will improve the ammunition shipping container, provide an APDS-T practice round, and modify the XM758 fuze for the 25mm BUSHMASTER family of ammunition.

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Program Element: #6.46.01.A
DOD Mission Area: #211 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #4 - Tactical Programs

C. (U) BASIS FOR FY 1982 ROTE REQUEST: The request for Project D029, Lightweight Company Mortar System, will permit initiation of engineering development (ED) of the XM721 illumination round. The request for Project D227, Battalion Mortar System, will permit completion of testing, correction of shortcomings discovered during testing, the integration of logistics support, the preparation of the Technical Data Package and incorporation of Producibility Engineering and Planning. The request for project D030 will permit the engineering development of multipurpose fuzeless technology in 25mm and other calibers. The request for Project D031 provides for a much lighter weight (plastic) ammunition shipping box which will save 200 pounds on the IFV and 400 pounds on the CFV. In addition, the FY82 25mm PIP will provide an APDS-T practice round ballistically matched to the AP service round out to its maximum effective range and modification of the XM758 fuze to enhance its range terrain functioning.

Project	Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
D029	Type Classification 60mm Training Round	3Q FY 1980	4Q FY 1979
D029	Type Classification for XM745 Guttered Multipurpose Fuze	4Q FY 1981	None Shown
D030	Type Classification	FY83	FY83
D144	Type Classification 81mm Smoke Round	4Q FY 1983	4Q FY 1985
D227	Acquire 18 Test Weapons	1Q FY 1979*	1Q FY 1979
	Begin Development Test/	4Q FY 1981**	4Q FY 1979
	Operational Test (DT/OT)	2Q FY 1982***	2Q FY 1980
	Complete DT/OT	2Q FY 1982	2Q FY 1980
	Development Acceptance IPR	3Q FY 1982***	3Q FY 1980
	Type Classification	3Q FY 1982***	3Q FY 1980
	Initial Operation Capability	1Q FY 1985***	3Q FY 1982

* Difference due to initiation of engineering development in FY 1981 instead of FY 1982. Funds for FY 1981 initiation will be obtained by reprogramming within Development and Readiness Command resources.

** DT began as scheduled but was suspended because of misfires and short round problems with ammunition at extreme temperatures. DT II was again suspended in January 1980 due to blast overpressure and wet efficiency. A special review in May

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Program Element: #6.46.01.A
DOD Mission Area: #211 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #4 - Tactical Programs

1980 recommended a codevelopment contract be negotiated with the UK to resolve the blast overpressure problem. The United Kingdom will demonstrate solutions for wet efficiency/overpressure in March 1981. Subsequently, a program decision on the feasibility of a codevelopment effort, DT II/OT II, and type classification will be made based upon time requirements and fiscal resources.

*** Difference due to problems with ammunition during DT which resulted in a two-year program slip.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	4546	3878	11973	Continuing	Continuing
Funds (as shown in FY 1981 submission)	5809	4273	4262	9188	59342

Differences between FY 1981 and FY 1982 submit: Reduction in FY80 resulted from reprogramming to higher priority Army projects. The FY81 decrease is attributable to the application of general congressional reduction.

Increase in FY82 includes initiation of development of an illumination round for the Lightweight Company Mortar, a significant increase in project D227 to resolve the blast overpressure problem with the improved 81mm mortar and provide for DT/OT testing and development testing of the 81mm illumination round, and initiation of a 25mm Product Improvement Program (PIP).

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Program Element: #6.46.01.A
 DOD Mission Area: #211 - Close Combat

Title: Infantry Support Weapons
 Budget Activity: #4 - Tactical Programs

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>To Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
<u>Weapons and Tracked Combat</u>						
<u>Vehicles, Army</u>						
Mortar, 81mm, XM252						
Funds (current requirements)	0	0	8300	18500	27400	54200
Funds (as shown in FY 1981 submission)	0	14900	20000	-	7100	42000
Quantities (current requirements)	0	0	300	636	883	-
Quantities (as shown in FY 1981 submission)	0	742	939	-	325	

Differences due to an additional one-year slip in proposed procurement of the UK 81mm mortar because of overpressure and wet efficiency problems in testing. Cost increases are due to increase in sales price from UK and devaluation of the dollar against the British pound.

<u>Lightweight Company Mortar</u>						
<u>(LWCHS), M224</u>						
Funds (current requirements)	0	0	0	0	0	11400*
Funds (as shown in FY 1981 submission)	0	0	0	0	0	13800

* Total cost reduction due to favorable contract on sight for the Lightweight Company Mortar System. The estimate was for about \$1700 unit cost; contract was for about \$1000 unit cost.

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Program Element: #6.46.01.A
DOD Mission Area: #211 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #4 - Tactical Programs

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Cost
Quantities (current requirements)	0	0	0	0	0	-
Quantities (as shown in FY 1981 submission)	0	0	0	0	0	-

Difference in funding due to more current cost estimates.

Procurement Ammunition, Army

Cartridge, 60mm, LWCMS, All types						
Funds (current requirements)	0	0	17100	0	*	22900**
Funds (as shown in FY 1981 submission)	20800	0	33000	0	-	134600
Quantities (current requirements)	0	0	164000	0	*	-
Quantities (as shown in FY 1981 submission)	28200	0	28200	-	-	-
Cartridge, 81mm, Improved						
Funds (current requirements)	0	0	0	34900	*	349300**
Funds (as shown in FY 1981 submission)	-	26300	-	-	-	165800
Quantities (current requirements)	0	0	0	136000	*	-
Quantities (as shown in FY 1981 submission)	-	136000	-	-	-	-

* Cost to completion not estimated for ammunition since procurement is continuous based on usage.

** Represents total five-year defense program requirements (FY82-86).

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Program Element: #6.46.01.A
DOD Mission Area: #211 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The Lightweight Company Mortar System (LWCMS) consists of an improved 60mm mortar, conventional-style fire control, high explosive ammunition fuze with a new M734 multioption electronic fuze, and the XM745 training fuze (gatted M734 multioption fuze). Illuminating ammunition will be developed. The Lightweight Company Mortar System fulfills the requirement to provide a manportable fire support system at the company level for nonmechanized units and will replace the 81mm mortar in all infantry units except mechanized infantry. Even though the 47-pound mortar and 3.75-pound round of ammunition weigh less than half the present 95-pound 81mm mortar and nine-pound round of ammunition, the lethality of the LWCMS equals about 70% of the 81mm mortar per round. The mortar can be fired out to 1000 meters using a small baseplate and no bipod, or out to 3500 meters using the standard baseplate and bipod. The new illuminating round will have a sufficient range to illuminate targets being engaged with the high explosive (HE) cartridge at maximum range (3500 meters). The 81mm smoke screening cartridges will provide greater screening capability. The Battalion Mortar System will provide an improved 81mm mortar capability of increased range, increased lethality, greater accuracy, and a higher sustained rate of fire than the current 81mm mortar. The improved 81mm mortar will fire newly developed ammunition to a range of approximately 5700 meters. The United Kingdom (UK) L16A2 81mm mortar is being tested and evaluated as a candidate to fill the improved 81mm mortar requirement. The system includes a UK L16A2 barrel and L5A5 mount, US M3 baseplate and M64 sight, and UK XL31E2 HE projectile with the US M734 multioption fuze. The illumination round under development in the US will provide improved illumination through increased burn time and greater candlepower. Multipurpose gun ammunition, developed by Rasmussen Ammunitionsfabrikker, Norway, in 20mm and .50 caliber sizes will provide a major increase in light armor and aircraft kill capabilities. This ammunition uses a fuzeless technology to delay detonation and enhance incendiary effects at a cost reduction over fuze cartridges. The Army negotiated for technology and production rights to support tri-service requirements. The Army will develop ammunition in 25mm and other calibers. The 25mm family of ammunition includes the XM242 chain gun, the primary armament for both the Infantry Fighting Vehicle (IFV) and the Cavalry Fighting Vehicle (CFV). The IFV with its 25mm armament will provide a large volume of firepower at all ranges during both day and night operations. In addition, the CFV will provide armored cavalry reconnaissance and security missions.

G. (U) RELATED ACTIVITIES: These developments will also satisfy the US Marine Corps' requirements for a mortar and mortar ammunition. Full coordination of this development with the Marine Corps continues. Program Element (PE) 6.36.08.A, Weapons and Ammunition, Lightweight Company Mortar System (LWCMS), supported advanced development of the LWCMS except for the multioption fuze. PE 6.36.13.A, Advanced Fuze Design, supported the advanced development of the multioption fuze, XM734. PE 6.46.02.A, Field Artillery Ammunition, supported engineering development of the fuze initially until it was transferred to this PE in FY 1974. PE 6.36.13.A, Advanced Fuze Design, supported the advanced development of an electronic time fuze for one year in FY 1978 in order to demonstrate that technology is in hand to provide an electronic time fuze for the LWCMS illuminating round. PE 6.36.27.A, Combat Support Munitions, supports advanced development of 81mm smoke mortar round. The UK L16A2 evaluation has undergone feasibility testing under PE 6.57.09.A, Exploitation of Foreign Weapons. The multipurpose

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Program Element: #6.46.01.A
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ammunition has been evaluated under PE 6.26.17, Small Caliber and Fire Control Technology, and PE 6.57.140, International Materiel Evaluation.

4. (U) **WORK PERFORMED BY:** In-house efforts are accomplished by US Army Armaments Research Development Command, Dover, NJ; and US Army Test and Evaluation Command, Aberdeen, MD.; Watervliet Arsenal, Watervliet, NY; and Harry Diamond Laboratories, Adelphi, MD. Major contractors are: Eastman Kodak, Rochester, NY; Bergman Manufacturing, Garland, TX; Ruoff, Inc., Runnemede, NJ; Norris Industries, Los Angeles, CA; International Telephone and Telegraph Research Institute, Chicago, IL; the United Kingdom Royal Ordnance Factories; and A/S Raufoss Ammunisjonsfabrikker, Norway.

I. (U) **PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:**

1. (U) **FY 1980 and Prior Accomplishments:** Lightweight Company Mortar System (LWCMS): The basic LWCMS, high-explosive round, and revolutionary new multioption fuze were fully developed and type classified standard in July 1977. Engineering development work was completed on the subcaliber training round and it was type classified in June 1980. In FY78 producibility Engineering and Planning (PEP) on the M734 multioption fuze was completed and resulted in lower procurement costs. In FY79 engineering development was initiated on the XM745 multioption training round fuze. Smoke Mortar Rounds: Advanced development on the 81mm smoke round was undertaken in Combat Support Munitions, Program Element (PE) 6.36.27.A, Combat Support Munitions, Project DE82. A draft requirements document for a 4.2-inch smoke screening round was approved. Battalion Mortar System: A US Army Test and Evaluation Command (TECOM) feasibility test of the UK 81mm L16A2 mortar system in the October 1976-April 1977 timeframe, supported a full test and evaluation of the UK system as a candidate to fulfill the Improved 81mm Mortar Required Operational Capability (ROC). Eighteen mortars and 16,700 rounds were procured from UK to conduct development test/operational test (DT/OT) testing. Harry Diamond Laboratories (HDL) contracted with Eastman Kodak to buy M734 multioption fuzes (MOF) to test their adaptation to both the US and UK 81mm cartridges. Two UK mortars and 600 rounds of UK XL31E2 ammunition were acquired for the compatibility tests which demonstrated the adaptation of the M734 to the UK 81mm mortar cartridge. Tests are continuing with the US cartridges. Four M125A1 81mm mortar carriers, modified versions of the M113 armored personnel carrier, were converted to carry the UK system and delivered for test. Analysis of the mortar tube design and material was conducted by Benet Weapons Laboratory of the Armaments Research and Development Command (ARRADCOM). Development Testing (DT) was commenced in October 1978 at Aberdeen Proving Ground, MD, and the Cold Regions Test Center, Alaska. Problems with misfires and short rounds developed with the ammunition at temperature extremes, and testing was suspended in January 1979. A Special In-Process Review and a General Officers' Review evaluated the program and recommended that the UK correct the deficiencies and the program be resumed. This was accomplished, and DT was resumed in August 1979 at Aberdeen Proving Ground, MD. DT II was again suspended in January 1980, due to excessive blast overpressure and wet efficiency. A special review in May 1980 recommended a codevelopment contract be negotiated with the UK to resolve

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Program Element: #6.49.01.A
DOD Mission Area: 211 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #6 - Tactical Programs

the blast overpressure problem. Development of the 81mm illumination round was initiated with acquisition of components for testing. The United Kingdom will demonstrate solutions for wet efficiency/overpressure in March 1981. Subsequently, a program decision on the feasibility of a codevelopment effort, DT II/OT II, and type classification will be made based upon time requirements and fiscal resources.

2. (U) FY 1981 Program: Lightweight Company Mortar System: Engineering Development and Testing (DT II) of the XM745 gutted multioption fuze will be completed. Smoke Mortar Round: Due to concept problems in developing the 81mm mortar smoke round, this project will remain in advanced development. Money is scheduled to be reprogramed into higher priority projects. Battalion Mortar System: The United Kingdom will demonstrate the feasibility of a solution to the overpressure/wet efficiency problems. If approved, a codevelopment effort with the UK will result in the design, fabrication, and test of an overpressure attenuation device and improvement in the high-explosive round; and in the conduct of selected portions of development testing (DT II). Mounts for vehicle application will be developed, fabricated, and tested. Integrated Logistic Support Items will be updated. Component testing of the 81mm illumination round will be conducted. Multipurpose Ammunition: Multipurpose technology will be translated, and test cartridges in 25mm, 20mm, and 50 caliber will be fabricated to support initial engineering design tests.

3. (U) FY 1982 Planned Program: Lightweight Company Mortar System: Engineering Development will be initiated on the XM721 illumination round. Smoke Mortar Round: Due to concept problems in developing an 81mm mortar smoke round, this project will remain in advanced development. Battalion Mortar System: Development Test II, Operational Test II, and operational climatic testing will be conducted to evaluate technical data and performance characteristics of the system. These tests will be conducted by the Test and Evaluation Command (TECOM) and the Operational Test and Evaluation Command (OTEA). Subsequently, a Development Acceptance In-Process Review will be held to determine whether the system meets the requirements and should be type classified and procured. All elements of Integrated Logistic Support will be completed. The Technical Data Package will be prepared and a producibility, engineering, and planning effort undertaken for US production of the 81mm high explosive round. Complete round testing, confirmation testing, and procurement of Development Test II rounds will be accomplished for the 81mm illumination round. Multipurpose Ammunition: Engineering design test of the 25mm, 20mm, and 50 caliber ammunition will be conducted. Testing will include alternate explosive fill, interoperability, and tracer improvement. The design engineering effort for the 25mm product improvement will reduce vehicle weight, improve ammunition performance, and achieve cost effectiveness.

4. (U) FY 1983 Planned Program: Lightweight Company Mortar System: Development of the XM721 illumination round will continue. Smoke Mortar Round: The 81mm smoke screening round will enter engineering development. All necessary experimental work will be performed, and the proposed system will be ready for full-scale development. Battalion Mortar System:

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Program Element: #6.46.01.A
DOD Mission Area: #211 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #4 - Tactical Program

Development Testing II and Operational Testing II for the 31mm illumination round are a recognized requirement although no funds are currently programed for this effort. Multipurpose Ammunition: Work on 20mm, 25mm, and 50 caliber will continue with fabrication of hardware and conduct of DT II. Type classification of these projectiles is expected in late FY 1983. Preliminary work will be initiated on the selected caliber (35mm or 40mm) for the DIVAD gun. Project 0030 is completed in FY 1983.

5. (U) Program to Completion: Lightweight Company Mortar System: Completion of development of the 60mm illumination round is planned. Smoke Mortar Round: 81mm smoke screening rounds will be tested and evaluated, with type classification scheduled for 4QFY85. Battalion Mortar System: DT II/OT II evaluation for the 31mm illumination round will be completed and the round type classified standard in 2QFY84.

FY 1982 RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.03.A

Title: Nuclear Munitions

DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare

Budget Activity: #4 - Tactical Program

A. RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	23077	11379				
	QUANTITIES	*	*				
0385	Improved 155mm Nuclear Projectile	18998	9153				
0584	Command Control and Security Systems	200	216				
0663	Improved 8-in Nuclear Projectile	3879	1810				

* Warhead quantities exceed the classification of this document.

** Total thousand is in the FY 1982 Budget Amendment.

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The mission of the Theater Nuclear Force (TNF) is to deter both nuclear and conventional attack by enemy forces, and should deterrence fail, to support the defense of the theater. This mission requires Army nuclear weapons that are controllable, effective, discriminant, and survivable.

Program Element: #6.46.03.A

DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare

Title: Nuclear Munitions

Budget Activity: #4 - Tactical Program

This program element is the foundation of the program to complete the modernization of the Army's battlefield nuclear weapons by improving the 8-inch and 155mm artillery-fired atomic projectiles (AFAP). Modernized AFAP will provide the critically needed reserve of combat power to ensure numerically inferior US and NATO forces are not defeated. They also provide the ability to tailor nuclear support for contingency force operations in non-NATO theaters. Because AFAP's are controllable and usable, their presence provides a real threat to enemy forces, reducing their effectiveness in massing to conduct a conventional battle. The NATO cannon artillery force structure is predominantly (80%) 155mm, and the 8-inch AFAP alone or with the old 155mm AFAP will not provide an adequate cannon-delivered nuclear capability. The combined US and non-US NATO forces have only about deployable 8-inch cannon, versus approximately deployable 155mm cannon. Some countries maintain only a token number of 8-inch cannon (e.g., and others have

The 155mm AFAP program is the only nuclear program that has been developed in conjunction with, and in consideration of, the Allied interest. A modernized nuclear projectile capability is required to replace the 155mm and 8-inch artillery-fired atomic projectiles (AFAP) currently available for NATO forces. The mission need for the Improved 155mm Nuclear Projectile is developed in additional detail in the D385 Project Descriptive Summary. RDTE on the Improved 8-inch Nuclear Projectile will be completed with the transition to production in FY 1981. Fielding of the 155mm and 8-inch AFAP will enhance the survivability and effectiveness of US and NATO TNF. All modernized weapons will have a command disable system that will prevent the weapon from being used in its intended mode; however, an improved capability is required to deny unauthorized access to weapons currently stockpiled, as well as newer weapons, when they are threatened by capture from a nontactical stockpile storage configuration. Prototype weapons access denial system (WADS) barriers and access-inhibitors will be installed on an upgraded nuclear weapons storage site in Europe and evaluated to identify the best combination of subsystems to improve the security of forward deployed Army nuclear weapons.

C. BASIS FOR FY 1982 RDTE REQUEST: The Improved Nuclear Projectile program was initially deferred in FY 1982 but has been reestablished by the FY 1982 Budget Amendment. FY 1982 funds requested will provide for initiation of production of hardware for Developmental Testing - Operational Testing, Phase II (DT/OT II), initial system safety study, maintenance evaluation, and new equipment test part of DT II for the Improved 155mm Nuclear Projectile, and initial system effectiveness evaluation of alternative weapon access denial systems installed in FY 1981 with Defense Nuclear Agency funds for the Command, Control and Security Systems Project. No FY 1982 RDTE funds are requested for the XM753/W79 Improved 8-inch Nuclear Projectile project which will be in its second year of quantity production for the stockpile.

Program Element: #6.46.03.A
 DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare

Title: Nuclear Munitions
 Budget Activity: #4 - Tactical Program

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Improved 155mm Nuclear Projectile Initial Operational Capability		
Command, Control and Security System Initial Operational Capability	See below	None specified, see below
Improved 8-inch Nuclear Projectile Initial Operational Capability		

Approving the Budget Amendment for the Improved 155mm Nuclear Projectile project in FY 1982 will ensure achieving an Initial Operational Capability in and The Command, Control, and Security Systems project objective was redefined in late FY 1980 from disablement system hardware development to weapon access denial system hardware development.

D. COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	23077	11379			
Funds (as shown in FY 1981 submission)	25646	12241			

(U) The \$2569 thousand decrease in FY 1980 is a result of:

(U) D385 - Reprogrammed \$2269 thousand unexpected funds made available by the leveling of project effort following the sharp reduction in the FY 1981 effort.

(U) D584 - Reprogrammed \$3000 thousand to higher priority Army requirements.

Program Element: #6.46.03.A

DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare

Title: Nuclear Munitions

Budget Activity: #4 - Tactical Program

(U) D663 - No Changes.

(U) The \$862 thousand decrease in FY 1981 is a result of:

(U) D385 - The FY 1981 decrease reflects the application of general Congressional reductions.

(U) D584 - The FY 1981 decrease reflects the application of general Congressional reductions.

(U) D663 - The FY 1981 decrease reflects the application of general Congressional reductions.

(U) The \$100 thousand decrease in FY 1982 is a result of:

D385 - Deferring project resulted in a \$34140 thousand decrease; but the FY 1982 Budget Amendment restored thousand for a net decrease of \$1140 thousand in this project. (see D385 Project Descriptive Summary.)

(U) Redefinition of project (see paragraph c, above) produced a \$1040 thousand increase.

(U) D663 - No funds required.

Program Element: #6.46.01.A

DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare

Title: Nuclear Munitions

Budget Activity: #4 - Tactical Program

E. OTHER APPROPRIATION FUNDS: (\$ in thousands)

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Cost
Ammunition Procurement, Army 155mm						
Funds (current requirements)	0	0				
Funds (as shown in FY 1981 submission)	0	0				
Quantities (current requirements)	**	**				
Quantities (as shown in FY 1981 submission)	**	**				
Ammunition Procurement, Army - 8-inch:						
Funds (current requirements)	19200	19700				
Funds (as shown in FY 1981 submission)	17800	19800				
Department of Energy-Defense Programs (DOE-DP) (formerly Energy Research and Development Agency, formerly Atomic Energy Commission)						
155mm nuclear nuclear Projectile	***	***	***	***	***	***
8-Inch Projectile	***	***	***	***	***	***

* Department of Defense Nuclear Weapon Components only.

** Warhead quantities exceed classification of this document.

*** DOE-DP budget figures exceed classification of this document.

The \$6100 thousand increase in total estimated procurement costs for the Improved 155mm Nuclear Projectile from FY80 to FY81's due to \$52100 thousand increase due to excess inflation beyond FY 1980 indices and FY 1981 Baseline Cost Estimate increases offset by a \$46000 reduction due to a 55% stockpile quantity decrease in accordance with the FY 1982 Amended Program Decision Memorandum. The FY 1981 Baseline Cost Estimate increases are detailed in paragraph 07 of the D185 Project Descriptive Summary. The \$14600 thousand increase in total estimated procurement costs for the Improved 8-inch Nuclear Projectile from FY80 to FY81 is due to inflation to FY 1980 constant dollars, 30% and greater increases in electronic costs,

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Program Element: #6.46.01.A

Title: Nuclear Munitions

DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare

Budget Activity: #4 - Tactical Program

the addition of prescribed under load containers, the addition of limited life component exchange vans, and the addition of alternate fuze setter power supplies.

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Program Element: #6.46.01.A

DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare

Title: Nuclear Munitions

Budget Activity: #4 - Tactical Program

F. DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is modernization of the Army's battlefield nuclear weapons to improve their real warfighting capability against the growing Soviet-Warsaw Pact armored forces, and thereby improve their deterrent value. Deterrence of armed aggression results from the enemy offensive planners' net assessment that their military operations will not succeed. This effect is produced by battlefield theater nuclear forces that are effective, discriminatory, controllable, and survivable. The potent reserve of combat power provided by battlefield nuclear weapons, particularly artillery-fired atomic projectiles (AFAP), and the linkage to strategic systems they imply are two of the most important elements that deter Warsaw Pact attack in Central Europe and Soviet military adventurism around the world. By their presence and possible use on the battlefield, US battlefield nuclear weapons will force an enemy to deploy his forces in a reduced mass posture that will decrease their effectiveness in conventional combat. The Army modernization program improves the deterrent value of Army nuclear weapons and reduces the likelihood of a conflict that would lead to nuclear war. The nuclear capability for the LANCE missile and 8-inch howitzer was modernized in preceding years, and these weapons are being fielded beginning in 1982 respectively. The major effort required in FY 1982 and outyears is the modernization of the 155mm nuclear capability. The current 155mm AFAP is (see paragraph A, D385 Project Descriptive Summary). It employs early 1950's nuclear technology

The modernized 155mm AFAP will be a lighter projectile, stressed for twice the launch setback forces and, with rocket-assist, will achieve ranges that allow standoff from the Soviet cannon artillery. The modernized weapon will have a yield times greater than the old 155mm projectile, and will provide times the lethal coverage. The new projectile will have a fuze to produce a precise height-of-burst with greater assurance of precluding fallout. Firing data corrections derived from the conventional ammunition being fired will reduce delivery probable errors by more as compared to the calculated corrections for the current 155mm AFAP. Finally, command and control on the new weapon will be provided by an electromechanical multiple-code permissive action link (PAL) instead of a mechanical lock, and weapon security will be improved by an integral, nonviolent command disable system. The command, control, and security system project is to develop and evaluate security system components and their integration into improved nuclear weapon access denial systems to improve the security of overseas nuclear weapon storage sites. The purpose of these systems will be to impose a guaranteed minimum delay for security backup forces to react to engage unauthorized site intruders. These systems will consist of active and passive devices functioning in synergism to impede the access to or removal of nuclear weapons in storage. This program is in response to a theater requirement to increase security beyond that provided in the Long-Range Security Program (LRSP)(storage site upgrade).

G. (U) RELATED ACTIVITIES: The development of improved nuclear projectiles is a joint Department of Defense (DOD) and Department of Energy-Defense Programs (DOE-DP) undertaking. In addition, the 8-inch nuclear projectile (Project 0663) uses

Program Element: #6.46.03.A

DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare

Title: Nuclear Munitions

Budget Activity: #4 - Tactical Program

the rocket motor developed for the M650 conventional 8-inch projectile (SSN E66600). The M650 is the conventional ballistic motor that will be used to derive firing data corrections for the XM753. Much of the electronic technology and production expertise developed for the 8-inch fuze will be applicable to the 155mm fuze. The command, control, and security systems project is being done in coordination with and is sponsored in FY 1981 by the Defense Nuclear Agency, Theater Nuclear Forces, Security, and Survivability (TNFS) Program. All Army nuclear munitions projects are coordinated through the Project Manager for Nuclear Munitions as well as the Army Staff to preclude duplication of effort.

II. (U) WORK PERFORMED BY: US Army Research and Development Command (ARRADCOM), Dover, NJ; Harry Diamond Laboratories, Adelphi, MD; Army Materiel and Mechanics Research Center, Watertown, MA; Ballistics Research Laboratory, Aberdeen, MD; Department of Energy-Defense Program activities and contractors in Germantown, MD; Albuquerque, NM; Amarillo, TX; Kansas City, MO; Los Alamos, NM; Las Vegas, NV; Livermore, CA; Denver, CO; Aiken, SC; Ferrulmatics Inc., Patterson, NJ; Chamberlin Corporation, Waterloo, IA; Motorola Corporation Incorporated, Scottsdale, AZ. (See also D385 Project Descriptive Summary.)

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1980 and Prior Accomplishments: Redesign of the LANCE warhead adaption kit to support a Department of Energy (DOE) in-production change to the reduced blast/enhanced radiation (RB/ER) W70 MOD 3 warhead and its non-RB/ER version, W70 MOD 4 warhead was completed in FY 1981. Completed laboratory, field, and joint flight testing of DOD-produced LANCE hardware leading to type classification in FY 1981. Production of LANCE warhead adaption kits was completed in FY 1979. The Army provided design support for the projectile main body case allowing DOE to

subcomponent packaging redesign of the fuze for the 155mm AFAP were initiated in FY 1979. Process engineering and design testing of the aft projectile body and rocket motor were conducted in FY 1979 and FY 1980. Ballistic characterization flight tests of mock 155mm nuclear projectiles were conducted in FY 1979. Engineering design support was provided for the Tri-Service EDS project and Army Materiel System Analysis Agency (AMSAA) Command, Control and Security Systems (CC&S) study. Fuze safety flight tests were completed on the fuze for the improved 8-inch AFAP in FY 1980. The fuze, fuze spanner wrench, projectile extractor, and training projectile were type classified for the 8-inch AFAP in FY 1979 and FY 1980. Engineering development of the AFAP limited life component (LLC) exchange van and stand was initiated in FY 1979.

Program Element: #6-46.03.A

DOD Mission Area: #231 - Battlefield Theater Nuclear Warfare

Title: Nuclear Munitions

Budget Activity: #4 - Tactical Program

Testing the structural integrity of field interchangeable projectile aft body/rocket motor joint and process engineering for rotating band attachment to the titanium projectile body of the 155mm AFAP was done in FY 1980. Flight testing of the 155mm AFAP design for ballistic performance was continued in FY 1980. The AMSAA CC&S study was completed, and the objective of project D584 was redefined to orient on weapon access denial systems (WAD). Development Testing/Operational Testing Phase 2 (DT/OT II) for the 8-inch AFAP, LLC van design, and transition to production for the 8-inch AFAP was completed in FY 1980.

2. FY 1981 Program: The reduction in 155mm AFAP modernization effort in FY 1981 (see D335 Project Descriptive Summary) prevents the planned procurement of hardware to support required DT/OT II testing. The revised program allows the Army to maintain continuity in the engineering development program for the radar fuze and to complete engineering design testing on the aft projectile body/rocket motor for the 155mm AFAP modernization in FY 1981. Defense Nuclear Agency will sponsor prototype access denial subsystems installation at the theater nuclear weapon storage site for evaluation and development by the Army in the command, control, and security systems project. Department of Defense (DOD) production line fuzes, rocket motors, and containers will be provided to Department of Energy (DOE) for assembly into the first production unit 8-inch nuclear projectiles. First delivery of the new 8-inch AFAP to DOD will occur in _____ and IOC will be in the _____.

3. FY 1982 Planned Program: Procure production-line quality fuzes, projectile aft body/rocket motors, containers, and fuze setters to support DT/OT II testing in FY 1983 and continue ballistic characterization flight tests for the 155mm AFAP modernization. Initiate evaluation of integrated weapon access denial subsystem at a theater storage site.

4. (U) FY 1983 Planned Program: Initiate DT/OT II testing and long-leadtime procurement and tooling to support production of the Improved 155mm Nuclear Projectile. Provide funds to DOE for Army reimbursable items of DOE developed equipment. Complete evaluation of access denial system.

5. Program to Completion: Complete DT/OT II testing, firing table flights, type classification, production, and training required to achieve Initial Operational Capability (IOC) with the modernized 155mm nuclear projectile in _____ Iterate weapon access denial system design as required and initiate military construction and other procurement as required to upgrade theater storage sites. Complete procurement of DOD-hardware to support deployment of the disapproved 8-inch nuclear projectile, XM54/W79.

FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D385

Title: Improved 155mm Nuclear Projectile

Program Element: #6.46.03.A

Title: Nuclear Munitions

DOD Mission Area: #241 - Battlefield Theater
Nuclear Warfare

Budget Activity: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: The objective of this project is the development of an improved 155mm Nuclear Projectile, the XM785 to replace the current 155mm artillery-fired atomic projectile (AFAP).

Soviet-Warsaw Pact (WP) tactical doctrine is based on massing maneuver forces to achieve a numerical superiority ratio of 10 or 12 to 1 at the decisive point in battle and to support their maneuver forces with massive firepower. Overall Soviet-WP maneuver forces outnumber NATO maneuver forces by about their cannon artillery outnumbers NATO cannon artillery by more than and their maneuver forces are highly mobile with armored protection. AFAP's give NATO forces the additional battlefield fire support needed to counter the Soviet-WP force superiority. Because they are controllable and useable, NATO AFAP present a threat to Soviet-WP forces that cause them to adopt combat formations that reduce their effectiveness in executing their doctrine for the conduct of battle. Thus, the real warfighting capability of AFAP deters conventional conflict as well as it provides a nuclear capability and a link to strategic systems. However, because of

The NATO cannon artillery force structure is predominantly (80%) 155mm. The 8-inch cannon will not provide an adequate battlefield nuclear capability alone, or even when augmented with the LANCE, the modernized 8-inch AFAP, and the old 155mm AFAP. Numerous comprehensive analyses by the Army, Office of the Secretary of Defense, Department of Energy, and the Defense Science Board have all concluded that both a modernized 8-in AFAP and a modernized 155mm AFAP are essential to a credible battlefield nuclear capability that provides first deterrence and then effectiveness, should deterrence fail. Nuclear capability provided by a dual-capable cannon force is also required because it needs no change in force structure of weapons, communications equipment, and manpower spaces beyond the artillery needs for the conduct of conventional fire missions. Analysis has shown that a nuclear capability in both the 8-inch and the

Project: #D385

Program Element: #6.46.03.A

DOD Mission Area: #241 - Battlefield Theater
Nuclear Warfare

Title: Improved 155mm Nuclear Projectile

Title: Nuclear Munitions

Budget Activity: #4 - Tactical Program

155mm cannon enhances the overall survivability of theater nuclear forces by compounding and complicating the enemy effort to target NATO nuclear forces. The combined US and non-US NATO forces have only about deployable 8-in cannon, versus approximately deployable 155mm cannon. Not all non-US NATO 155mm and 8-inch cannon are currently "nuclear certified", but 80% or more are "certifiable" and hence a nuclear threat to enemy forces. Some countries maintain only a token number of 8-in cannon's and others have only the 155mm cannon.

The 155mm AFAP project is the only nuclear modernization program that has been developed from the beginning in conjunction with and in consideration of the Allied interest. Based on this ongoing modernization, the NATO Allies have declined to certify their new family of howitzers, the SP/FH-70, with the old 155mm AFAP. The modernized 155mm AFAP will have a yield times greater than the 1950's technology could provide in the old 155mm AFAP and will provide times the lethal coverage. The new projectile will weigh less and be stressed for twice the launch setback forces. With rocket-assist, it will achieve approximately twice the range of the old 155mm AFAP allowing standoff from of Soviet cannon artillery. The modernized 155mm AFAP will have a fuze instead of the inherently inaccurate doppler proximity-mechanical time fuze on the M454, and will produce a more precise height-of-burst and have greater assurance of not producing fallout. Firing data corrections derived from the conventional ammunition being fired will reduce the delivery probable error by 50% or more compared to the method of calculated corrections used for the current 155mm AFAP. Finally, weapon control on the new AFAP will be provided by an electromechanical multiple-code permissive action link (PAL) instead of a mechanical lock, and security will be improved by an integral nonviolent command disablement system.

B. (U) RELATED ACTIVITIES: The Department of Energy, Defense Programs (DOE-DP) will develop the nuclear warhead. A joint DOE/DOD project officers group will coordinate the integrated DOE/Army development effort. The XM785 will attempt to match the ballistic characteristics of the M549 conventional 155mm projectile. It will also employ fuze technology developed and engineered for the 8-inch projectile. England, Germany, and Italy have completed development and are now beginning production on a new 155mm howitzer, the SP/FH70, with which the new 155mm nuclear projectile will be compatible.

C. (U) WORK PERFORMED BY: US Army Armament Research and Development Command (ARRADCOM), Dover, NJ; Harry Diamond Laboratories, Adelphi, MD; Army Materiel and Mechanics Research Center, Watertown, MA; ARRADCOM, Aberdeen, MD; Department of Energy, Defense Programs facilities, Lawrence Livermore Laboratory, Livermore, CA; Sandia Laboratories, Livermore, CA; Denver, CO; Aiken, SC; Chamberlain Corporation, Waterloo, IA; Motorola Incorporated, Scottsdale, AZ.

Project: #D385
Program Element: #6.46.03.A
DOD Mission Area: #41 - Battlefield Theater
Nuclear Warfare

Title: Improved 155mm Nuclear Projectile
Title: Nuclear Munitions
Budget Activity: #4 - Tactical Programs

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1980 and Prior Accomplishments: Subsequent to the Public Works Subcommittee hearings on the FY 1977 Energy Research and Development Agency (now Department of Energy-Defense Programs (DOE-DP)) Appropriation Act, DOE and Department of Defense (DOD) were directed by Congress to jointly reassess the 155mm nuclear projectile requirement in light of the approved 8-inch nuclear projectile and the LANCE Mod 3 warhead production. The "155mm Artillery Fired Atomic Projectile Modernization Analysis" report was provided to Congress in February 1977. The Army requested DOE-DP participation in a joint engineering development program for an improved 155mm projectile in May 1977 and DOD forwarded the request to DOE in October 1977. DOE accepted the program and began engineering development (Phase 3 for DOE) in February 1978. The Secretary of Defense had directed in his FY 1979 Amended Program Decision Memorandum (APDM) that the Initial Operational Capability date for the improved 155mm nuclear projectile be accelerated. The basis for this directive was the possibility of a pre-comprehensive test ban (CTB) moratorium on testing that would stop development of the new projectile. The Army and DOE pursued an atypical development program that resulted in an underground nuclear test in of a weaponizable nuclear device for the 155mm projectile. This test assured that the Army could modernize the 155mm in the event of a CTB. It was also a proof test for design changes that produced a yield greater than All Army RDTE effort in FY 1978 was devoted to engineering design work on the projectile main body in support of the early DOE nuclear test. Design changes in the nuclear device forced a reduction in the volume available for a rocket motor. The need to develop a new rocket motor, the delay in DOE acceptance of the program, and the push for an early nuclear test caused the Army to slip the Initial Operational Capability (IOC) Full Engineering Development was initiated in FY 1979. Electronic packaging of fuze functions, test firing of high energy rocket propellants, ballistic characterization analyses, interface iteration with DOE, and metallurgical manufacturing processes were all emphasized. The developer's acquisition plan was formalized and reviewed by the Army Staff in late FY 1979. Ballistic characterization flight tests and structural integrity flight testing of DOE components were conducted. The design of the field joint between the DOE weapon in the projectile main body and the projectile aft body that provides for interchangeability of the range-extending rocket motor was finalized. Process engineering for the attachment of high-pressure obturating bands/rotating bands to the titanium aft projectile body/rocket motor was developed in an Army laboratory and transferred to the Chamberlin Corporation. Conducted functional flight tests of prototype fuzes. Established the ballistic validity of ballistic verification projectiles and further characterized the ballistic performance of the XM785. After a DOD reduction in the FY 1981 program (to relieve mid-1980's demands on the Department of Energy (DOE) nuclear weapon production complex), the FY 1980 program was intentionally slowed to level the effort through FY 1980 and FY 1981, and to minimize the impact of the reduction on out-of-house contractors.

Project: #D385

Program Element: #6.46.03.A

DDO Mission Area: #241 - Battlefield Theater
Nuclear Warfare

Title: Improved 155mm Nuclear Projectile

Title: Nuclear Munitions

Budget Activity: #4 - Tactical Programs

2. (U) FY 1981 Program: Sustain the contractor (Motorola) fuze production line to preserve the validity of FY 1980 fuze testing data for use in conjunction with Development Testing/Operational Testing, Phase 2 (DT/OT II). Complete validation testing of titanium aft body process engineering. Conduct Special In-Process Review to update Acquisition Plan and a design review and acceptance of the DOE Preliminary Weapon Development Report.

3. (U) FY 1982 Planned Program: Initiate production of production-line quality fuzes, projectile aft/bodies/rocket motors, containers and fuze setters for DT/OT II testing. Continue ballistic characterization flight tests.

4. (U) FY 1983 Planned Program: Initiate DT/OT II testing. Initiate long-leadtime procurement and tooling to support quantity production.

5. Program to Completion: Complete development and DT/OT II testing, firing table flights, type classification, and production of the XM785 nuclear projectile with XM749 fuze and all ancillary and support equipment. Complete new materiel training and achieve initial operational capability (IOC) with an Improved 155mm Nuclear Projectile in 4QFY85.

6. Major Milestones:

Project: 7D385

Program Element: #6.46.01.A

DOD Mission Area: #241 - Battlefield Theater
Nuclear Warfare

Title: Improved 155mm Nuclear Projectile

Title: Nuclear Munitions

Budget Activity: #4 - Tactical Programs

<u>Major Milestones</u>	<u>Current Milestone Dates</u>	<u>Milestone Dates Shown in FY 1980 Submission</u>
Army requested Joint Department of Defense-Department of Energy (DOD-DOE) Engineering Development of new 155mm Nuclear Projectile	May 1977	May 1977
OSD forwarded request to DOE	Oct 1977	Oct 1977
DOE accepted request (Initiated Phase 3)	Feb 1978	Feb 1978
DOE underground nuclear test proves technology		
In-Process Review (IPR) to approve Acquisition Plan	Mar 1979	Mar 1979
DOE underground nuclear test proves weaponization		
Begin development testing/ operational testing (DT/OT II)	January 1983*	4QFY1982
Development Acceptance (DEVA) IPR (DOD components only)	February 1984	4QFY1983
First DOE Production Unit Type Classify Total System (DOD & DOE components)	May 1985*	4QFY1984
First War Reserve Hardware Available for DOD	2QFY1985*	1QFY1985
Initial Operational Capability (IOC)		

Project: #0385

Program Element: #6.46.03.A

DOD Mission Area: #241 - Battlefield Theater
Nuclear Warfare

Title: Improved 155mm Nuclear Projectile

Title: Nuclear Munitions

Budget Activity: #4 - Tactical Programs

Because of the urgent need for the 155mm nuclear projectile modernization, slippage in the current milestone dates from the dates shown in the FY 1981 submission resulted from refinements to development scheduling by both DOD and DOE in further adjustment to the FY 1981 decrement. No slippage of the IOC due to DOD development program is anticipated. The predicted capacity of the DOE production complex and the could force IOC delays in the future. Asterisked (*) milestone dates depend on the thousand in the FY82 Budget amendment.

7. Resources (\$ in thousands):

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>to Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
RDTE						
Funds (current requirements)	18998	9353				
Funds (as shown in FY 1981 submission)	21267	10049				
Quantities (current requirements)	*	*				
Quantities (as shown in FY 1981 submission)	*	*				

* Total in FY 1982 is FY 1982 Budget Amendment to restore funds deferred by the preceding administration.

The \$2269 thousand decrease in FY 1980 is the result of reprogramming unexpended funds made available by the leveling of effort in FY 1980 and FY 1981 after the sharp reduction in the FY 1981 program (see explanation, paragraph D1). At least \$1999 thousand of this amount is anticipated to be reprogramed back in the future. The \$696 thousand decrease in FY 1981 reflects the application of general Congressional reductions. The \$1140 thousand decrease in FY 1982 is due to a \$961 thousand decrease due to refinements in the program that followed the FY 1981 reduction (see explanation, paragraph D1) and a thousand decrease that occurred when the thousand deferred from the FY 1982 budget was "rounded-off" to, thousand in the FY 1982 amendment.

Project: #0385
 Program Element: #6.46.01.A
 DOD Mission Area: #241 - Battlefield Theater
Nuclear Warfare

Title: Improved 155mm Nuclear Projectile
 Title: Nuclear Munitions
 Budget Activity: #4 - Tactical Programs

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
Other Appropriations:**						
Procurement Ammunition, Army						
Funds (current requirements)	0	0				
Funds (as shown in FY 1981 submission)	0	0				
Quantities (current requirements)	0	0				
Quantities (as shown in FY 1981 submission)	0	0				

*Warhead quantities and production rates exceed the classification of this submission. Overall quantity changed from FY 1981 to FY 1982 (see below).

**Department of Defense-procured components only; Department of Energy-Defense Programs (DOE-DP) budget figures exceed classification of this document.

The \$6100 thousand increase in procurement cost from FY80 to FY81 is due to \$52100 thousand increase due to inflation to FY 1980 constant dollars and Base Line Cost Estimate increases offset by a \$46000 reduction due to a 55% stockpile quantity decrease in accordance with the FY 1982 Amended Program Decision Memorandum. The FY 1981 Base Line Cost Estimate increases were due to 30% and greater increases in electronic costs, the addition of titanium for rocket motor bodies, the addition of prescribed nuclear load trainers, the addition of limited-life component vans, and the addition of alternate fuse-setter power supplies.

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FY 1982 ROTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: 06.46.08.A
DOD Mission Area: 0211 - Close Combat

Title: Army Small Arms Program
Budget Activity: 14 - Tactical Program

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	1446	0	400	400	Continuing	Not Applicable
DF 21A	NATO Small Arms Evaluation	1446	0	400	400	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The NATO Small Arms Evaluation was completed in FY80 and has resulted in a NATO standardization Agreement (STANAG) that is undergoing ratification by member countries. The standardization effort described below represents a new start in FY82 under this program element. The product of this effort is the development, maintenance, and assurance of complete interchangeability of small caliber and automatic cannon caliber ammunition and weapons among all NATO countries with all of the logistic, strategic, and tactical advantages associated therewith. This is achieved by developing, implementing, and maintaining NATO standardization agreements (STANAG's) and by periodic inspection of compliance thru structured batteries of standardized interchangeability tests at specially equipped and calibrated Test Centers (chartered by NATO and operated under NATO aegis), one of which is the North American Regional Test Center (NARTC) located at US Army ARRADCOM, Ft Dix, NJ. Included in this program is the development of these standard test procedures and test equipment and their codification into standard NATO Manuals of Proof and Inspection Procedures, as well as the staffing and operation of the NARTC. The program includes all studies, experimental work, and analyses required to generate and support US positions and to fulfill commitments made to NATO. The program covers the entire range of weapon systems up to and including 40mm, and is currently active in 5.56mm, 7.62mm, 9mm, 20mm x 139, and 25mm ammunition and includes all ancillary items such as links, clips, chargers, and magazines. The addition of 35mm-40mm ammunition is anticipated in consequence of the DIVADS program.

C. (U) BASIS FOR FY 1982 ROTE REQUEST: These funds are to support US participation in the work of the NATO Panel (AC/225 Panel III, Sub-Panel I) responsible for NATO small caliber ammunition; the implementation of NATO agreements into the US production base; the staffing, maintenance, and operation of the NARTC; and all necessary engineering and laboratory support required during FY 1982. This program has been operational for 20 years and supported from procurement appropriations, a method now deemed unsuitable for supporting this continuing program. Milestones are not applicable to this program.

D. (U) COMPARISON WITH FY 1981 ROTE REQUEST: (\$ in thousands) Not Applicable. There was no FY81 submission.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable.

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Program Element: #6.46.08.A

DOD Mission Area: #011 - Close Combat

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Title: Army Small Arms Program

Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The objectives of the program are the participation in multilateral efforts to achieve complete battlefield interchangeability of all small caliber and automatic-cannon caliber ammunition produced in all NATO countries in all of the weapons produced by or used in those countries; to implement resultant standardization agreements into US production; to participate in the design and operation of a mechanism for guaranteeing and maintaining compliance with NATO standardization agreements by the US. The program has the following discrete elements:

a.(u) To participate in the development of the technical content of all NATO standardization agreements (STANAG).

b.(u) To foster, advocate, and recommend use by the NATO Panel and incorporation into applicable STANAG's to the fullest extent possible, designs, processes, requirements, procedures, and equipment of the US so that compliance of the terms and conditions of the STANAG can be achieved by the US at minimum cost and with the least possible disruption of well-established procedures and processes.

c.(u) To reconcile differences, when they exist, between US national interests and those of NATO; to obtain through suitable negotiation, a congruence of these interests and to achieve the goals and objectives of the NATO panel with the least possible compromise of or modification to US national interests, policies, programs, and procedures. To provide technical guidance to national design, production, or procurement agencies early enough to prevent embarkation on a course which ultimately will prove detrimental to US interests or deleterious to the goal of battlefield interchangeability.

d.(u) To monitor the output of the US design, procurement, production, or using agencies to obtain timely indication of difficulties or hardships for which relief should be sought through modification of some aspect of the agreements in the STANAG; to prepare an effective technical position (often requiring testing or other experimental work) to petition for such relief and to endeavor to obtain that relief without endangering or diminishing the ultimate accomplishment of the NATO panel.

e.(u) To prepare and publish the English language version of the NATO Manuals of Proof and Inspection Procedures and amendments and revisions thereto, as a service to the NATO panel.

f.(u) To manage the interfaces between NATO and the US authorities in areas of ammunition standardization.

g.(u) To staff, equip, maintain, and operate the North American Regional Test Center (NARTC), which serves as an extra-national test agency to conduct, as a service to NATO, official NATO qualification-approval, production and surveillance testing of ammunition and ancillary items produced in NATO countries, and other engineering-type tests directed by NATO. Such other tests include tests to qualify new weapon designs for use in ammunition tests, tests to design and approve new test equipment and methods for adoption by NATO, tests to establish international standards for reference rounds, piezo-electric pressure transducers, and test barrels.

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Program Element: #6.46.08.A
DOD Mission Area: #211 - Close Combat

Title: Army Small Arms Program
Budget Activity: #4 - Tactical Programs

h.(4) To participate in the affairs of the NATO panel through active attendance at plenary sessions and meetings of the executive committee and North American Regional Panel and all ad hoc committees and working groups established by the Chairman for the accomplishment of a specific job or consideration of a particular problem.

G. (U) RELATED ACTIVITIES: The program embodies the total US effort in achieving NATO interchangeability of small caliber and automatic cannon caliber infantry weapon systems. This program contains no duplication of effort either within the Army or DOD and meets the relevant mission requirements of all services.

H. (U) WORK PERFORMED BY: RDTE work associated with this program is conducted in-house at the US Army ARRADCOM facilities located at Dover and Fort Dix, NJ. No contractors are associated with this program except for small procurements of test equipment and material.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Prior efforts under this program element were the funding of the NATO Small Arms Evaluation through FY 1980. That program has been completed and has resulted in the selection of a second NATO standard caliber (5.56mm) for small arms and the production of a NATO Standardization Agreement (STANAG) which is undergoing ratification by member countries. The described effort is a new program under this program element. The prior program was generally funded from the procurement allocations under which ammunition standardization programs were developed and implemented for 7.62mm, 9mm, 20mm x 139 and for 7.62mm links, clips, and chargers. A STANAG for 5.56mm ammunition has been initiated, and a STANAG for 25mm ammunition is in process. The North American Regional Test Center (NARTC) has been fully staffed and equipped and has been operational for 19 years. It actively maintains calibration and correlation with its European counterpart and ten National Test Centers. As a result of these efforts, the armies of the NATO countries are equipped with rifles, machine guns, sidearms and automatic cannon which will fire any ammunition produced in any of the NATO countries. As a result of the mechanisms established in these prior years, the interchangeable stockpile of NATO ammunition is still growing, in some cases, 20 years after ratification of the STANAG, and the introduction of noninterchangeable ammunition has been dependably prevented. The cost of the program is fully justified by the magnitude of the follow-on ammunition production whose interchangeability is guaranteed by this work. As an example, since the ratification of STANAG 2310 (7.62mm ammunition), the US has produced approximately 6500 lots containing nearly 10 billion rounds of interchangeable 7.62mm ammunition worth some \$750 million and approximately 2 million 7.62mm weapons worth \$500 million. The total NATO 7.62mm system consists of some 25 cartridge designs fully interchangeable in more than 20 weapons deployed throughout NATO. Furthermore, the confidence with which the interchangeability established by this program is held allows for the acquisition of foreign weapons with no question of incompatibility with domestic ammunition; for example, the US adoption of the Belgian MAG 58 machine gun as the M240 machine gun for use on US tanks.

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Program Element: #6.46.08.A
DOD Mission Area: #11 - Close Combat

Title: Army Small Arms Program
Budget Activity: #4 - Tactical Programs

2. (U) FY 1981 Program: FY 1981 is the transition year from prior funding sources to RDTE. Whereas an FY 1981 proposal was not submitted in time to be included in the budget, a below threshold reprogramming action is expected to provide sufficient funds in FY 1981. These funds will be used to continue all of the ongoing efforts including operation of the North American Regional Test Center (NARTC), and to complete the development of the standardization program for 5.56mm ammunition.

3. (U) FY 1982 Planned Program: The FY 1982 program will primarily support the completion of the 25mm standardization program, the design, acquisition, and/or fabrication of 5.56mm-peculiar test equipment and gauges, the publication of the 5.56mm Manual of Proof and Inspection Procedures, and initiation of full-scale efforts on standardization of 5.56mm link, clips, and chargers. The FY 1982 program will also continue the operation of the NARTC and will probably support the first interchangeability firings of 5.56mm ammunition and the first US attempts at 9mm ammunition production.

4. (U) FY 1983 Planned Program: The FY 1983 program will support the continuation of all ongoing programs and operation of the NARTC, and will complete the design, acquisition, and/or fabrication of 25mm-peculiar test equipment and gauges, the publication of the 25mm Manual of Proof and Inspection Procedures, and completion of work on the STANAG's for 5.56mm ancillary equipment.

5. (U) Program to Completion: This is a continuing program that will extend as long as the interchangeability of weapons and ammunition within the NATO community is US policy. In the outyears existing programs will be continued and new ones added as the NATO standardization of additional calibers becomes a desired objective.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.09.A

Title: Combat Support Systems

DOD Mission Area: #215 - Land Combat Support

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion Continuing	Total Estimated Cost Not Applicable
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	1297	548	3102	2701	Continuing	Not Applicable
D191	Smoke Munitions and Material System	1297	548	3102	2701	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the Engineering Development (ED) of new and improved smoke munitions and systems. Adequate tactical protection of armored vehicles requires that they possess the means to rapidly and effectively obscure the enemy's surveillance and thus interfere with his weapons acquisition, aiming, and guidance capabilities. Armored vehicle on-board smoke screening systems being developed will provide rapid response protection systems that meet this requirement.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Funds are required to complete development of the rapid smoke grenade launcher for tactical vehicles such as self-propelled artillery, self-propelled air defense systems, and combat support vehicles, to complete validation and adaptation studies of the vehicle engine exhaust smoke system (VEESS) to the M60, M60A2, and M48A5 tanks, Armored Vehicle Launch Bridge (AVLB), M728 Combat Engineering Vehicle (CEV), and M88A1 Medium Recovery Vehicle (MRV), and to continue development of VEES for armored vehicle engines such as self-propelled artillery and air defense systems.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE Funds (current requirements)	1297	548	3102	Continuing	Not Applicable

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Program Element: 06.46.09.A
 DOD Mission Area: 015 - Land Combat Support

Title: Combat Support Systems
 Budget Activity: 04 - Tactical Programs

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
Funds (as shown in FY 1981 submission)	1028	620	3528	Continuing	Not Applicable

The \$169 thousand dollar increase in FY 1980 was required to complete type classification of the XM257 grenade launcher. The decrease of \$72 thousand in the FY 1981 funding level reflects the application of general Congressional reductions. The \$426 thousand decrease in FY 1982 is the result of not receiving projected requirements for developing grenade launcher systems for self-propelled air defense weapons and artillery.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands): Not Applicable.

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Program Element: #5.46.09.A
DOD Mission Area: #215 - Land Combat Support

Title: Combat Support Systems
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: This program supports the development of rapid smoke protection for US armored vehicles to include the following: application of the M239 or M250 rapid smoke grenade launcher to M60A2, XM1, and M48A5 tanks, M728 Combat Engineer Vehicle, DIVAD Gun, and M88A1 Medium Recovery Vehicle, development of a 4-tube discharger, grenade launcher system for application to the Infantry Combat Vehicle, Improved TOW Vehicle, SLUFAC, M113 Squad and TOW Carrier, and other combat vehicles. Additionally, a vehicle engine exhaust smoke system (VEESS) for M60A1/A3 tanks and other US diesel-driven armored vehicles is being developed which will complement the rapid smoke grenade launcher system.

G. (U) RELATED ACTIVITIES: The Army is the Department of Defense (DOD) Executive Agent for development of smoke and multi-spectral obscurants. The other Services sponsor engineering development for materiel unique to each service. Liaison personnel from each Service monitor the developing agencies programs, and joint committees meet regularly to review Service needs and insure development programs are oriented to satisfy joint needs. This program is supported by Program Elements 6.26.22.A, Chemical Munitions and Chemical Combat Support, and 6.36.27.A, Combat Support Munitions.

H. (U) WORK PERFORMED BY: The Smoke Systems program is managed by the Project Manager-Smoke/Obscurants. Approximately 60 percent of the armored vehicle rapid smoke protection systems effort will be in-house by US Army Chemical Systems Laboratory, Edgewood, MD; 20 percent will be the test effort of the US Army Test and Evaluation Command, Aberdeen Proving Ground, MD; and 20 percent will be contractor effort. Fifty percent of the vehicle exhaust smoke generating system will be in-house by the US Army Chemical Systems Laboratory, Edgewood, MD, and 50 percent will be contractual effort with Teledyne Continental Motors Corporation, Muskegon, MI. Other efforts supporting this program will be conducted by US Army Test and Evaluation Command, Aberdeen, MD; Miller Research Corporation, Baltimore, MD; Battelle Corporation, Columbus, OH; Project Manager-M60; Project Officer-M88; Project Manager-XM1; Project Manager-Fighting Vehicle Systems (FVS); Project Manager-Improved TOW Vehicles; Project Manager M113A1 Armored Personnel Carrier; Chrysler Corporation Defense Division, Warren, MI; and US Army Armament Materiel Readiness Command, Rock Island, IL.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Concept feasibility testing, user testing, and type classification of the M239 launcher (6-tube) and L8A1 Smoke Grenade for M60A1/A3 Tanks were completed in FY76 along with the initiation of design for a 4-tube launcher for other types of armored vehicles. During FY 1978, the US Tank Units in Europe received approximately 600 of the recently type classified M239 rapid smoke grenade launcher systems. The initial filling plan, which called for issuing 1291 M239 systems to US Army forces in Europe for application to M60A1 tanks, was completed in December 1978. In FY 1979, type classification of the M243 and M250 rapid smoke grenade launchers was completed. A value engineering program to redesign the M239 launcher dischargers to reduce the weight, develop interchangeable bases, and lower the

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Program Element: #6.46.03.A

Title: Combat Support Systems

DOD Mission Area: #215 - Land Combat Support

Budget Activity: #4 - Tactical Programs

cost was initiated. Coordination with Project Manager-M60 was initiated for fielding of the vehicle engine exhaust smoke system (VEESS) on M60A1/A3 tanks. Validation and adaption programs of the VEES to the M60, M60A2, M48A5 tanks, AVLB, M728 CEV, and M88A1 Medium Recovery Vehicle (MRV) were initiated. and artillery. In FY 1980 the XM259 smoke grenade launcher designed for use on the Infantry Fighting Vehicle (IFV) was type classified. Effort continued on development of the XM259 grenade launcher and adaptation for follow-on armored vehicle requirements, and the validation and adaptation studies of the VEES to the M60, M60A2 and M48A5 tanks, AVLB, M728 CEV and M88A1 MRV. A feasibility study of a VEES for the Detroit Diesel 6V53 engine was initiated.

2. (U) FY 1981 Program: Development efforts will continue on the XM259 grenade launcher for the M113A1 Armored Personnel Carrier, Surface Launch Unit Fuel Air Explosive (SLUFAE), and the Marine Corps LVT-7 vehicles. Work will also continue on validation and adaptation studies of the VEES to the M60, M60A2, and M48A5 tanks, Armored Vehicle Launch Bridge (AVLB), M728 CEV, and M88A1 MRV. Developmental work on an engine smoke generator for the XM1 tank and Infantry Fighting Vehicle/Cavalry Fighting Vehicle will be monitored by PM Smoke. System-specific work will be accomplished by each system's respective project manager office.

3. (U) FY 1982 Planned Program: Development and adaption of rapid smoke grenade launcher systems for the M113A1 SLUFAE and the LVT Vehicles will be completed. The feasibility study of a VEES for the 6V53 Detroit diesel engine will also be completed. Fielding programs of the vehicle engine exhaust smoke system (VEES) will be coordinated with PM-M60 for the M60, M60A2, and M48A5 Tanks, Armored Vehicle Launch Bridge (AVLB), and M728 Combat Engineer Vehicle (CEV). Engineering Development will be initiated on a manportable smoke/obscurants generating system. The Development Test II/Operational Test II plan will be prepared. Procurement of test items will be initiated.

4. (U) FY 1983 Planned Program: Engineering Development effort on launcher adaptation for additional identified armor vehicle requirements will continue. Development will be initiated on a vehicle engine exhaust smoke system (VEES) for the 6V53 Detroit diesel engine and other tracked vehicle engines as required. The DT II/OT II tests of the manportable obscurants generating system will be completed and evaluated. Production prototypes will be selected. Plans for DT II/OT II on the XM76 infrared defeating smoke grenade will be prepared.

5. (U) Program to Completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: 06.46.10.A

Title: Lethal Chemical Munitions

DOD Mission Area: 0215 - Land Combat Support

Budget Activity: 04 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion Continuing	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	1050	0	2219	1583	Continuing	Not Applicable
DF94	Lethal Chemical Ground Munitions	1050	0	2219	1583	Continuing	Not Applicable
DF95	Lethal Chemical Missile Warhead	0	0	0	0	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Soviet Union has developed and continued to maintain a formidable offensive chemical warfare capability which presents a threat to the survival of United States (US) and North Atlantic Treaty Organization (NATO) forces. In contrast, the US has not manufactured any chemical weapons since 1969. Consequently, the current stockpile is deteriorating and becoming obsolete. National defense policy requires the development and maintenance of a credible deterrent/retaliatory chemical warfare capability. This Program Element supports that requirement by providing for the Engineering Development of agent/munition prototypes completing Advanced Development. Work accomplished under this program supports all Engineering Development needs of the Army, and the ground forces of the Marine Corps for the development of a chemical capability for artillery, rocket, and tactical missile warheads.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Engineering Development (ED) will be initiated on a lethal binary Intermediate Volatility Agent (IVA) 155mm projectile. The enhanced inhalation and percutaneous effects of the IVA will significantly increase casualty production in the target area. The longer persistency of the IVA will also reduce the number of munitions required to maintain contamination in a given area for a specified time. Funds are not programmed for work in Project 6.46.10 DF95, Lethal Chemical Missile Warheads, until FY 1984 when a chemical warhead for the Multiple Launch Rocket System (MLRS) is scheduled to transition from Advanced to Engineering Development.

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Program Element: #6.46.10.A
 DOD Mission Area: #015 - Land Combat Support

Title: Lethal Chemical Munitions
 Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Initiate Engineering Development (ED) on 155MM Binary Intermediate Volatility Agent Projectile	1Q FY 1982	Not Shown in FY 1981 Submission
Complete ED on 155mm IVA Projectile	4Q FY 1984	Not Shown in FY 1981 Submission
Initiate ED on Chemical Warhead for MLRS	1Q FY 1984	Not Shown in FY 1981 Submission
Complete ED on Chemical Warhead for MLRS	4Q FY 1987	Not Shown in FY 1981 Submission

The scheduled milestone and programed funding for this Program Element are extremely sensitive to changes in national policy in regard to chemical warfare and Congressional and Presidential support for construction and operation of a binary production facility. Acquisition and maintenance of a credible deterrent/retaliatory capability requires consistent support.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE					
Funds (Current Requirements)	1050	0	2219	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)					

(CDS not Submitted for FY 1980 and FY 1981)

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Program Element: #6.46.10.A

Title: Lethal Chemical Munitions

DOD Mission Area: #215 - Land Combat Support

Budget Activity: #4 - Tactical Programs

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands): Not applicable.

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Program Element: 6.46.11.A

DOD Mission Area: 215 - Land Combat Support

Title: Lethal Chemical Munitions

Budget Activity: 4 - Tactical Programs

F. (U) **DETAILED BACKGROUND AND DESCRIPTION:** The objective of the Program Element is to apply the inherent safety characteristics of the binary concept to Engineering Development of lethal chemical artillery munitions and warheads for rockets and missiles which successfully complete Advanced Development. The program is essential to the development of a credible deterrent/retaliatory capability required by national security policy and to counter the formidable threat posed by the Soviet Union. Development of both artillery munitions and rocket and missile warheads is required to provide a capability to engage targets in both the forward and rear areas of the battlefield. Such a capability will increase the deterrent/retaliatory value of our chemical stockpile.

G. (U) **RELATED ACTIVITIES:** Department of Defense (DOD) Directive 5160.5 assigns the Army executive agent responsibilities for the development of all lethal chemical agents and munitions from Basic Research (6.1) through Advanced Development (6.3), and for Engineering Development (6.4) for common use munitions. Each Service sponsors Engineering Development on lethal chemical agent weapons unique to its own specific requirements. Information is exchanged and efforts coordinated through exchange of technical documents, liaison officers, and joint technical coordinating groups which meet on a regular basis. This Program Element (PE) is supported by technology developed in PE 6.26.22.A, Chemical Munitions and Chemical Combat Support, and PE 6.36.15.A, Lethal Chemical Munitions Concepts, Project 6.36.15.DE76, Lethal Chemical Materiel.

H. (U) **WORK PERFORMED BY:** The US Army Chemical Systems Laboratory at Edgewood, MD, is the in-house developer for lethal chemical agent munitions. The US Army Test and Evaluation Command (TECOM), at Aberdeen Proving Ground, MD, and Dugway Proving Ground, Dugway, UT, provide test and evaluation support.

I. (U) **PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:**

1. (U) **FY 1980 and Prior Accomplishments:** The M687 binary nonpersistent lethal chemical nerve agent projectile completed Engineering Development (ED) and was type classified in FY 1976. Development has continued on the XM736 binary persistent lethal nerve agent 8-inch projectile from FY 1977 to the present. Type classification for the XM736 was initially scheduled for FY 1979. Technical problems have required a delay in type classification to 4th quarter FY 1981. Funds to continue the ED efforts in FY 1980 have been provided by Army reprogramming, and it is planned to reprogram funds in FY 1981 to continue the work. Because there have been no funds programmed for this PE since FY 1979, a Congressional Descriptive Summary (CDS) was not submitted in FY 1980 and FY 1981. The programmed funding in FY 1982 and beyond reflects the increased urgency to modernize our deteriorating chemical weapons stockpile and develop a credible deterrent/retaliatory capability. During FY 1980 Development Test II/Operational Test II (DT II/OT II) was resumed on the XM736. The testing was scheduled to be completed in the 1st Quarter of FY 1981.

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Program Element: #6.46.10.A
DOD Mission Area: #215 - Land Combat Support

Title: Lethal Chemical Munitions
Budget Activity: #4 - Tactical Programs

2. (U) FY 1981 Program: The DT II/OT II testing of the XM736 binary projectile was temporarily suspended in November 1980 while deficiencies observed during dynamic firing using agent stimulants are investigated and evaluated. A decision to resume testing or initiate additional engineering design work is scheduled to be made before the end of 2nd Quarter FY 1981. The \$594 thousand required to support the efforts will be provided by reprogramming by the Army. Unless time-consuming redesign work is required, completion of ED and type classification is scheduled for 4th Quarter FY 1981.

3. (U) FY 1982 Planned Program: It is planned to initiate ED on the 155mm binary intermediate volatility agent (IVA) projectile. Manufacture of munition components will be initiated, and the DT II/OT II test plan will be completed.

4. (U) FY 1983 Planned Program: Engineering Development of the 155mm binary IVA projectile will continue with the initiation of DT II/OT II.

5. (U) Program to Completion: Engineering Development will be completed on the 155mm projectile in FY 1984 and initiated on chemical warheads for the Multiple Launch Rocket System (MLRS) and the Corps Support Weapon System (CSWS). Work will continue on the MLRS and CSWS chemical warheads through FY 1987. The PE will continue to support ED on new munition requirements identified by the user community.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.12.A
DOD Mission Area: #214 - Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	3608	1786	3031	5272	Continuing	Not Applicable
	QUANTITIES						Not Applicable
D021	Explosive Demolitions	600	203	211	1458	Continuing	Not Applicable
D145	Surface-Launched Unit, Fuel-Air Explosive (SLUFAE)	1969	351	0	0	0	2613
D300	Countermine and Barrier (NATO)	0	538	0	0	0	538
D415	Mine Neutralization/Detection	1039	694	2820	3814	Continuing	Not Applicable

The total estimated cost of project number D145 as reported in FY81 Congressional Descriptive Summary was understated due to administrative oversight. The project total under this PE did not include R&D totals accruing during the FY71-FY77 time period while included in PE 6.36.19A, Landmine Warfare and Barrier Development, Project D606, Landmine Warfare Development and PE 6.46.12A, Countermine and Barriers, Project D415, Mine Neutralization/Detection. The current total estimated cost represents actual total R&D costs based on government records through FY80 and those additional known remaining R&D costs in FY81.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This PE provides for the development of explosives and devices for general tactical demolitions missions, special-purpose items for general Army and Special Forces use, equipment for US Army Technical Escort, Army-peculiar tools and kits for Explosive Ordnance Disposal (EOD) units and engineering development of a group of complementary mine detection and neutralization systems. Demolitions are used to assist in the rapid creation of obstacles to enemy movement and to aid friendly mobility by clearing enemy obstacles and debris. Technical escort provides for the safe movement of potentially hazardous munitions. EOD units provide a capability to neutralize inherent explosive ordnance hazards which present a possible threat to operations, installations, personnel, or materiel. Historically, minefields have proven to be effective combat multipliers used primarily in the defense. Defensive minefields are selected to take advantage of natural obstacles and to stop or canalize attacking forces. Mines are also used offensively for flank protection of advancing formations to deny access to vital terrain and routes of communications. The Warsaw Pact, whose

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Program Element: #6.46.12.A
DOD Mission Area: #214 - Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

doctrine specifies the use of minefields during both offense and defense operations, can emplace minefields rapidly by mechanical means. The current capability to counter this mining threat by US Forces is extremely deficient in that it consists of handheld detectors which require a slow point-to-point search and then manual or explosive neutralization of individual mines. Priority is placed on development of detection/neutralization devices and systems which allow friendly forces to maintain the momentum of the attack by rapidly breaching enemy minefields and neutralizing their barrier potential. Project D300, Countermine and Barriers (NATO), has been deleted from this PE as a separate project and in the future will be included as a task under project D415.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Initiate engineering development (ED) on the Bridge Destruction Device, a man-portable line charge mine neutralization system (POMINS), a vehicle magnetic signature duplicator system (VEMASID), redesign the fuzing mechanism of the British mine-clearing line charge (Giant Viper), and continue ED on the vehicle-mounted road mine detector.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	3608	1786	3031	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	3671	1876	5788	Continuing	Not Applicable

The small decrease in FY80 reflects reprogramming to higher priority Army requirements. The FY81 decrease is the result of general Congressional reductions and reprogramming to higher priority Army requirements. The decrease in the FY82 program reflects a delay in the initiation of work on some D021 tasks and program delays associated with advanced development efforts on the Israeli Portable Mine Neutralization System (POMINS) and the Vehicle Magnetic Signature Duplicator (VEMASID) D415.

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Program Element: #6.46.12.A
DOD Mission Area: #214 - Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Cost
Ammunition Procurement, Army						
(Blasting Agent)						
Funds (current requirements)	0	2500	0	0	0	2500
Funds (as shown in FY 1981 submission)	0	2500	2700	Not Shown	8900	14100
Quantities (current requirements)	0	1650	0	0	0	1650
Quantities (as shown in FY 1981 submission) (1000 # kits)	0	1650	2000	Not Shown	2000	5650
Ammunition Procurement, Army						
(SLUFAR)						
Funds (current requirement)	0	0	0	0	0	0
Funds (as shown in FY 1981 submission)	1	2	8700	0	144900	151600
Quantities (current requirements)	0	0	0	0	0	0
Quantities (as shown in FY81 submission) (rounds each)	0	0	1250	Not shown	16996	18246
Weapons and Tracked Combat Vehicles						
(SLUFAR)						
Funds (current requirements)	0	0	0	0	0	
Funds (as shown in FY81 submission) (launcher mod of M548 and loader mod of transporter)	0	0	8000	Not Shown	32500	40500

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Program Element: #6.46.12.A
DOD Mission Area: #214 - Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

	FY 1980 <u>Actual</u>	FY 1981 <u>Estimate</u>	FY 1982 <u>Estimate</u>	FY 1983 <u>Estimate</u>	Additional <u>To Completion</u>	Total <u>Estimated Cost</u>
Quantities (current requirements)	0	0	0	0	0	0
Quantities (as shown in FY81 submission) (launchers)	0	0	53	Not shown	0	275

The entire SLUFAR procurement schedule has changed as a result of system test failures during OT II and consequent Army decision to delete the system from the funded level in the 82 POM. Since then, however, the system successfully completed OT IIA and is scheduled for type classification in IQFY81. Funding of the procurement of Blasting Agent (BA) in FY83 and beyond is deleted due to changes in the Army priority for and the extent of the requirement for the system.

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Program Element: #6.46.19.A
DOD Mission Area: #214 - Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: This program provides development support for several mine warfare functions performed by the Army. In the area of tactical demolitions, simple firing devices for explosives are developed with the goal of increased reliability and a reduction in size and weight, and a long-range remote control firing device will soon begin development. Special-purpose explosives are also developed such as the Bridge Destruction Device designed to be effective against steel bridge members. Items have been developed to assist Explosive Ordnance Disposal (EOD) personnel in the neutralization of hazardous munitions, and Hard Overpack, a container for moving leaking chemical munitions, has been developed. This requirement is continuous because of the introduction of new items into the inventory and the acquisition of foreign items from both friendly and enemy sources for evaluation and potential adaption. Since the development of Joint-Service EOD items has been assumed by the Navy, this program supports Army-peculiar developments and integration of Navy-developed items into the Army system. Providing effective countermeasures to landmines continues to present a significant challenge to the Army developer. In recent years, efforts have been directed towards devices to perform both hasty and deliberate breaches of minefields. Since breaching must take place while under fire as well as in a more benign environment, two distinct activities must be addressed: mine detection and neutralization. The preponderance of developmental effort has been directed towards hasty minefield neutralization and breach with minimum impact on the momentum of the attack. The Surface-Launched Unit, Fuel-Air Explosive (SLUF AE) mine neutralization system has been designed to provide a rapid standoff breach of a minefield up to 240 meters in depth. SLUF AE is scheduled for type classification standard during FY 1981. Follow-on systems in this program include modification of the British Giant Viper projected line charge which will accomplish both explosive neutralization of mines and NATO standardization, and a vehicle-mounted road mine detector to rapidly clear lines of communications, a vehicle-mounted magnetic signature duplicator to cause premature actuation of mines employing magnetic influence fuzes, and a manportable line charge mine neutralization system capable of clearing antipersonnel mines, barbed wire, and other barrier devices.

G. (U) RELATED ACTIVITIES: Joint Service EOD items are funded and developed by the Navy as the single manager for EOD items in Program Elements 6.36.54.N and 6.46.54.N, EOD Equipment to avoid duplication. Countermine developments in this program element (PE) follow from advanced development (AD) efforts in PE 6.36.19.A, Countermine and Barrier Systems. Army countermine efforts are closely coordinated with the Development Project Office for Selected Ammunition, Dover, New Jersey, who is responsible for the development of mine fuzes, sensors, kill mechanisms, and logic in PE 6.36.06.A, 6.36.19.A, and 6.46.19.A, Landmine Warfare. The Army has significantly reduced the cost and developmental effort on Surface-Launched Unit, Fuel-Air Explosive (SLUF AE) by utilization of Navy-developed fuel-air explosives and rocket technology. The Army continues to monitor the joint Fuel-Air Explosive (FAE) II program to avoid duplication. Available Navy in-house capability has been used to produce developmental hardware. US continues to monitor RDTE efforts of foreign nations, particularly NATO, for technological breakthroughs in the detection and neutralization of landmines. The procurement and testing of the British Giant Viper Mine-Clearing Line Charge and the Israeli Portable Mine Neutralization System (POMINS) are examples.

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Program Element: #6.46.12.A
DOD Mission Area: #214 - Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

II. (U) WORK PERFORMED BY: Explosive Demolitions is the responsibility of the US Army Armament Research and Development Command (ARRADCOM), Dover, NJ. The US Army Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, VA, is assigned responsibility for the Army Countermine and Barrier Program. In-house support is provided by: Naval Weapons Center, China Lake, CA; Naval Surface Weapons Center, White Oak, MD; US Army Test and Evaluation Command, Aberdeen, MD; Yuma Proving Ground, Yuma, AZ; and the US Army Missile Command (MICOM), Huntsville, AL. Contractors include: Honeywell Corporation, Hopkins, MN; Lanson Industries, Cullman, AL; Chrysler Corporation, Detroit, MI; Cubic Corporation, La Jolla, CA; and Martin Marietta, Orlando, FL.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: In FY 1975 a track-width mine plow was developed from a Soviet design, but was terminated because of blast vulnerability. During FY 1976, Initial Surface-Launched Unit, Fuel Air Explosive (SLUF AE) prototype items were fabricated, and engineering design tests were conducted against a live minefield. In FY 1977, the M122 remote firing device was type classified and limited production initiated. Efforts continued on the bulk explosive (blasting agent) system to assist in the rapid creation of obstacles. The vehicle-mounted explosive container for transport of hazardous explosive items to safer areas and the Hard Overpack to contain leaking chemical munitions were initiated. In FY 1977, SLUF AE Development Test (DT) II/Operational Test (OT) II launcher hardware and initial prototype rounds with electronic fuzes were procured. Surface-Launched Unit, Fuel-Air Explosive (SLUF AE) reliability, availability, and maintainability (RAM) tests and logistic support concept tests were conducted. Arctic and tropic testing on the SLUF AE was completed, and the compilation of the SLUF AE technical data package was initiated. During FY 1978, the mine-clearing roller was type classified standard and production initiated. Initiated engineering development (ED) on the vehicle-mounted road mine detector. All necessary experimental work on the detector had been performed, and the proposed system was ready for full-scale development. Initiated ED on an overhead prototype shelter for troop positions. During 1979, Developmental Testing (DT II) on the blasting agent was completed, and development test and operational testing (DT/OT II) tests on the overpack were conducted. The vehicle-mounted explosive container was transferred to Navy Explosive Ordnance Disposal (EOD) for development. Completed DT/OT II on SLUF AE and developed requirement to conduct OT IIA to resolve operational problems with defining the target and ranging to it. Initiated International Materiel Evaluation (IME) of the British Giant Viper mine-clearing system. During FY 80, conducted OT IIA for the surface-launched unit, fuel-air explosive (SLUF AE) mine neutralization system. Continued engineer design tests on the vehicle-mounted road detector and efforts on combat shelters for troop positions.

2. (U) FY 1981 Program: Type classify SLUF AE. Conduct DT II/OT II on the Vehicle-Mounted Road Mine Detector. Continue evaluation of the British Giant Viper System. Type classify the chemical munition container, Hard Overpack. Continue testing combat shelters and initiate production on the blasting agent.

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Program Element: #6.46.12.A

DOD Mission Area: #214 - Mine Warfare

Title: Countermine and Barriers

Budget Activity: #6 - Tactical Programs

3. (U) FY 1982 Planned Program: Continue ED of vehicle-mounted road mine detector (VMRMD). Initiate ED on the portable mine neutralization system (POMINS), the vehicle magnetic signature duplicator system (VEMASID), the Bridge Destruction Device, and modify the Giant Viper fuze mechanism.
4. (U) FY 1983 Planned Program: Type classify the vehicle-mounted road mine detector. Continue ED on the Giant Viper fuze, portable mine neutralization system, the vehicle magnetic signature duplicator, and the Bridge Destruction Device.
5. (U) Program to Completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: 6.46.16.A
 DOD Mission Area: #211 - Close Combat

Title: Fighting Vehicle Systems (FVS)
 Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Cost**
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	34637	41651	106721	TBD	TBD	TBD
	Infantry Fighting Vehicle (IFV)						16*
	Cavalry Fighting Vehicle						
0254	Fighting Vehicle Systems (FVS)	34637	41651	106721	TBD	TBD	TBD

*includes one automotive test rig.

**includes FY79 and prior.

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Warsaw Pact doctrine envisions the employment of highly mobile, armor-heavy maneuver forces supported by massive artillery fire and air strikes to rapidly breach enemy defenses and penetrate deep into rear areas. The mobility, firepower, and survivability of these forces are being enhanced through an ongoing modernization program. In opposition to the numerically superior Warsaw Pact forces is the NATO Combined Arms team. In the 1980's, the primary antiarmor system within that team will be the M1 main battle tank. However, in order to defeat the total threat array, other systems within the combined arms team must provide combat capabilities which are complementary to and compatible with the M1. The Infantry and Cavalry Fighting Vehicles (IFV/CFV) were developed to provide these capabilities in both mounted and dismounted operations. They are required to more fully enhance the capabilities of the tank, and to accomplish those tasks which the tank cannot perform. The IFV and CFV will provide to the combined arms force an improved armored full-track fighting vehicle which substantially increases the cross-country mobility, firepower, and survivability of combat infantry and armored reconnaissance squads. Both IFV and CFV provide a two-man turret which mounts the Vehicle Rapid Fire Weapon System (VRPWS), a stabilized, dual-feed 25mm weapon, and a 7.62mm coaxial machinegun. Both configurations mount the Tube-Launched, Optically Tracked, Wire-Guided Missile (TOW) system. The IFV carries a nine-man squad with an adaptation for six Firing Port Weapons (FPW). The CFV carries a five-man squad and the same armament as the IFV (less the FPW) and is primarily

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Program Element: 15-16-A
 DOD Mission Area: III - Close Combat

Title: Fighting Vehicle Systems (FVS)
 Budget Activity: 4 - Tactical Program

pecially designed to accomplish reconnaissance, security, and economy of force operations. Both IFV/CFV are compatible with the M Tank System, have an inherent swimming capability, and are air-transportable in the C141 and C5A aircraft.

C. (U) BASIS FOR FY 1982 ROTE REQUEST: Funds requested are to support the continued development of Test Measurement and Diagnostic Equipment (TMDE), and skill performance aids (SPA) materials; additional logistics development to permit immediate government assumption of integrated logistics support; development of training devices; and apply modification for TOW Missile guidance electronics for integration of TOW 2. The Initial Operational Capability (IOC) is three months later because of extended production leadtimes and reduced quantities of production vehicles during initial production buys. The Army is planning to implement a competitive program during FY82 for improved maintainability and cost reduction of the Integrated Sight Unit (ISU).

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
* Complete OT II on IFV	Nov 79	Nov 79
* Army Systems Acquisition Review Council III (ASARC III)	Dec 79	Dec 79
* Complete Prototype Qualification Test - Government (PQT-G) on IFV	Apr 80	Jun 80
* Initial Operational Capability (IOC)	2QFY81	4QFY82

D. (U) COMPARISON WITH FY 1981 ROTE REQUEST: (\$ in thousands)

ROTE	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
Funds (current requirements)	14637	41651	106721	180	180
Funds (as shown in FY 1981 submission)	32937	41960	29869	19294	295999

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Program Element: 5.46.16.A
 DOD Mission Area: #11 - Close Combat

Title: Fighting Vehicle Systems (FVS)
 Budget Activity: #4 - Tactical Programs

The FY80 increase reflects a \$1700 reprogramming action for the CFV Force Development and Experimentation effort. The FY81 variance is attributable to an inflation adjustment. The amount of \$48855 was added by the President's budget amendment to restore the FY82 program to an executable level. Additional funding will cover increases in contractor estimates for technical manuals, automated test equipment, training devices, TOW 2 conversion, and integrated logistics support (ILS) requirements to facilitate the Army's ability to meet its projected IOC in 2QFY31. Increases beyond 1981 are currently under study.

E. OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>FY 1983</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost*</u>
Weapons and Tracked Combat Vehicle Procurement, Army:						
Funds (current requirements)	231600	52770	809800	TBD	TBD	TBD
Funds (as shown in FY 1981 submission)						
FVS	225400	464400	534700	Not Shown	4852600	6116500
Quantities (current requirements)	100	400	600	600	5142	6882
Quantities (as shown in FY 1981 submission)	208	400	600	Not Shown	8001	9261

The above procurement program combines IFV and CFV under the FVS program. The current procurement requirements as shown are based on a sole-source procurement strategy. Although a competitive second-source program has been initiated with preliminary efforts ongoing to identify a second producer, the above program does not include funds to fully implement a second source strategy.

*Includes FY79 and prior years; does not include initial spares.

D259 - Budget increases from the FY81 submission shown in the current requirement are due to several factors. The latest

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Program Element: 0.46.16.A

DOD Mission Area: #111 - Close Combat

Title: Fighting Vehicle Systems (FVS)

Budget Activity: #4 - Tactical Program

estimates for production were derived primarily from contractor proposal data and revised contractor estimates for the outyears which reflect considerably higher projections for inflation than previously submitted. In addition, there were added requirements for Test Measurement Diagnostic Equipment which increased the total vehicle program cost. The vehicle quantity initial operational objective (IOO) was decreased from 9,261 to 6,882 per Department of the Army direction.

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Program Element: 6.46.16.A
DOD Mission Area: #211 - Close Combat

Title: Fighting Vehicle Systems (FVS)
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The Fighting Vehicle Systems (FVS) program has a twofold objective. The first objective is to develop a full-tracked, lightly armored Infantry Fighting Vehicle (IFV) which provides the mechanized infantry with protected cross-country mobility and vehicular-mounted firepower necessary to accomplish assigned missions. The second objective is to provide a Cavalry Fighting Vehicle (CFV) for the armored cavalry and the mechanized battalion scout squads which allows them to accomplish reconnaissance and security missions. The IFV, with its stabilized 25mm cannon and 7.62mm machinegun, the TOW antitank guided missile system, and six firing port weapons, will provide a large volume of firepower at close and long ranges during both day and night operations. Its armor protection is significantly increased over the current M113 armored personnel carrier due to spaced laminate armor. Its speed and mobility are compatible with the XM1. The CFV is a modified IFV with a different storage configuration and no firing port weapons. A unique capability of the IFV and CFV is the stabilized turret drive which permits the main gun and machinegun to be fired accurately even when the vehicle is moving rapidly over rough cross-country terrain. The FVS Primary Weapon, 25mm automatic cannon, with an effective range in excess of 2500 meters, delivers both armor-piercing and high-explosive fire with extreme accuracy. The TOW antitank missile is fired from a double-tube, armored launcher which is attached to the turret weapon station. The TOW can defeat any currently known enemy tank at ranges out to 3,750 meters. An M240C 7.62mm machinegun is coaxially mounted within the weapon station and supplements the firepower of the other weapons.

G. (U) RELATED ACTIVITIES: Program Element (PE) 6.46.17.A, Vehicle Rapid Fire Weapon System (VRFWS), supports the Fighting Vehicle Systems program by providing for a 25mm automatic gun for use with both vehicles. Funds are provided to IFV from the Multiple Launch Rocket System, Program Element 6.33.03.A, for development of the MLRS Derivative Vehicle. The Firing Port Weapon (FPW) project was formerly funded in PE 6.36.07.A, Army Small Arms Program, and the CFV development effort was funded in PE 6.46.29 DH65 in FY80 and prior. The FVS Product Improvement Program under PE 2.17.35 0112 was activated in FY80 and is funded starting in FY92 to begin PIP developments.

H. (U) WORK PERFORMED BY: The IFV/CFV engineering development is being conducted by FMC Corporation, San Jose, CA. Major subcontractors involved in this program are General Electric, Pittsfield, MA; Cummins Engine Co., Columbus, IN; and Hughes Aircraft Co. and Hughes Helicopter Co. both of Culver City, CA. Support, as required, is being performed by the US Army Tank-Automotive Command, Warren, MI; US Army Armament Research and Development Command, Dover, NJ; US Army Electronics Research and Development Command, Adelphi, MD; US Army Missile Command, Huntsville, AL; and the Project Manager, TOW/DRAGON, Huntsville, AL.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

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Program Element: 6.46.16.A
DOD Mission Area: #211 - Close Combat

Title: Fighting Vehicle Systems (FVS)
Budget Activity: #4 - Tactical Programs

1. (U) FY 1980 and Prior Accomplishments: The Mechanized Infantry Combat Vehicle (MICV) program was approved by the Defense Systems Acquisition Review Council (DSARC) in April 1972. Following the source selection process, a cost-plus-incentive-fee contract was awarded to FMC in November 1972 for Engineering Development and Advanced Production Engineering. The Firing Port Weapon (FPW) project was transferred to this program following the Concept Formulation In-Process Review in May 1974. The Modified M16 Rifle was selected to enter engineering development as the candidate FPW. Prototype Qualification Test-Government (PQT-G) was initiated on 1 October 1975, but when testing revealed uncertainties relative to the suspension and transmission, tests were terminated in February 1976. During the remainder of FY 1976, transmission problems were corrected and verified. The PQT-G was restarted and Operational Test (OT) II initiated in October 1976. During the final quarter of FY 1976, the Army organized a Special MICV Task Force to review the total MICV program and make recommendations on vehicle configuration in view of the operational requirements. The Task Force recommended a redirection of the program to develop a single fighting vehicle for the infantry and scout roles which would mount a two-man turret with a 25mm gun and TOW launcher. On 3 November 1976, the Secretary of the Army approved the recommendations of the Task Force. The development of a new Fighting Vehicle was begun with the Award of the sole-source letter contract to FMC Corporation. In January 1977, a Defense Department program budget decision eliminated the one-man turret, 20mm MICV from FY 1979 production and authorized only 27 vehicles in FY 1979. Since these 27 unique vehicles were determined not to be cost effective, the Army terminated the 20mm MICV program in March 1977, and approved the application of its resources for use in the development of the new Infantry and Cavalry Fighting Vehicles. At that time, ongoing PQT-G and Producibility Engineering and Planning (PEP) efforts related to the 20mm MICV were terminated. On 30 July 1977, the MICV Systems Office was officially redesignated the Fighting Vehicle Systems (FVS) Office. The MICV was renamed the Infantry Fighting Vehicle (IFV), M2, and the MICV/Scout became the Cavalry Fighting Vehicle (CFV) M1. The PEP contract was awarded in June 1978. Initial TOW firings were successfully conducted in July 1978. A Congressionally directed study (Criser Task Force) confirmed the requirement for and current design of the IFV/CFV. Further, it recommended against developing a more survivable vehicle at this time. As directed by the Office of the Secretary of Defense, a study of less costly derivatives and force structure changes was conducted by the Mahaffey Study Group which concluded that the current IFV/CFV program was the best in terms of cost and operational effectiveness among all derivative-type vehicles considered. First Engineering Development vehicles were received in November 1978. Formal contractor testing began in December 1978 and government testing in June 1979. The IFV Operational Test II (OT II) training began in July 1979. The test, utilizing four IFV's and mechanized infantry platoon with appropriate support from Fort Carson, CO, verified the operational capability of the system. Operational testing (OT II) of the IFV with armament was completed in November 1979. The final report was published in February 1980. A Force Development Test & Experimentation (FDTE) effort was conducted at Fort Knox with five CFV's to demonstrate the operational capability of the vehicles in the cavalry role. Follow-on development and fix verification testing of two prototype vehicles was initiated in

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Program Element: 6-46.16.A
DOD Mission Area: #211 - Close Combat

Title: Fighting Vehicle Systems (FVS)
Budget Activity: #4 - Tactical Programs

Sep 80 and is continuing. Development testing (DT II) began in July 1979 and was completed in June 1980. CFV testing was conducted during April-August 1980. ASARC III/BSARC III decisions made were for type classification, vehicle production testing, and competitive vehicle acquisition in FY82. A sole source contract was awarded to FMC in February 1980 to initiate production. Development efforts began for Test Measurement and Diagnostic Equipment and training devices.

2. (U) FY 1981 Program: Engineering development will continue on Test, Measurement, and Diagnostic Equipment (TMDE), skill performance aids (SPA) materials, Depot Maintenance Work Requirements, and additional logistic support to permit government assumption of integrated logistics support at IOC; integration of ventilated NBC protective masks; development of training devices; and modification for TOW missile guidance electronics to integrate TOW 2 through an engineering change proposed to the current Hughes TOW 2 contract for immediate cut-in. Initial deliveries will begin in May 81. The FY81 program will include First Article Preproduction testing of six vehicles to verify the performance of the system when built in accordance with the full-production process. First Article Preproduction Test is to be accomplished during April-October 1981.

3. (U) FY 1982 Planned Program: Engineering development will continue on the training devices, Improved TOW 2, Test Measurement & Diagnostic Equipment, and other logistics support efforts including Physical Tear-down and Maintenance Evaluation. A competitive effort to redesign/repackage the Integrated Sight Unit (ISU) for improved maintainability and cost reduction will be implemented by the Army if suitable alternative approaches are proposed. Initial operational capability (IOC) for the Continental United States is scheduled for March 1983. A comparison testing will be performed on two vehicles from November 1981 and April 1982 production runs to verify performance and quality standards. During this period, skill performance aids validation will be achieved as part of the maintenance evaluation. Initial production Test (IPT) will be conducted on a total of eight vehicles commencing in January 1982 and continuing through October 1982.

4. FY 1983 Planned Program: Engineering development will continue on training devices, Test Measurement and Diagnostic Equipment, and TOW 2; completion of Depot Maintenance Work Requirements and Physical Tear-down and Maintenance Evaluation; start development of Extension Training Manuals; and initiation of study for nuclear hardening of the IFV/CFV vehicle system. Follow-on test and evaluation effort will be initiated concurrently with initial operational capability to verify the suitability of the entire logistics package to include maintenance manuals and Test Measurement and Diagnostic Equipment (TMDE).

5. (U) Program to Completion: In FY84, Test Measurement & Diagnostic Equipment (TMDE) development will be completed

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Program Element: 6.46.16.A
DOD Mission Area: 7211 - Close Combat

Title: Fighting Vehicle Systems (FVS)
Budget Activity: 14 - Tactical Program

and effort on training devices continued. Implementation of efforts to harden the vehicle against nuclear effects will continue.

I. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation:

a. (U) Developmental testing (DT) began in January 1974 with the Mechanized Infantry Combat Vehicle (MICV) and was interrupted in March 1976 for seven months due to unsatisfactory transmission performance. Transmission redesign was achieved and testing resumed in October 1976 continuing through January 1977. The MICV/20mm program was terminated in March 1977 after an Army review determined it was not cost effective for development in view of its operational shortfalls. Subsequently, all resources remaining were applied to the development of the Infantry Fighting Vehicle (IFV) and the Cavalry Fighting Vehicle (CFV). Results of MICV contractor testing were based on completion of 142,000 RAM miles and 140,000 rounds of 20mm ammunition fired. Subsequent contractor testing on the IFV/CFV was comprised of 18,000 RAM miles traveled, 118,000 rounds of 25mm ammunition fired, and 56 TOW missiles fired. Contractor testing revealed only minor deficiencies which were all correctable. The IFV/CFV test and evaluation program made maximum use of prior MICV/20mm test data and reentered the development test program at the DT II milestone. The extensive effort since 1974 on the MICV assured concept validation sufficient to warrant committing resources to full-scale development.

b. (U) Development Testing II (DT II) began in June 1979 at Aberdeen Proving Ground (APG), MD. DT II provided the final technical data for determining the IFV/CFV system readiness for transition into the full-production phase of the acquisition cycle. Developmental testing assured that engineering was reasonably complete; that all significant design problems associated with survivability/vulnerability, human factors, and supportability had been identified; that solutions to these problems were at hand; and that all test issues critical to the production decision had been resolved. Critical milestones are listed: DT II started Jun 79, Interim Evaluation Report (IER) to the Army Systems Acquisition Review Council (ASARC III)-Dec 79; IER to the Defense Systems Acquisition Review Council (DSARC III)-Jan 80; DT II completed Jun 80; Final Report-Dec 80.

c. (U) Two Infantry Fighting Vehicles (IFV) and one Cavalry Fighting Vehicle (CFV) have undergone DT II at APG. Vehicles are to be used as weapon-mounted fighting stations as well as troop carriers. Vehicles have two-man turrets which incorporate the 7.62mm Coaxial Machinegun; The Tube-Launched Optically Tracked, Wire-Guided (TOW) Missile System and the 25mm

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Automatic Cannon. Except for minor design changes, the configuration tested will also be procured. An improved TOW subsystem, designated Test Measurement and Diagnostic Equipment (TMDE), and the Integrated Logistics Support (ILS) System are still being developed and were not available for test during OT II and OT III. The improved TOW subsystem will be developmentally tested during First Article Preproduction Testing, and the technical data package will be verified during Initial Production Testing (IPT). The designated TMDE will also be evaluated during these tests. The TMDE is comprised of the Built-in Test Equipment (BITE), the Simplified Test Equipment-Transitional (STE-T), the Direct Support Electrical System Test Set (DSESTS), TOW Subsystem Support Equipment (TSS-SE), and EQUATE (AN/USM 410). A complete ILS package will be tested during IPT and also during a logistics follow-on evaluation (FOE) scheduled for late FY82.

d. (U) Reliability results achieved during government testing is based on the following test measurements: 12,500 miles traveled; 27,300 rounds fired by primary weapon and 68 TOW missiles fired. The minimum acceptable value for system performance in test was 195 mean miles between failure (MMBF), reliability demonstrated was 279 MMBF. Maintainability Standards require scheduled organizational maintenance and service no more frequently than every six months or 1500 miles. The demonstrated reliability and maintainability results are tabulated in paragraph 3 below. Organizational and DS/GS maintenance performance is expected to improve with the appropriate TMDE and adequate spare parts provisioning. A number of problem areas were recorded in test on the Integrated Sight Unit (ISU). These included image flutter, a problem noted during previous OT testing; detent mechanism failure of boresight knobs; effect of electromagnetic interference; reticle brightness; faulty thermal switch rheostat control; and vertical wavy lines in sight picture. Corrective action has been identified for each and will be verified during IPT. Other problems cited during test included a sporadic U-Joint torque spike; excessive power converter failures; toxic fumes (high carbon monoxide levels) when firing all weapons in buttoned-up configuration; powertrain and powerpack cooling failures; faulty catch bar on driver's hatch; degraded communications due to high noise levels; no ISU backup sight; inadequate test equipment and technical manuals. Corrective action has been identified for each problem area. In nearly all cases, corrections will be incorporated into the production vehicles and ancillary equipment.

e. (U) The Program Manager, Fighting Vehicle Systems, is BG Donald P. Whalen, assigned 2 July 1980. The prime contractor is FMC Corporation, San Jose, CA. Some of the major subcontractors include General Electric Corp., Hughes Aircraft Corp., Hughes Helicopter Corp., and Cummins Engine Co. The US Army Tank-Automotive Command (USATACOM) and contractors are preparing qualification test procedures to environmentally test the IFV/CFV and armament. A copy of the PQT-C final report, dated June 1980, was received from the contractor. The developmental tester is the US Army Test and Evaluation Command (TECOM), and the test evaluator is the US Army Materiel Systems Analysis Agency (AMSAA).

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f. (U) OT II testing was completed in June 1980 with no significant technical problems beyond those cited above. All significant Army requirements for transportability have essentially been demonstrated in test. Accuracy requirements for the M242 25mm Automatic Cannon exceeded the stated requirements for all rounds and all rates. Reliability, durability, and maintainability requirements for the XM231 Firing Port Weapon have been demonstrated. Results are tabulated in paragraph 3.

2. (U) Operational Test and Evaluation:

a. (U) A combined Operational Climatic Test/Force Development Test and Experimentation (OCT/FDTE) was conducted during January-March 1976 for the MICV/20mm program. The test was conducted at Fort Knox, KY, using US Army Forces Command (FORSCOM) personnel as player participants. The OCT provided limited data on capabilities, limitations, and safety aspects of the Mechanized Infantry Combat Vehicle (MICV) system in European winter thaw conditions. The FDTE developed mobility/movement rate data on the MICV. The Initial Operational Test was conducted by the US Army Operational Test and Evaluation Agency (OTEA) at Fort Benning, GA, using mechanized infantry troops as player participants. The test started 4 October 1976 and continued through 31 January 1977. A need for additional user training and 20mm gun modifications became apparent due to complexity of the one-man fighting station. This test was discontinued as a result of termination of the MICV/20mm gun program in March 1977.

b. (U) Operational Testing II (OT II) for the IFV was accomplished during October-November 1979 at Fort Carson, CO, by the Army's Operational Test and Evaluation Agency (OTEA). The purpose of the test was to provide data and associated analyses on the operational effectiveness of the Infantry Fighting Vehicle (IFV), Firing Port Weapon (FPW), and the 25mm Cannon for consideration in determining a full-scale production decision. The objectives of testing were to provide information on the effectiveness, survivability, reliability, availability, maintainability and integrated logistics support system (ILS) for the IFV system. The organization, doctrine, training, and human factors, as they pertain to the employment of the IFV system, were also evaluated. Operational testing was conducted independently, yet concurrently, with developmental testing. Hardware in OT II included, for the first time, the improved fire extinguisher system (HALON) and the upgraded Phase II sights. Systems used in OT II were similar, but not all had the HALON fire extinguishers and the upgraded Phase II sights. Organizational and direct support maintenance was performed by military personnel; general support maintenance was accomplished by FMC. Results of OT II were presented to the Army System Acquisition Review Council (ASARC III) in December 1979 and the Defense Systems Acquisition Review Council (DSARC III) in January 1980. The OT II test report was available in February 1980.

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c. (U) OT II testing was comprised of the following: 9,919 miles traveled; 30,528 rounds fired; and 19 TOW missiles fired. Results of OT II indicated that the Army's requirements have been met in all of the critical areas of test. The test vehicles demonstrated the Army's Materiel Need (MN) requirements for all mobility and transportability characteristics in contractor tests, DT and OT. Also, critical firepower requirements were met. In each performance area, the requirement was either met or exceeded for the 25mm Automatic Cannon, the Firing Port Weapon, and the Coaxial Machinegun. The mission profile used for reliability performance is based on combined DT/OT II goals for the IFV/CFV system. Reliability performance during DT/OT II for Mobility, Firepower, and System is summarized in paragraph 3. These estimates are based on 21,495 RAM miles for firepower, 20,982 RAM miles for mobility and support and 49,778 primary weapon rounds fired normalized to a combat mission profile. All technical problems were isolated and appropriate fixes defined. Among the significant technical problems surfaced during test were the following: vibrations in the integrated sight unit with vertical lines in the night mode; universal joint/final drive failures due to cracked materials and improper installation; coaxial machinegun failure due to bad ammunition lots, damaged feed chutes and mounts and poor weapon maintenance; insufficient electrical power for "silent watch" mode of operation caused by less than fully charged batteries and possible inadequate power source; heater and ventilation system failures; easily damaged swim barrier; excessive generator failures due to malfunction of diodes; and excessive transmission wear due to engine torsional vibration. Fixes have been identified for each problem, and will be applied and tested prior to the start of initial production.

d. (U) The Armor and Engineer Board, Fort Knox, KY, conducted a CFV Force Development Test and Experimentation (FDTE) during April-August 1980. This evaluation was accomplished to provide data to determine the adequacy of organization, doctrine, tactics, means of employment, and institutional/exportable training and organizational maintenance training programs envisioned for implementation upon fielding of the CFV System. The test was completed on schedule with all major objectives met.

e. (U) Survivability testing to include full-up ballistic nondestructive and destructive testing will be accomplished during November 1980-April 1981. The Initial Production Test (IPT) will be accomplished during Jan-Oct 82. The IPT will verify the quality of performance and material when produced in accordance with the Technical Data Package and the full-production process. Comparison Testing is scheduled during Nov 81-Apr 82 and will be conducted by TECOM on two vehicles to verify performance and to insure that production vehicles achieve and maintain quality standards throughout production.

f. (U) The Logistic support package, complete with TMDE will be further evaluated in a follow-on evaluation (FOE) with 10C Battalion, Nov 82-Apr 83. The logistics evaluation both during and subsequent to FOE, will be met by a dedicated Sample

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Title: Fighting Vehicle Systems (FVS)
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Data Collection (SDC) effort planned and programed by the Tank Automotive Command (TACOM). The coordination is in process. The collection and evaluation of logistic data will be administered by TACOM. Specific interest will be directed toward the adequacy of technical manuals, maintenance procedures, logistic task allocations, repair times and the adequacy of new training.

1. (ii) System Characteristics:

OPERATIONAL/TECHNICAL

CHARACTERISTIC	REQUIREMENT	DEMONSTRATED TO DATE	STATUS	WHERE DEMONSTRATE
<u>Reliability (OT/OT II)</u>				
- Mobility (mean miles between failure)	600	636	MET	PQT-G/OT II
- Firepower (mean miles between failure)	290	706	MET	PQT-G/OT II
- System (mean miles between failure)	195	289	MET	PQT-G/OT II
<u>Maintainability (System)</u>				
- Maximum-Time-To-Repair Organizational, (time not to exceed 4 hrs)	95%	89%	LOW	PQT-G
- Maximum-time-to-Repair Direct Support, (time not to exceed 12 hrs)	90%	96%	MET	PQT-G
- Maximum-Time-to-Repair	90%	86%	LOW	PQT-G

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General Support (DS
backup)
(time not to exceed 12 hrs)

<u>CHARACTERISTIC</u>	<u>REQUIREMENT</u>	<u>DEMONSTRATED TO DATE</u>	<u>STATUS</u>	<u>WHERE DEMONSTRATE</u>
<u>Firepower</u>				
a. 25mm Gun				
- Muzzle Velocity (feet per second)				
• Armor Piercing (APDS-T)	4300-4500	4390	MET	PQT-C
• High Explosive (HEIT)	3000	3573	MET	PQT-C
- Rate of Fire				
• MAXIMUM (rounds per minute)	450-600	Motor Depend.	MET	PQT-G
• Controlled (shots per minute)	200	200	MET	PQT-G
• Lethal Area -	10-20m ² /	16.7m ² /	MET	PQT-G
- Reliability				
• Mean rounds - between stoppage (MRBS) ² /	2000	7264	MET	PQT-G
• Mean Rounds between clearable stoppage (MRBCS) ¹ /	500	6226	MET	PQT-G
- Maintainability				
• Mean time to repair - (MTTR)	15 min	12 min	MET	PQT-G/OT II

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- Max time of repair -	60 min	30 min	MET	PQT-G/OT II
(MXFFR)				
- Availability	.90	.99	MET	PQT-G/OT II

CHARACTERISTIC	REQUIREMENT	DEMONSTRATED TO DATE	STATUS	WHERE DEMONSTRATE
- Durability (25 min)				
. Barrel life (rds)	4000	5000	MET	PQT-G/OT II
. Receiver life (rds)	25000	30000	MET	PQT-G/OT II
- APDS-T Ammunition				
. Penetration 1"			MET	PQT-G
21000m				
. Velocity (M/Sec)	1100	1270	MET	PQT-G
. Tracer Rng (meters)			LOW	PQT-G
- HEAT Ammunition				
. Velocity (m/sec)	1000	1050	MET	PQT-G
. Tracer Rng (meters)			---	PQT-G

b. (2) Firing Port Weapon

- Sustained Firing Rate	60 rpm	5 min	MET	PQT-G
(round s per minute)	Intervals			
- Min Range (meters)	3-5			TBT
- Length (in)	15-27	28.5	Long	PQT-G
- Protrusion (in)	3-5	7	Long	PQT-G
- Weight (lb)	4-8	8.5	OVER	PQT-G
- Reliability				
. Mean Rounds	2000	4701	MET	PQT-G/OT II
Between Stoppage				
(MRBS)2				

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. Mean Rounds between failure (MRBF) ^{4/}	500	5289	MET	PQT-Q/OT II
- Durability				
. Receiver life (rds)	10000	10000	MET	PQT-G/OT II

<u>CHARACTERISTIC</u>	<u>REQUIREMENT</u>	<u>DEMONSTRATED TO DATE</u>	<u>STATUS</u>	<u>WHERE DEMONSTRATE</u>
. Barrel life (rds)	10000	Exceeded 10000	MET	PQT-G/OT II

Mobility

- Range (mi) (Ave 25 mph)	300 mi	303 mi	MET	PQT-C
- Acceleration	0-30 mph in 18-22 sec	19.7 sec	MET	PQT-G
- Fwd Speed	40-45 mph	41.8 mph	MET	PQT-G
- Cbt Weight (lb)	35-40,000	50,000	MET	PQT-G
- Reverse Speed	5-10 mph	13 mph	MET	PQT-G
- Braking Deceleration	35 feet (from 25 mph)	24 feet	MET	PQT-G
- Ascend Slope	60%	YES	MET	PQT-C
- Mtu Speed	2.5 mph	YES	MET	PQT-C
- Turning Radius	30'	19.7'	MET	PQT-C
- Water Speed	4.5 mph	4.4 mph	LOW	PQT-G

^{1/} 1270 meter range @ -65°F.

^{2/} MRBS - Firing malfunction which requires more than 10 seconds to clear for the 25mm gun and less than 20 seconds for the firing Port Weapon.

^{3/} MRBCS - Firing malfunction which can be cleared in 10 seconds or less.

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4/ Firing malfunction which requires 20 sec or more to clear for the FPW.

Final DT IC Test Report to be published in Dec 1980.
Independent Evaluation Report was published in March 1980.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.19.A

DOD Mission Area: #214 - Mine Warfare

Title: Landmine Warfare

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion Continuing	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	8742	9572	8310	9940	Continuing	Not Applicable
	QUANTITIES						
D016	Mine Systems	0	0	3183	5016	Continuing	Not Applicable
D088	Modular Pack Mine System	5199	8698	5127	4924	1158	35769
D407	Antitank Artillery Mine XM718	687	229	0	0	0	17644
D568	Ground-Emplaced Mine Scattering System Anti-tank/Antipersonnel Mines	2856	645	0	0	0	41644

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program element provides for increased tactical effectiveness and responsiveness of landmines by supporting the development of a Family of Scattersable Mines (FASCAM) which can be dispensed rapidly from helicopters, ground dispensers, cannon artillery and rockets, and tactical aircraft. The minefield continues to be one of the most effective, efficient, and adaptable obstacles available. The increased pace of modern warfare together with the fluidity and porosity of today's battlefield makes the use of labor-intensive, hand-emplaced, logistically burdensome conventional landmines less effective than in previous wars. Current mines, which must be emplaced well in advance of the actual tactical need, lack the responsiveness and flexibility necessary for effective employment in rapidly changing tactical situations. Scatterable mines placed with multiple delivery means provide a formidable threat and deterrent to mass armor attacks such as can be mounted by the Warsaw Pact. Scatterable mines will be used to delay, canalize, or interdict attacking enemy forces and to deny selected areas to the enemy.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Continue engineering development (ED) on the Modular Pack Mine System (MOPMS) and initiate ED of the off-route antitank mine system (ORATMS).

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DOD Mission Area: #214 - Mine Warfare

Title: Landmine Warfare
Budget Activity: #4 - Tactical Program

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	8742	9572	8310	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	8767	10401	13141	Continuing	Not Applicable

FY80 funds were reprogramed to higher priority Army requirements. The FY81 decrease reflects the application of a Congressional general reduction for inflation. The FY82 decrease reflects a delay in initiation of engineering development efforts on new mine systems and restructuring within the program element.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
Ammunition Procurement, Army:						
Funds (current requirements) (Artillery AT mines)	29900	61500	58400	64300	196600	480300
Funds (as shown in FY 1981 submission)	10900	61500	86400	Not Shown	214500	445000
Quantities (current requirements) (rounds)	13000	27000	25000	28000	84000	205000
Quantities (as shown in FY 1981 submission)	15000	27000	39000	Not Shown	96000	201000

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Title: Landmine Warfare
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	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Cost
Ammunition Procurement Army:						
Funds (current requirements) (GEMSS XM74/XM75 mines)	9800	12900	35500	19100	97100	174400
Funds (as shown in FY 1981 submission)	6700	11800	12600	Not Shown	41600	72700
Quantities (current requirements) (mines)	11000	30000	70000	37000	197000	345000
Quantities (as shown in FY 1981 submission)	12000	30000	30000	Not shown	90000	162000
Other Procurement Army:						
Funds (current requirements) (GEMSS dispensers)	5000	0	12400	9100	30400	190000
Funds (as shown in FY 1981 submission)	4900	0	12100	Not shown	44700	61700
Quantities (current requirements) (each)	6	0	23	24	78	379
Quantities (as shown in FY 1981 submission)	12	0	39	Not Shown	184	235

The FY82 decrease in artillery-delivered AT mines is the result of increased procurement unit costs and slippage in prior year production deliveries beyond the normal procurement leadtimes. FY83 and beyond quantities have also been adjusted consistent with OSD consolidated guidance. The increase in GEMSS funding for mines in FY81 reflects higher than anticipated costs for mines. The quantities were reduced to stay within obligational authority. The funding profiles for 82 and beyond reflect a change in Army requirements for GEMSS mines. GEMSS dispenser unit costs for 81 have increased significantly, primarily because of the small quantities. These high costs have resulted in a reduction in quantities planned for FY81 and FY82.

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Program Element: #6.46.19.A
DOD Mission Area: #214 - Mine Warfare

Title: Landmine Warfare
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The minefield continues to be one of the most effective, efficient, and adaptable obstacles available. Conventional hand-emplaced antitank (AT) and antipersonnel (AP) mines cannot keep pace with related battlefield activities. To overcome this deficiency, the Army has pursued development of a Family of Scatterable Mines (FASCAM). FASCAM consists of smaller mines with improved lethality, target sensing and discrimination, and response times, packaged for delivery by multiple means. The first scatterable mine, the M56 helicopter-delivered AT mine, has been fielded in US Army, Europe. Production has commenced on both the M692 artillery-delivered AP mine and the companion M718 artillery-delivered AT mine. The Ground-Emplaced Mine Scattering System with both AT and AP mines has completed development and entered production. The Modular Pack Mine System is well into development and will complete this generation of Army-developed scatterable mines. Scatterable mine systems utilize extensive component commonality during manufacture. The option to emplace minefields when and where desired in a matter of minutes provides the tactical commander with a unique capability which will impact on both friendly and enemy tactics.

G. (U) RELATED ACTIVITIES: This program follows from advanced development (AD) Program Elements (PE) 6.36.06.A, Land Warfare/Barrier Development, and 6.36.19.A, Barriers Systems, where components and mine hardware concepts are devised. Principal system technical development responsibility is assigned to the US Army Armament Research and Development Command (ARRADCOM), Dover, NJ, under the management of the Development Project Office for Selected Ammunition. Closely related to this PE is the joint-Service development of air delivered scatterable mines (GATOR). The scope of this development is controlled by an approved joint development plan. The Army is developing both Antipersonnel (AP) and Antitank (AT) mines for the GATOR systems using existing components under the Air Force as lead Service. Joint-Service mine requirements are coordinated through the Department of Defense (DOD) Armaments/Munitions Requirements and Development Committee and the Joint Technical Coordination Group for Bombs, Mines, and Clusters.

H. (U) WORK PERFORMED BY: Principal Army Management Agency is the Development Project Office for Selected Ammunition, ARRADCOM, Dover, NJ. In-house support is provided by the US Army Mobility Equipment Research and Development Command Fort Belvoir, VA; US Army Test and Evaluation Command, and the Army Materiel Systems Analysis Agency, Aberdeen, MD; and Yuma Proving Ground, Yuma, AZ. Principal contractors are: Aerojet Ordnance and Manufacturing Company, Downey, CA; Hughes Aircraft Company, Fullerton, CA; Honeywell, Inc., Hopkins, MN; Solid State Division, Somerville, NJ; AAI Corporation, Cockeysville, MD; Chamberlain, Waterloo, IA.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Scatterable mine development was initiated in the late 1960's with emphasis on the XM56 helicopter-delivered antitank mine system and the XM692E1 artillery-delivered antipersonnel mine system. During FY

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Program Element: #b.46.19.A
DOD Mission Area: #214 - Mine Warfare

Title: Landmine Warfare
Budget Activity: #4 - Tactical Programs

1973, the XM56 and the XM692E1 systems entered developmental testing (DT) and the XM718 artillery delivery AT mine system entered engineering development (ED). In FY 1974, the M56 helicopter antitank (AT) mine system was type classified standard. During FY 1975, the M56 AT mine system went into production; Development Test II/Operational Test II (DT II/OT II) continued on the XM692E1 antipersonnel (AP) mine system, and engineering design tests continued on the XM718 AT mine system. Design and testing of the Ground-Placed Mine Scattering System (GEMSS) and its associated XM75 AT mines and XM74 AP mines continued with emphasis on system reliability, maintainability, and human factors. Efforts continued on the joint-Service GATOR air-delivered mines in coordination with Navy and Air Force. During FY 1976, the M692 artillery-delivered AP mine was type classified standard and went into initial production. In FY 1977, the M56 helicopter AT mine was fielded; initial production continued on the M692 artillery AP mine; DT II/OT II was completed on the XM718 artillery AT mine and initiated on the GEMSS; advance development on the Modular Pack Mine System (MOPMS) was completed. In FY 1978, DT II/OT II continued on the GEMSS; The M718 artillery AT mine was type classified standard and production initiated; OT III was conducted on the M692 artillery AP mine, and MOPMS entered engineering development. In FY 1979, initiated full-scale production on the M692 artillery AP mine; conducted DT III on the M718 artillery AT mine, and completed OT II and conducted 75% of DT II on the GEMSS system. In FY80 full-scale production of the M718 at mine was initiated; GEMSS DT/OT II was completed; type classification was accomplished and production initiated; MOPMS Force Development Test and Experimentation FDTE was completed, and an in-process review conducted to determine future program direction. Production of the ADAM M692 AP mines continued.

2. (U) FY 1981 Program: Continue production of the M718 AT mine, complete DT III, and conduct production validation IPR. Continue production of GEMSS M128 dispenser and mines, and continue publications preparations and EOD testing of mines. Conduct MOPMS System Engineering Development test and procure long-lead DT/OT II hardware; initiate development of training aids and manuals. continue ADAM M692 production, complete DT III, and conduct production validation IPR.

3. (U) FY 1982 Planned Program: Continue GEMSS production and RDTE of manuals. Conduct final Engineering Development tests for MOPMS. Procure Developmental Testing II/Operational Testing II hardware; conduct DT II and initiate OT II. Initiate engineering development (ED) of the off-route antitank mine system (ORATMS), to include the evaluation of design approved materials, man/weapon interface studies, and development of engineering models for evaluation of alternative approaches that will lead to selection of the most cost effective hardware.

4. (U) FY 1983 Planned Program: Continue ED on the off-route Antitank Mine System. GEMSS production will continue and RDTE of manuals will be completed. MOPMS development will be near completion.

5. (U) Program to Completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D098
Program Element: #6.46.19.A
DOD Mission Area: #214 - Mine Warfare

Title: Modular Pack Mine System (MOPMS)
Title: Land Mine Warfare
Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: The Army has been developing a Family of Scatterable Mines (FASCAM) to replace current labor-intensive, logistically burdensome conventional mines. These small, highly lethal, scatterable mines are delivered by artillery, ground vehicle, helicopter, and tactical aircraft. This new capability to deliver mines rapidly acts as an effective combat multiplier. One of these systems, the Modular Pack Mine System (MOPMS), can be used independently or in conjunction with other FASCAM systems, natural or manmade obstacles, and conventional mines to provide a rapid means of emplacing tactical, point or protective minefields, and to close lanes and gaps in existing minefields. MOPMS consists of a man-portable module which serves as the shipping, storage, and dispensing container for 21 mines, AT, AP, or a mix. A remote command dispense capability will be provided to permit key areas to remain free of mines until tactically appropriate. The module can be recovered for reuse if the mines are not dispensed. MOPMS utilizes the baseline FASCAM components (commonality of batteries, safing, and arming mechanisms, and some electronic), thereby accelerating the development at a significantly reduced risk.

B. (U) RELATED ACTIVITIES: This project follows from advanced development Program Element 6.36.06.A, Land Mine Warfare, where components and the concept were devised. Principal system technical development responsibility is assigned to the US Army Armament Research and Development Command (ARRADCOM), Dover, NJ, under management of the Development Project Office for Selected Ammunition. MOPMS is being developed under the family concept and utilizes a high degree of component commonality with other FASCAM systems.

C. (U) WORK PERFORMED BY: Principal Army Management Agency is the Development Project Office for Selected Ammunition, ARRADCOM, Dover, NJ. In-house support is provided by the US Army Test and Evaluation Command and the Army Materiel Systems Analysis Agency, Aberdeen, MD. Principal contractors are: Aerojet Ordnance and Manufacturing Company, Downey, CA; Hughes Aircraft Company, Fullerton, CA; and Honeywell Incorporated, Hopkins, MN.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: In FY78, conducted Validation In-Process Review after system concept was demonstrated. During FY79, initial prototype hardware was procured, and engineer design test conducted, demonstrating achievement of acceptable patterns from the dispenser and satisfactory functioning of prototype electronics. The XM71 remote control unit was fabricated. Initial engineering tests were conducted satisfactorily. During FY80, Force Development Test and Evaluation (FDTE) was conducted and an IPR held. The first systems engineering development test hardware was procured.

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Project: #D088
 Program Element: #6.46.19.A
 DOD Mission Area: #214 - Mine Warfare

Title: Modular Pack Mine System (MOPMS)
 Title: Land Mine Warfare
 Budget Activity: #4 - Tactical Programs

2. (U) FY 1981 Program: Conduct System Engineering Development Tests with FY 1980 hardware and adapt design based on test results. Procure final systems engineering development test hardware and long-lead development test and operational test (DT/OT) hardware. Initiate development of skill performance aids (SPA) and technical manuals to support Army training programs.

3. (U) FY 1982 Planned Program: Conduct final Engineering Development Tests. Complete fabrication of Developmental Test II/Operational Test II (DT II/OT II) hardware and initiate testing.

4. (U) FY 1983 Planned Program: Complete DT II/OT II and conduct a Development Acceptance In-process Review (DEVAIPR).

5. (U) Program to Completion: Type classify standard for Army use and initiate Procurement in FY84.

6. (U) Major Milestones:

Major Milestones
 Validation In-Process Review
 Developmental Testing II
 Operational Testing II
 Developmental Acceptance In-Process
 Review and Type Classify Standard
 Initial Procurement

Current
Milestone Dates
 1QFY78
 3QFY82-2QFY83
 1QFY83-2QFY83
 3QFY83
 FY84

Milestone Dates
Shown in FY 1981 Submission
 1QFY78
 3QFY82-2QFY83
 1QFY83-2QFY83
 3QFY83
 FY84

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Project: #D088
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Title: Modular Pack Mine System (MOPMS)
 Title: Land Mine Warfare
 Budget Activity: #4 - Tactical Programs

7. (U) Resources (\$ in thousands):

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional to Completion</u>	<u>Total Estimated Cost</u>
RDTE						
Funds (current requirements)	5199	8698	5127	4924	1158	35769
Funds (as shown in FY 1981 submission)	4052	9462	7414	-	1972	33563
Quantities (current requirements)	Not Applicable					
Quantities (as shown in FY 1981 submission)	none shown					

The total estimated cost is based on contractor and government experience gained on this and other FASCAM development and production efforts and is considered good. Low risk characterizes remaining development effort.

Other Appropriations:

Ammunition Procurement, Army						
Funds	0	0	0	0	18700	124800
Quantities (Modules)	0	0	0	0	1080	10525

Changes in the RDTE profiles reflect the following: In FY 1980, increased costs were caused by prototype design complexity and were financed by below threshold reprogramming. FY81 decrease reflects the application of general Congressional reductions. FY82 and FY83 changes reflect an internal program restructuring of the PE.

FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.20.A

DOD Mission Area: #211 - Close Combat

Title: Tank Systems

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	51784	51569	29063	13602	0	697034 13
DG20	Tank, XM1	51784	51569	29063	13602	0	697034

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This element supports the development of the XM1 tank, a four-man, highly mobile, fully tracked combat vehicle with significantly improved survivability, mobility, and firepower. The XM1 mounts a 105-millimeter main gun and three machine guns. The XM1's improved day/night fire control and shoot-on-the-move capabilities assure a high probability of first round hits at engagement ranges. High acceleration and cross-country speeds provided by a 1500 horsepower turbine engine and improved suspension system make the XM1 tank a more difficult target for opposing ground and air forces. The XM1 is required to counter ever-improving enemy armor threats of the 1980's and 1990's. It will replace the M60-series tank as the primary ground combat offensive weapon in the Army's combined arms team.

C. (U) BASIS FOR FY 1982 RDTE REQUEST:

1. (U) The final phases of the third Development Test (DT III) will be completed in January 1982 when nuclear effects blast testing and validation of equipment publications is finished. The results of the development and operational testing completed in FY 1981 will be the basis for further efforts in reliability and maintainability growth in areas where improvements are cost-effective and savings can be realized. The ten XM1's which accrued high mileage during development and operational testing will be refurbished at the Anniston Army Depot prior to redistribution to meet Army inventory requirements. The refurbishment of these tanks will assist in the development and validation of the Army's overhaul program for the tank.

2. The funds requested are necessary to accomplish the developmental work scope required to provide a fully developed XM1 tank system capable of being operated and maintained by Army tactical and/or supporting units.

Program Element: #6.46.20.A
DOD Mission Area: #211 - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

<u>Major Milestones</u>	<u>Current Milestone Dates</u>	<u>Milestone Dates Shown in FY 1981 Submission</u>
Complete Development Test/Operational Test (DT/OT) II	September 1979/ February 1979	July 1979
Defense Systems Acquisition Review Council (DSARC) III	April 1979	April 1979
Award-Low Rate Initial Production (LRIP) Contract	May 1979	May 1979
Delivery of First LRIP Tank	February 1980	February 1980
Conduct DT III/OT III	March 1980/ September 1981	March 1980/June 1981
Management Review #1	February 1980	February 1980
Management Review #2	Requirement deleted	July 1980
Management Review #3	Requirement deleted	January 1981
Initial Operational Capability (IOC) (Tank Company)	January 1981	July 1980
Decision to Start Full-Production (DSARC IIIA)	October 1981	June 1981
Award Full-Production Contract (3rd year add-on option)	October 1981	August 1981 (for 3rd year buy)
European Operational Capability (Tank Battalion)		

DT/OT III termination date reflects time to complete majority of work scope. The operational capability dates were adjusted due to availability of production tanks and due to the need for remedial gunnery training (IOC only). Office of the Secretary of Defense cancelled the requirement for Management Reviews #2 and #3 based on the successful demonstration of XM1 mission reliability and power-train durability growth during the extended engineering tests at Fort Knox, KY, in June-December 1979. A combination of FY 1979 and FY 1980 funding shortfalls, production base start-up problems, and shortcomings in XM1 reliability and durability performance in testing due to production quality problems have necessitated postponing the full-production decision, shifting the full-production contract award to a FY81 add-on option buy, and deferring achievement of the first XM1 battalion-size unit in Europe until the second quarter FY 1982.

Program Element: #6.46.20.A

Title: ~ Tank Systems

DOD Mission Area: #211 - Close Combat

Budget Activity: #4 - Tactical Programs

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	51784	51569	29063	13602	697034
Funds (as shown in FY 1981 submission)	49549	51320	14866	101	665087

Increases in funds over those previously reported result from: FY80, increased by the Army \$1,999,000.00 for additional turbine engine durability efforts to achieve long-term life-cycle cost savings; remaining FY80 and FY81 cost increases compensate for the impact of inflation; FY82, cost of deferred development and testing of training devices, increased scope of integrated logistic support efforts to achieve enhanced system support capabilities, and cost effective reliability and maintainability improvements to achieve long-term operating and support cost savings. FY83, complete logistic support development and the near-term reliability and maintainability program for the initial production XM1 tanks.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
Weapons and Tracked Combat Vehicles Procurement:						
Funds (current requirements)	717800	1147500	1346800	1448000	12474700	17710200
Funds (as shown in FY 1981 submission)	713900	1100300	1078500	-	7936700	11404700
Quantities (current requirements)	309	360	569	627	5103	7058
Quantities (as shown in FY 1981 submission)	352	569	720	-	5307	7058

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Program Element: #6.46.20.A
DOD Mission Area: #211 - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Estimated Cost
Military Construction, Army:						
Funds (current requirements)	18900	-	7800	10700	8000	45300
Funds (as shown in FY 1981 submission)	5800	-	-	-	2500	8300

- Procurement: The reduction in tank buy quantities in FY80 through FY83 was caused by a composite of escalation, programmatic changes, contractor claims, and cost growth. To stay within budget limitations, the FY79 and FY80 production contracts were renegotiated. These changes necessitated baseline changes in FY81 thru FY83 and beyond to reflect the maximum procurable tanks within funding limits. In regard to funding variations, the increase in FY80 was due to escalation adjustments and Congressional plus-up of spares. FY81 and FY82 increases are due to escalation adjustment increases in advanced procurement, spares, and training equipment. When applied, the FY83 increases reflected an additional procurement of 82 tanks and advance procurement for an additional 278 tanks to be procured in FY84. The funds provided by these adjustments were considered in maximizing the number of XM1's to be provided in FY's 80 through 81.

- Military Construction: The increase in FY80 provides for gunnery range upgrade at Fort Knox, KY; in FY82 reflects a shared cost of gunnery range upgrades at Grafenwoehr, GE; in FY83 for institutional training facilities at Aberdeen Proving Ground, MD and for construction at conduct-of-fire trainer sites; and in FY84 expected construction at camps and stations where XM1's are located.

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Program Element: #6.46.20.A
DOD Mission Area: #211 - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

F. (U) **DETAILED BACKGROUND AND DESCRIPTION:** Congress terminated the XM803 Main Battle Tank program in FY 1972 as unnecessarily complex, excessively sophisticated and too expensive, and directed initiation of a new tank prototype program. The objective of this program is to counter the quantitatively superior and increasingly sophisticated tank forces of the Warsaw Pact by producing a qualitatively superior tank for use as the primary ground combat weapons system in a highly mobile, sustainable, combined arms force. The XM1 will be superior in the areas of survivability, firepower, and mobility, thereby providing a dramatic increase in combat capability. The ballistic protection offered by special armor coupled with the tank's inherent agility makes the XM1 significantly more survivable than the M60 tank. Likewise, a reduced silhouette and fuel and main-gun ammunition compartmentalization increase the tank's and crewmen survivability. Improved firepower is provided initially by a 105 millimeter (mm) gun and subsequently (planned for initial production in late FY 1984) a 120mm gun. The 1500 horsepower turbine power package coupled with the high performance suspension system provides superior cross-country mobility. The XM1 Tank Program was approved on 18 January 1973 and contracts awarded to General Motors and Chrysler for competing prototype designs. Evaluation of the prototypes was completed on schedule (July 1976); however, the Defense Systems Acquisition Review Council (DSARC) delayed the selection of the prototype for engineering development 120 days until a resolicitation to consider a standardized version of the XM1 could be evaluated. Testing of the LEOPARD 2 (Americanized Version (AV)) tank in accordance with agreements reached with the Federal Republic of Germany was conducted from September to December 1976. On 11 November 1976, Chrysler Corporation was selected to fabricate eleven pilot-model XM1's for development and operational testing in 1978-1979. Results of the test program disclosed that while Army system design requirements were being met overall, significant shortfalls existed in the areas of mission reliability and power-train durability. Subsequently, the Deputy Secretary of Defense in May 1979 authorized the Army to proceed with the first year's production of 110 XM1's, but constrained FY 1980 and subsequent-years production pending the outcome of extended engineering development testing. This extended test program was completed in December 1979 and resulted in the demonstration that prior problems with XM1 mission reliability and power-train durability had been solved. The Office of the Secretary of Defense subsequently removed the constraints placed on the program in May 1979.

G. (U) **RELATED ACTIVITIES:** There is no other program being conducted by other Services that meets the XM1 requirements. The Marine Corps is closely monitoring the XM1 development in relation to their requirement for a main battle tank in a high intensity environment for subsequent operations ashore. Related and nonduplicatory Army activities are being conducted in Program Element (PE) #6.46.30.A, Tank Gun Cooperative Development; and PE #2.35.37.A, Combat Vehicle Improvement Program.

H. (U) **WORK PERFORMED BY:** The prime contractor for the XM1 is Chrysler Defense Incorporated, Detroit, MI. Major subcontractors to Chrysler are: Detroit Diesel Allison, Indianapolis, IN; Hughes Aircraft Corporation, Culver City, CA; AVCO-Lycoming, Stratford, CT; and Cadillac Gage, Detroit, MI. In-house work is managed by the Office of the Program Manager, XM1 Tank System with work being accomplished by the US Army Tank Automotive Command, Warren, MI; the US Army Armament Research and Development Command, Dover, NJ; and the Ballistics Research Laboratory, Aberdeen Proving Ground, MD.

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Program Element: #6.46.20.A
DOD Mission Area: #211 - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Based on the recommendations of the XMI Defense Systems Acquisition Review Council (DSARC) III, the Deputy Secretary of Defense on 8 May 1979, authorized the Army to proceed with the first production-year buy of 110 XMI's, the majority of which are being used in Development and Operational Test III (DT/OT III), now ongoing. Extended engineering development at Fort Knox, KY, demonstrated that previous shortfalls in XMI mission reliability and power-train durability had been overcome. Lessons learned from this test have been incorporated into the first-year production tanks being used in the third and final Development and Operational Test (DT/OT III) program. The first production tank rolled out of the Lima Army Tank Plant and was delivered to the Army on 28 February 1980 on schedule. DT III started in March 1980 and OT III in September 1980. As a result of production start-up problems, only 41 of 71 XMI's scheduled for acceptance by the Army through November 1980 were available to support planned testing and institutional training programs. The September 1980 start date reflects this shortfall in XMI's for the test program.

2. (U) FY 1981 Program: The majority of development testing and all of the operational testing for the XMI tank will be completed by 30 September 1981. The tank's training devices less the driver trainer will also have completed testing. Integrated logistic support efforts will continue with emphasis on adjustments resulting from lessons learned during testing and development of general support and depot level repair capabilities. The Defense Systems Acquisition Review Council is expected to meet in October 1981 to decide on XMI full production. Finally, an outcome of the XMI development and operational testing will be the initiation of a near-term reliability and maintainability growth program, should shortfalls in the production-model tank be disclosed in testing. This effort, tentatively, will continue into FY 1983, or until all XMI reliability and maintainability requirements are met. With about thirty percent of RAM-D test data scored, the XMI is meeting or on track to meet all but two durability requirements. In the meantime, work is ongoing to improve the quality of the XMI coming off the production line. The Army is considering an extended RAM-D test for the period June to October 1981 to verify the improvements in tank quality.

3. (U) FY 1982 Planned Program: Final developmental testing in nuclear effects blast testing and manual validation, driver trainer evaluation, and close-out actions resulting from DT/OT III, e.g., refurbishment of DT/OT III tanks to a condition ready for reissue to gaining units, will be accomplished during this period. Development of depot-level maintenance capabilities for vehicle and component overhaul will be completed as well as the software package to permit diagnosis of printed circuit boards using Automatic Test Equipment at the general support maintenance echelon. The near-term reliability and maintainability growth program will continue with emphasis on applying the lessons learned from the test program and developing changes that have long-term operations and support cost savings.

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Program Element: #6.46.20.A
DOD Mission Area: #211 - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

4. (U) FY 1983 Planned Program: The near-term reliability and maintainability growth program will be completed. XM1 used in demonstration testing will be refurbished to a ready-for-issue condition at the Anniston Army Depot.

5. (U) Program to Completion: Tropic testing of the XM1 production tank will be accomplished in FY 1984 with completion not later than FY 1985. A funding request for this effort will be identified in the FY 1983 budget submission.

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Program Element: #6.46.20.A
DOD Mission Area: #211 - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

J. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation: The Army's third Development Test (DT III) is being conducted by the US Army Test and Evaluation Command (TECOM) and independently evaluated by the US Army Materiel Systems Analysis Activity. DT III started in March 1980 and for the most part will end in September 1981. Nuclear-effects-blast testing will be completed in November 1981 and manual evaluations in January 1982. A total of nine production-model XM1's are being used by TECOM to technically evaluate the automotive aspects of the tank; its weapons and fire control; Reliability, Availability, Maintainability and Durability (RAM-D); and environmental effects. Testing is being done at Aberdeen Proving Ground, MD; Yuma Proving Ground, AZ; White Sands Missile Range, NM; and at the Cold Regions Test Center, Fort Greely, AK. The objectives of the test are to determine whether the problems discovered during testing of the pilot-model tank in 1978 and 1979 have been corrected, the production-model XM1 meets Army requirements and contract specifications, the system support package (e.g., manuals, test sets, tools,) is adequate to support the XM1 in the field, the XM1's RAM-D requirements have been met, and the XM1 is capable of operation in various climatic environments. The assessment of RAM-D performance will support derivation of the XM1's maintenance and logistic burden in an operational environment. These estimates will be used to evaluate XM1 manpower and logistic burden at the battalion and theater level and as a basis for future XM1 RAM-D improvements should such improvements prove to be cost effective. The majority of the DT III test program will be accomplished by Army technical experts. However, those aspects of the test which are highly affected by man-machine interface considerations will be performed using soldiers. In addition to the tank testing, TECOM evaluated the XM1's prototype maintenance troubleshooting trainers in December 1980. This was accomplished at the contractor's plant site in Orlando, FL. Results of the development test will be considered by the Army and Defense Systems Acquisition Review Councils to recommend whether to enter full production of the XM1. These council meetings are scheduled for November and December 1981, respectively. Initial development test results indicate that the XM1 should meet its system performance and RAM-D requirements. By the time the test program is complete, the nine development-test XM1's and XM1's periodically operated by the contractor will have traveled approximately 30,000 miles and fired 12,000 rounds of main-gun ammunition. The test is structured to provide for periodic tank configuration changes and validation of these changes. After the test is completed, the nine XM1's will be brought to the final test configuration and will be reissued for use by the Army to satisfy tank inventory requirements and distribution plans. The XM1 production tank differs from the hand-tooled pilot tank tested during the second Development and Operational Tests (DT/OT II) in that the production tank is an assembly-line product that incorporates changes resulting from lessons learned during DT/OT II (February 1978-September 1979) and the extended Full-Scale Engineering Development testing at Fort Knox, KY (June-December 1979). Comments on prior and future XM1 development test programs follow:

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Program Element: #6.46.20.A
DOD Mission Area: Full - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

a. (U) Prior Development Testing: Phase I of the first Development Test (DT I) was conducted by the TECOM at Aberdeen Proving Ground, MD, from February to April 1976 to provide data for selection of either the Chrysler or General Motors XM1 prototype vehicle and the decision to enter engineering development. Both prototypes successfully demonstrated the ability to meet or exceed XM1 requirements. Selection of the prototype XM1 for engineering development, initially scheduled for July 1976, was deferred 120 days by the Secretary of Defense pending the outcome of a resolicitation which considered incorporating standard components in accordance with agreements reached with the Federal Republic of Germany. On 12 November 1976, the Source Selection Authority announced selection of the Chrysler prototype for engineering development. Phase II of the first Development Test (DT I), testing of the Leopard 2 (Americanized Version (AV)), ran from September to mid-December 1976. As a result of this test, the Army concluded that the XM1 best met Army requirements for a main battle tank. In January 1977, the US and Germany agreed to limit interoperability/standardization efforts to subsystems/components only. The second Development Test (DT II) was run from February 1978 to September 1979. This test was designed to assess the degree to which eleven pilot-model XM1's met the Materiel Need statement, to demonstrate that engineering development was reasonably complete, and that engineering solutions to problems were in hand. The test disclosed that XM1 performance objectives were met, except for mission reliability, power-train durability, track durability, and the tank's maintenance ratio; i.e., the ratio of maintenance man hours to operating hours. Later, extended Full-Scale Engineering Development testing at Fort Knox, KY, demonstrated that mission reliability and power-train durability problems had been overcome. Track-durability problems were recognized as technology pacing items requiring further technical development before significant improvement can be expected. Finally, in the case of the maintenance ratio assessment, it was recognized that the ongoing development and operational tests will provide the best opportunity to make a detailed evaluation of this requirement. In addition to the Government testing, AVCO Lycoming ran 1,000 hours of endurance testing in the laboratory on each of two engineering-development engines with production modifications. The Blue Ribbon Panel which reviewed the Fort Knox and laboratory test results concluded that significant improvements had been achieved, and with further improvement in a few areas, significant long-term operations and support cost savings can be realized. The Army is working to make the improvements recommended by the Panel.

b. (U) Future Testing:

(1) (U) Training Devices: Delays in concept definition precluded development testing of all of the prototype XM1 training devices concurrent with the tank test program. Development testing of these devices will be conducted at the contractor's plant site under the auspices of the US Army Test and Evaluation Command. Two competing prototypes of the XM1 Unit-Conduct of Fire Trainer (U-CFT) will undergo development testing in April 1981 in Daytona, FL (General Electric Company), and Warren, MI (Chrysler Defense, Incorporated). The objectives of the development tests are to insure that the U-CFT engineering designs are complete and meet contract specifications. The development test of the prototype driver trainer will run from October to December 1981 at the Sperry Secor Company plant in Fairfax, VA. The objectives of these tests are the

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same as for the competing U-COFT devices. The final climatic-region testing of the XM1 is scheduled for Fiscal Year 1984 at the Tropic Test Center, Fort Clayton, The Canal Zone. The primary objective of this test is to assess the effect of high humidity and heat on the tank. Funding and test-support requirements have caused deferral of this test to 1984.

(2) (U) Production Acceptance Test and Evaluation: In fiscal year 1982, six production-model XM1's produced at the Detroit Arsenal Tank Plant will be subjected to system-performance testing to insure quality of production. Five of these will undergo Reliability, Availability, Maintainability and Durability testing, and the sixth will undergo engineering performance tests. In excess of 20,000 test miles will be run over mixed terrain, and 4,000 rounds of main gun ammunition will be fired. The test will be conducted by the US Army Test and Evaluation Command. As an additional check of quality assurance, a production-model XM1 will be randomly selected each quarter from both tank plants. These tanks will undergo 2,000 miles of Army testing and will fire 100 rounds of main-gun ammunition.

2. (U) Operational Test and Evaluation: The third Operational Test (OT III) of the XM1 tank is a two-site test being conducted by the US Army Armor and Engineer Board at Fort Knox, KY, and by the US Army Training and Doctrine Command Combined Arms Test Activity at Fort Hood, TX. The tests began on 16 September 1980 and are scheduled to end by 31 May 1981. At Fort Knox, a 3250-mile operational mission profile test of each of four production-model XM1's, is being run by Company H, 2d Squadron, 6th Cavalry. The data collected will be used in conjunction with the development test results to assess the XM1's Reliability, Availability, Maintainability and Durability (RAM-D), and the crews' ability to tactically employ the tank. At Fort Hood, OT III is being conducted using a three-company battalion (41 production-model XM1's in the battalion, plus one XM1 in the maintenance support unit). The test started with the handoff of the XM1 to the armor unit and is proceeding with individual, crew, and unit training as the unit transitions from a fully trained, combat-ready M60 tank battalion to an operationally effective XM1 unit. The test includes crew and small unit maneuver exercises, individual tank and platoon gunnery, and company and battalion-level field training exercises, all conducted under varying operational and environmental conditions in both daylight and night. The test unit is the 2d Battalion, 5th Cavalry, 1st Cavalry Division. The Operational Test and Evaluation Agency is responsible for managing and independently evaluating operational tests at both sites. The objectives of the tests are to: assess the RAM-D performance of the production-model XM1; determine if the production-model XM1 incorporates, without degradation, the improvements made to the pilot-model XM1; evaluate the adequacy of institutional training programs for tank crews and maintenance personnel; and provide the data with which to assess the logistic supportability of the XM1 in battalion and smaller units. Initial results from the Fort Knox test indicate that XM1 mission reliability performance is below expectations and that power-train durability cannot be achieved, if only the Fort Knox test data is considered. The principal causes of these shortfalls are immature production processes and inadequate quality control during assembly of the XM1. Corrective action is being taken, and the Army intends to run an extended RAM-D test from June to October 1981 using XM1's produced in the

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Program Element: #6.46.20.A
DOD Mission Area: #211 - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

May-June 1981 timeframe and benefiting from remedial improvements to the production base. The XM1 tanks will accrue a total of over 28,000 miles and will fire over 8,500 rounds of main-gun ammunition in the course of the operational test. The results of this test program will assist the Army and Defense Systems Acquisition Review Councils to make XM1 full-production recommendations. In addition to the XM1 operational test, the XM1 prototype maintenance trainers for the turret, engine, transmission, hull electrical systems, laser rangefinder and thermal imaging system, and the ballistic computer will be subjected to operational testing from February through July 1981. The test will be conducted by the US Army Armor and Engineer Board using personnel from the 1st Advanced Individual Training Brigade, Fort Knox, KY (for the Turret Organizational Maintenance Trainer), and the US Army Ordnance Center and School, Aberdeen Proving Ground, MD (for the other trainers). The Director of Training Development, US Army Armor Center, will conduct the independent evaluation to assess each of the trainers' performance characteristics and training contribution; the ability of soldiers to apply skills learned on the trainers to actual XM1 hardware; and the reliability, availability, maintainability, safety features, and support aspects.

a. (U) Prior Operational Testing: Phase I of the first Operational Test (OT I) was conducted by the Operational Test and Evaluation Agency (OTEA) at Aberdeen Proving Ground, MD, during April 1976. This test was accomplished in conjunction with the first development test using one prototype vehicle and one automotive test rig from each contractor (Chrysler and General Motors). Both prototypes met the operational effectiveness objectives required for that stage of development. Phase II of OT I tested the the German Leopard 2 (Americanized version) prototype and was completed in December 1976 at Aberdeen Proving Ground, Md, by OTEA against the same test criteria used to evaluate the US competitive prototype tanks. As a result of this test the Army concluded that the XM1 best met Army requirements for a main battle tank. The second Operational Test (OT II) was conducted by OTEA at Fort Bliss, TX, using five pilot-model XM1's and personnel from the 3d Armored Cavalry Regiment. The test ran from May 1978 to February 1979 and resulted in ratings of satisfactory in firepower and survivability; marginal in availability, mobility, and fightability; and unsatisfactory in reliability. Satisfactory ratings reflected the superior armor protection of the XM1, the compartmentalization of fuel and service ammunition, and significant improvement in XM1 main-gun accuracy over that of the M60A1 tank. Marginal assessments reflected the higher fuel consumption of the XM1, XM1 track retention and reliability problems, some design features having undesirable human factors implications, and vehicle downtime resulting from the poor reliability of the XM1. The detailed results of this test in conjunction with the Development Test results were the basis for design changes to preclude recurrence of these shortfalls in the production model XM1. Many of the corrections, particularly those affecting reliability and safety, were validated during the extended Full-Scale Engineering Development testing of the three refurbished pilot-model XM1's at Fort Knox, KY, from June to December 1979.

b. (U) Future Operational Testing: Operational testing of two XM1 prototype Unit-Conduct of Fire Trainers (U-COFT's) will be conducted by the US Army Training and Doctrine Command Combined Arms Test Activity. The test of the U-COFT's will be run at Fort Hood, TX, from July through September 1981, using personnel from the XM1 opera-

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Program Element: #6.46.20.A
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Title: Tank Systems
Budget Activity: #4 - Tactical Programs

tional test unit, the 2d Battalion, 5th Cavalry, 1st Cavalry Division. The independent evaluation will be accomplished by the Director of Training Development, US Army Armor Center (USAARMC). The evaluation of the U-COPT's will address performance characteristics; the effectiveness of training transfer to the XML; the reliability, availability, and maintainability characteristics; and safety, human factors, and supportability aspects. The results of this test will be used in the determination of which prototype U-COPT will be procured by the Army. The driver trainer will be tested at Fort Knox, KY, from March through May 1982, using personnel from the 1st Advanced Individual Training Brigade. The Director of Training Development, USAARMC will conduct the independent evaluation. The evaluation of the driver trainer will assess performance against the same objectives listed for the U-COPT evaluation. In late fiscal year 1981, five XML tanks will be delivered to Fort Knox, KY, for 4,000 miles of testing per tank in an operational environment. The objective of the test will be to demonstrate that the XML is maintaining its performance requirements.

3. (U) System Characteristics:

Operational/Technical Characteristics	Objectives ^{1/} 6-9	Demonstrated Performance ^{2/} 5.8
Acceleration (hard surface, 0 degree slope, 0 to 20mph) (sec)		
Speed (mph)		
10% slope	20-25	26
60% slope	3-5	5
Maximum	40-50	45
Cruising range (miles)	275-325	270
Horsepower/Weight(tons)	26-30:1	25:1
Height (inches)	90-95	93.5
Width (inches)	120-144	144.25
Stowed ammunition (main gun rounds)	55-65	55
Reliability (Mean Miles Between Failure)		
ASARC/DSARC III	216 (goal)	145

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Title: Tank Systems
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Operational/Technical Characteristics	Objectives ^{1/}	Demonstrated Performance ^{2/}
Management Review #1	272/200 ^{3/}	326 4/
End DT/OT III	320	
Power Train Durability (Probability of achieving 4000 miles)		
ASARC/DSARC III	.4 (goal)	.2
Management Review #1	.5/.3 ^{3/}	4 ^{5/4}
End DT/OT III	.5	4/
Maintenance ratio (maintenance/man-hours/operational hours)	1.25	

1/ End Development/Operational Test (DT/OT) III requirements except as indicated.

2/ DT/OT II and extended Full-Scale Engineering Development test results.

3/ Values reflect Office of the Secretary of Defense requirements/thresholds for Management Review #1 in February 1980.

4/ To be demonstrated at the end of DT/OT III.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.21.A
 DOD Mission Area: #212 - Fire Support

Title: COPPERHEAD (Cannon-Launched Guided Projectile)
 Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	9035	6091	3362	2077	0	159389
D073	COPPERHEAD	9035	6091	3362	2077	0	159389

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports engineering development of the COPPERHEAD semiactive laser-guided projectile. The COPPERHEAD is a 155mm field artillery projectile fired from conventional howitzers and designed to attack stationary and moving hard, point targets such as tanks with a high probability of achieving first-round kills. The projectile acquires and homes on laser energy reflected from a target which has been illuminated by a laser designator. This projectile will provide the Army the capability to effectively attack armored targets of the numerically superior Warsaw Pact forces at ranges beyond the capability of direct fire antitank weapons. The high single-shot kill probability provides a force multiplier that significantly improves the Army's antitank capability within the existing force structure.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: The warhead product improvement program initiated in FY81 will be continued with emphasis on completion of confirmatory tests commencement of safety tests and preproduction studies. Investigation of range enhancement feasibility will be continued.

Program Element: #6.46.21.A
 DOD Mission Area: #212 - Fire Support

Title: COPPERHEAD (Cannon-Launched Guided Projectile)
 Budget Activity: #4 - Factical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Initiate Advanced Development	Feb 72	Feb 72
Initiate Engineering Development	Jul 75	Jul 75
Initiate DT II	Mar 78	Mar 78
Defense Systems Acquisition Review Council (DSARC III)	Nov 79	Nov 79
Initial Operational Capability (IOC)	Nov 81	Sep 81

Delay in DSARC III increased materials leadtime, and late delivery of selected initial production facility equipment all contributed to the two-month slip of IOC.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	9035	6091	3362	2077	159389
Funds (as shown in FY 1981 submission)	7036	6035	3349	2051	157296

FY80 funds were increased to accommodate required fixes identified as a result of the exhaustive failure analysis following DT/OT. Reassignment of internal componentry to permit increased reliability in launch environments, complete redesign of the container and seeker logic changes constitute the significant engineering changes accomplished with the additional funding. These fixes will be incorporated in first production rounds. Increases in FY's 81 and 82 are attributable to the amended budget request and the application of higher fuel, inflation, and civilian pay pricing indices than were applied last year.

Program Element: #6.46.21.A
DOD Mission Area: #212 - Fire Support

Title: COPPERHEAD (Cannon-Launched Guided Projectile)
Budget Activity: #4 - Tactical Programs

E. (ii) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>to Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
Ammunition Procurement, Army						
Funds (current Requirements)	71200	122100	115700	129600	615400	1118900
Funds (as shown in FY 1981 submission)	66300	121000	103800	Not Shown		959800
Quantities (current requirements)	2100	4300	4229	5075	28682	44386
Quantities (as shown in FY 1980 submission)	2100	4300	3900	Not Shown	34086	44386

FY 1980 funds were increased to cover cost increases in the production facility resulting from late receipt of production line equipment, a slightly higher target price for the first procurement and increased cost of long-lead materials. The FY81 increase is attributable to the application of higher fuel, inflation, and civilian pay pricing indices than were applied last year. Dollar and quantity changes for FY82 and the increase in total estimated cost are driven by the inability of the Army to procure COPPERHEAD at an economically efficient rate, near-term readiness and affordability considerations, and the application of higher inflation indices to outyear procurement.

Program Element: #6.46.21.A
DOD Mission Area: #212 - Fire Support

Title: COPPERHEAD (Cannon-Launched Guided Projectile)
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: A requirement exists to increase the indirect fire capability of field artillery cannon units by providing terminally guided projectiles that acquire and home on stationary and moving point targets with a high probability of achieving first-round kills. The COPPERHEAD projectile satisfies this requirement. The COPPERHEAD is compatible with standard 155mm howitzers and propelling charges and will be included in the basic ammunition loads of appropriate field artillery units. COPPERHEAD fire missions will be conducted using standard artillery procedures and fire control techniques. COPPERHEAD fire missions have been successfully conducted using the Ground Laser Locator Designator (GLLD), the primary designator as well as the remotely piloted vehicle (RPV), and a helicopter-mounted airborne designator. During the final portion of the trajectory, the observer illuminates the target with a narrow beam laser. The COPPERHEAD acquires the reflected energy and guides to the target using proportional navigation guidance. The COPPERHEAD has a maximum range of 16 kilometers and carries a shaped charge warhead that can penetrate of homogeneous armor. The COPPERHEAD will complement rather than replace available projectiles in field artillery cannon units.

G. (U) RELATED ACTIVITIES: The COPPERHEAD project is related to program elements 6.47.30.A (RPV) (Remotely Piloted Vehicle) and 6.43.08.A (Precision Laser Designator) where work is being performed to develop laser designators for use by forward observers. An extensive effort is underway to insure maximum component commonality between the Army projectile and the Navy 5-inch projectile in order to avoid duplication of effort and to achieve maximum possible savings. To facilitate the achievement of this objective, these projectile development programs are jointly managed with the Army established as the responsible service.

H. (U) WORK PERFORMED BY: Martin Marietta Corporation, Orlando, FL, is the contractor responsible for system development. Responsible government Activities include: US Army Armament Research and Development Command, Dover, NJ; US Army Missile Command, Huntsville, AL; Project Manager, Cannon Artillery Weapons Systems, Dover, NJ; US Army Test and Evaluation Command, Aberdeen, MD.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: The COPPERHEAD program began in 1971 with \$1.6 million emergency funds to conduct in-house systems studies. Semiautomatic laser homing was selected for use during the initial phase of the program because it was the most technically advanced. In February 1972, contracts were signed with Texas Instruments and Martin Marietta to conduct a two-phase competitive prototype demonstration. Each contractor fabricated and delivered fully functional prototype projectiles with telemetry to the Army for testing. In January 1975, a Special Commonality Defense Systems Acquisition Review Council (DSARC) directed the Army to continue the Advanced Development program. Sixteen of 18 prototype projectiles and six Navy 5-inch/155mm prototype projectiles were tested and evaluated. DSARC II was conducted in June 1975,

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Program Element: #6.46.21.A
DOD Mission Area: #212 - Fire Support

Title: COPPERHEAD (Cannon-Launched Guided Projectile)
Budget Activity: #4 - Tactical Programs

and approval to enter Engineering Development ED was received. The (ED) contract was awarded to the Martin Marietta Corporation in July 1975 based on the results of the competitive advanced development phase. The FY 1976 funding was reduced by over 31 percent (from \$24.8 million to \$17.0 million) necessitating a complete program restructure which resulted in a program slip of six months and the initiation of ED at a lower level than initially anticipated. During FY 1976 and FY 1977, design changes to the warhead, fuze, roll-rate sensor, and seeker gyro were tested, and the final two Army prototypes were successfully fired. The first one was fired at a tank illuminated by a designator mounted in a Remotely Piloted Vehicle (RPV), and the second was fired at a moving tank illuminated by a helicopter-mounted designator during darkness. During FY 1977 subsystem testing was completed, and the first series of all-up-round baseline tests was conducted at White Sands Missile Range (WSMR). Producibility Engineering and Planning (PEP) was initiated in December 1976 under Congressionally imposed dollar and time constraints. PEP constraints were lifted in April 1977. During FY 1978 the preliminary Technical Data Package (TDP) was delivered by the contractor and reviewed by government personnel. Naval Avionics Center (NAC) initiated technical data package (TDP) validation efforts in December 1977. Prototype Qualification Tests (PQT) were initiated in March 1978. The Initial Production Facilities contract was awarded in 1977. Qualification tests, development test/operational test II were completed in September 1979. An Army Systems Acquisition Review Council (ASARC) was held in September 1979 which recommended the COPPERHEAD guided projectile enter production beginning in FY 1980. The Naval Avionics Center completed the technical data package desk top validation. DSARC III was held in November 1979, and the Army was permitted to enter production at a rate not to exceed 200 units per month until a threshold reliability has been demonstrated based on production validation test firings. Seeker fixes to provide increased projectile effectiveness under obscured environment conditions were successfully tested in 2QFY80. These fixes and other improvements, which focus on the attainment of enhanced reliability, will be incorporated in first-production rounds. A container redesign to diminish shock and vibration effects of rough handling was completed.

2. (U) FY 1981 Program: Payment of the Design-to-Unit Production Cost (DTUPC) Award fee will be based on the prime contractor's performance. Initiation of a projectile effectiveness enhancement characterized by an improved warhead program which will increase the probability of kill against future armor threats and a range enhancement investigation. The Naval Avionics Center independent validation of the COPPERHEAD Technical Data Package continues.

3. (U) FY 1982 Planned Program: Continuation of the projectile effectiveness improvement effort to include completion of improved warhead confirmatory tests, commencement of safety tests and preproduction studies. Completion of independent validation of the technical data package.

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Program Element: #6.46.21.A
DD Mission Area: #212 - Fire Support

Title: COPPERHEAD (Cannon-Launched Guided Projectile)
Budget Activity: #4 - Tactical Programs

4. (U) FY 1983 Planned Program: Completion of the warhead improvement program and integration of the improved warhead into production hardware.

5. (U) Program to Completion: Program completed in FY 1983.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.21.A
DOD Mission Area: #212 - Fire Support

Title: COPPERHEAD (Cannon-Launched Guided Projectile)
Budget Activity: #4 - Tactical Programs

J. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation:

a. (U) The COPPERHEAD cannon-launched guided projectile is being developed by the Project Manager, Cannon Artillery Weapons System, Dover, NJ. The development contractor is the Martin Marietta Corporation, Orlando, Florida. Advanced development of COPPERHEAD was highlighted by competitive feasibility demonstrations between Martin Marietta and Texas Instruments. The Naval Surface Weapons Laboratory, Dahlgren, Virginia, also participated by adapting their 5-inch guided projectile to 155mm. The engineering development contract was awarded to Martin Marietta when their prototype guided projectile achieved 8 direct hits out of 12 rounds fired including two hits on moving tanks, a direct hit on a stationary tank that had been designated from a remotely piloted vehicle, and a direct hit on a moving tank designated by the Airborne Target Acquisition and Fire Control Systems (ATAFCS). Prototype Qualification Testing for the engineering development version Developmental Test (DT II) was conducted by the US Army Test and Evaluation Command (TECOM) at White Sands Missile Range (WSMR) between March 1977 and December 1979. In July 1978, DT testing was delayed when it became necessary to incorporate design changes for improved reliability and in-flight performance. A titanium gyroscope was substituted for the original plastic gyroscope, and large-scale integrated circuits replaced hybrid electronics. New projectiles were manufactured in August and testing resumed in September 1978.

b. (U) Major subtests included environmental qualification, battlefield environment, cold weather performance, and range performance and reliability. In addition, nuclear effects, nuclear-biological-chemical decontamination, and electromagnetic radiation effects were also tested. 168 rounds were fired during the DT II firing program. During severe environmental qualification firings, the projectile reliability was lower than desired. Design changes were identified and a limited number of projectiles which incorporated the design fixes were reworked in August 1979. These projectiles were fired in September and October 1979, and resulted in a significant improvement in reliability. Overall reliability achieved during DT II was 0.69, which was consistent with the desired reliability level for OT testing. The projectile effectiveness and single-shot kill probability met or exceeded the required value as shown in paragraph three below. A technical data package (TDP) suitable for production was provided to the project manager. The TDP included the final design configurations.

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Program Element: #6.46.21.A
DOD Mission Area: #212 - Fire Support

Title: COPPERHEAD (Cannon-Launched Guided Projectile)
Budget Activity: #4 - Tactical Programs

c. (U) Ongoing and future testing includes Production Facility Proof Tests to evaluate and refine the new COPPERHEAD production facility. 30 rounds have been allocated for this purpose, 20 of which will be actual all-up-round firings and the remaining 10, component/subassembly tests. This test program is scheduled to be conducted in the second quarter of FY81. In the third quarter of FY81, the Army plans to initiate a 30-round first article test program. This will be followed by a 105-round series of initial production tests designed to demonstrate COPPERHEAD performance with rounds produced on the actual production line. It is anticipated that after initial production testing any remaining reliability problems will be identified and corrected prior to the 75-round Special Reliability Demonstration scheduled for January 1982. The purpose of this demonstration is to show sufficient reliability growth (.8 is required) to warrant proceeding into full-scale production. Other tests planned include a 13-round-per-month Lot Acceptance Test Program scheduled to commence with the April 1981 production and a follow-on evaluation scheduled for the first quarter of FY83.

2. (U) Operational Test and Evaluation:

a. (U) Operational Test I (OT I) was conducted at White Sands Missile Range during 25 March-30 April 1974. Test results indicated that a Forward Observer (FO) section equipped with the Ground Laser Locator Designator (GLLD) would successfully complete an artillery fire mission with the COPPERHEAD. An independent operational test (OT II) was conducted by the Operational Test and Evaluation Agency (OTEA), Falls Church, VA. The test was conducted during the period March-June 1979 at Fort Carson, CO, using soldiers of the 4th Division. The doctrine and tactics used by the test units were in agreement with the operational concept developed by the Army's Field Artillery School. OT II consisted of two phases. The nonfire phase was conducted under both day and night conditions. Laser designator operators were evaluated for their ability to properly designate for the COPPERHEAD guided projectile. Acquisition, tracking, engagement, training, and command-control-communications were also evaluated. During the live fire phase, 71 rounds with full guidance and control were fired against single and multiple moving target arrays in a tactical scenario. Firings were conducted at various ranges under day and night conditions, and several missions were conducted in conjunction with smoke and dust normally present on the battlefield. Of the 71 rounds fired during OT II, 29 rounds hit the target. The results of both OT I and OT II generated the requirement for improved reliability discussed above. Of particular concern was degraded performance on a smoke- or dust-obscured battlefield. In response to this concern, significant changes in seeker circuitry were developed and tested by the prime contractor in August 1980 in an exercise called Smoke Week III. The results of this testing demonstrated major improvements in COPPERHEAD performance and utility on the obscured battlefield.

b. (U) The test unit for OT II was a 155mm M109 (SP) howitzer direct support battalion with an M198 towed howitzer section attached from the XVIII Airborne Corps. COPPERHEAD projectiles were drawn from the ammunition supply point and transported to the firing unit in tactical vehicles, subjected to the normal ammunition handling procedures used by combat

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Program Element: #6.46.21.A
DOD Mission Area: #212 - Fire Support

Title: COPPERHEAD (Cannon-Launched Guided Projectile)
Budget Activity: #4 - Tactical Programs

soldiers. The fire control procedures and communications procedures used in the test are those currently being employed by field artillery units.

c. (U) A follow-on evaluation test is planned for the first quarter of FY83 utilizing production projectiles. The test will be conducted with an active duty unit equipped with fire control devices scheduled for fielding concurrent with the COPPERHEAD system. The evaluation is planned to approximate the OT II variety of tactical situations and verify the anticipated improvements in reliability and performance on the obscured battlefield.

3. System Characteristics:

<u>Operational/Technical Characteristics</u>	<u>Objectives</u>	<u>Demonstrated Performance</u>
Weight (pounds)	150	138
Length (inches)	54	54.2
Accuracy (CEP-ft)		
Range (km)		
Maximum	16-24	16
Minimum	1.5-3.0	3.0
Single-Shot Kill Probability		

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.24.A

DOD Mission Area: #211 - Close Combat

Title: High Mobility Multipurpose Wheeled Vehicles (HMMWV)

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	1300	2797	3074	2810	0	9981
	QUANTITIES						33
DH17	High Mobility Multipurpose Wheeled Vehicles	1300	2797	3074	2810	0	9981

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The High Mobility Multipurpose Wheeled Vehicle (HMMWV) Program is a Tri-Service Program, under Army lead, to develop a family of vehicles to meet critical Army, Air Force, and Marine Corps combat, combat support, and combat service support mission requirements and selectively replace vehicles in the 1/4-ton to 1 1/4-ton weight class presently in the tactical wheeled vehicle fleets of the three services. The 1 1/4-ton vehicles of the HMMWV family will utilize a common chassis, minimizing logistic support requirements, in three body configurations specifically tailored for mission requirements by the application of kits. Typical mission requirements include TOW missile carrier, forward air control, rear area and base security, personnel and cargo transport, and command and control. Obsolete and overage vehicles to be selectively replaced by vehicles of the HMMWV family include vehicles from four families: the JEEP (M151), the MULE (M274), the GAMA GOAT (M561 utility and M792 ambulance), and the M880 1 1/4-ton commercial series. To the maximum extent possible, existing commercial and military components will be used in the HMMWV. A Joint Mission Element Need Statement (JMENS) has been approved.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Funds requested provide for continuing the engineering development of the common chassis, body configurations for the weapons carrier, utility, and ambulance versions, and kits for the High Mobility Multipurpose Wheeled Vehicle (HMMWV). Specifically, the FY82 funds are required to: complete the design and fabrication of prototype vehicles, test prototypes for compliance with the performance specification and government requirements, support the tests of the prototypes in a military environment, assess the results of testing, and conduct an In-Process Review to determine acceptable contractor candidate vehicles to compete for the production quantities.

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Program Element: #6.46.24.A
DOD Mission Area: #211 - Close Combat

Title: High Mobility Multipurpose Wheeled Vehicles (HMMWV)
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Special IPR (Specifications)	December 1979	December 1979
Special IPR (Specifications)	September 1980	Not Shown
Release RFP for prototype test vehicles	M Month ^{1/}	January 1980
Award competitive contracts for prototype test vehicles	M+5 Months ^{1/}	April 1980
Initiate Development Test II/ Operational Test II	M+15 Months ^{1/}	February 1981
Development Acceptance IPR (type classification)	M+21 Months ^{1/}	September 1981
Award Production Contract	M+21 Months ^{1/}	September 1981
Initial Operational Capability	M+49 Months ^{1/}	September 1983

^{1/} Milestone dates are inexact due to pending Congressional action on Army's FY 1980 reprogramming request.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	1300	2797	3074	2810	9981
Funds (as shown in FY 1981 submission)	1300	2771	2612	2680	9363

The funding level difference in FY 1981 and increased costs in FY 1982 and beyond are the result of higher fuel, inflation, and civilian pay pricing indices than were applied last year.

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Program Element: #6.46.24.A

DOD Mission Area: #211 - Close Combat

Title: High Mobility Multipurpose Wheeled Vehicles (HMMWV)

Budget Activity: #4 - Tactical Programs

8. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>To Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
Other Procurement, Army:						
Funds (current requirements)	0	0	3600	0	933900	937500
Funds (as shown in FY 1981 submission)	0	0	11500	0	926000	937500
Quantities (current requirements)	0	0	0	0	38129	38129
Quantities (as shown in FY 1981 submission)	0	0	394	0	37735	38129

(U) Procurement funds and quantities in the FY 1981 submission were predicated on development being initiated in FY 1980 which required Congressional approval of Army's FY 1980 transfer request of \$4900 thousand. The FY 1982 estimate of \$3600 thousand is to fund the Army share of FY 1982 support costs which will be the first year of a five-year multiyear procurement contract. FY 1983 procurement funds will be identified by the Army prior to submission of the FY 1983 budget request.

(U) The estimates of total cost and quantities are minimums as they are based on old estimates of Army Initial Issue Quantities. The Initial Issue Quantity and the Authorized Acquisition Objective based on the recently completed Tactical Wheeled Vehicle Fleet requirements Study are being developed. Also, the estimates do not include the requirements of the Air Force and Marine Corps.

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Program Element: #6.46.24.A
DOD Mission Area: #211 - Close Combat

Title: High Mobility Multipurpose Wheeled Vehicles (HMMWV)
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The High Mobility Multipurpose Wheeled Vehicle (HMMWV) family combines the 1/4-ton through 1 1/4-ton family of wheeled vehicles into a common baseline chassis with variations in body design to accommodate specific roles and missions. The common chassis concept greatly advances the tactical vehicle procurement process for the Services by emphasizing logistics commonality and standardization. The existing fleet of 1/4-ton through 1 1/4-ton wheeled vehicles has demonstrated a degree of obsolescence and operational deficiencies sufficient to warrant immediate upgrading. Also, many of the vehicles are already overage. Vehicles in the current fleet include: the M151 1/4-ton JEEP and M274 1/2-ton MULE (as weapons carriers), the M561 1/4-ton GAMA GOAT, the M792 1 1/4-ton Ambulance, and the M880 Series of commercial 1 1/4-ton trucks. Each is limited in off-road mobility, payload capacity, and survivability when assigned to various combat, combat support, and combat service support roles critical to the success of today's Army. For most of these vehicles, obsolescence and the absence of a warm production base have seriously degraded supportability and maintainability. In the weapons carrier role, both the JEEP and the MULE are grossly overloaded, unprotected, and slow. Vehicles from the HMMWV family are required to selectively replace vehicles in the current fleet. Additionally, the Marine Corps expects to completely modernize its 1/4-ton through 1 1/4-ton tactical wheeled vehicle fleet with common chassis derivatives of the HMMWV. The program is designed to capitalize to the maximum extent possible on existing commercially available vehicle technology. The development effort is minimal and is considered to be a low technical risk. The program will depend on industry for the design and fabrication of prototype test vehicles.

G. (U) RELATED ACTIVITIES: This program is supported by other Army ground mobility research and development programs, to include: Program Element #6.11.02.A, Project AF22, Research in Vehicle Mobility; PE #6.26.01.A, Tank-Automotive Technology; and PE #6.36.21.A, Vehicle Engine Development. This program also is supported by US Marine Corps research and development PE #6.37.29.M, Project 075J, High Mobility Tactical Truck-Light. Duplication of effort is precluded by Joint Services' participation in the planning and conduct of this program, review and coordination of the program at all Service management levels, and by participation in the development of the Performance Specification and In-Process Reviews.

H. (U) WORK PERFORMED BY: US Army Tank-Automotive Command, Warren, MI, has the responsibility for implementation of this program. Contractors for the program are to be selected.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: No research and development funds were appropriated for the Army for this program in FY 1979 and prior years. Marine Corps research and development funds in FY 1979 in the amount of \$253 thousand and in

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Program Element: #6.46.24.A
DOD Mission Area: #211 - Close Combat

Title: High Mobility Multipurpose Wheeled Vehicles (HMMWV)
Budget Activity: #4 - Tactical Programs

FY 1980 in the amount of \$1,000 thousand were provided to the Tank-Automotive Command. Marine Corps plus Army funds were used to provide engineering support in program planning, development of the performance specification, preparation of the Joint Mission Element Need Statement, mobility studies, release to industry of a Letter of Intent with the performance specification and a request for industry comments on the program plan and performance specification, and the conduct of an In-Process Review to incorporate industry comments to improve the program plan and performance specification.

2. (U) FY 1981 Program: Request for Proposals for the design and fabrication of prototype vehicles will be released to industry. Responses will be evaluated and contracts awarded. Development of kits and preparation of the Integrated Logistic Support (ILS) Package will be initiated.

3. (U) FY 1982 Planned Program: Development Test II/Operational Test II (DT/OT II) on the prototype vehicles will be conducted. A Development Acceptance In-Process Review (DEVA IPR) will be conducted, and the High Mobility Multipurpose Wheeled Vehicle (HMMWV) Family will be type classified. A contract for the initial production of vehicles will be awarded. Development of kits and preparation of the Integrated Logistic Support (ILS) Package will continue.

4. (U) FY 1983 Planned Program: The ILS Package and kit development will be completed. Required engineering support will be provided. The High Mobility Multipurpose Wheeled Vehicle (HMMWV) Family will be adapted to new roles and required capabilities.

5. (U) Program to Completion: Conditional Initial Operational Capability (IOC) will be achieved by First Quarter FY 1985. Full-support IOC will be achieved by Third Quarter FY 1985.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.26.A
DOD Mission Area: #211 - Close Combat

Title: Fire Support Team Vehicle (FISTV)
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	7720	8216	9806	7070	None	33812
DP23	FISTV	7720	8216	9806	7070	None	33812

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Supports development of a Fire Support Team Vehicle, which will provide significantly increased capability to the Fire Support Team Headquarters in support of fast-moving armor, mechanized infantry and cavalry units. Currently, the Fire Support Team Headquarters must rely on a standard M113 Armored Personnel Carrier with limited communications ability, no target location capability, and no armor protection for its laser designator/rangefinder or its operator when in use. The Fire Support Team Vehicle provides a mobile, survivable platform with enhanced communications capability, significantly increased target location capability, and an armored environment for laser designation of enemy point targets for destruction by precision-guided munitions such as Copperhead and Hellfire. This program integrates the Ground Laser Locator Designator into an armored targeting station similar to the weapons station of the improved TOW Vehicle. A North Seeking Gyro compass is being developed and integrated into the targeting station to provide accurate target heading and target elevation information. This information, when combined with target range data from the Ground Laser Locator Designator, provides highly accurate target information for conventional or precision-guided fire missions. The program also adds remote capability to the Ground Laser Locator Designator to permit operation from within the vehicle and supports the development of a new intercom which allows transmission or reception of radio traffic on any one of four radios from any one of four crew stations. (The Fire Support Team Vehicle will have the necessary radios to allow voice and digital interface with the platoon forward observers and TACFIRE.) Although the Fire Support Team Vehicle uses the M113A2, assets will be converted to the appropriate configuration at depot, and new Armored Personnel Carrier procurement will not be required.

C. (U) BASIS FOR FY82 RDTE REQUEST:

1. (U) Continues development of the Fire Support Team Vehicle. During this period, the first three prototype vehicles

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Program Element: #6.46.26.A
 DOD Mission Area: #211 - Close Combat

Title: Fire Support Team Vehicle (FISTV)
 Budget Activity: #4 - Tactical Programs

will continue Engineering Development Test-Government. After testing, required changes will be made and the vehicles will be upgraded and refurbished prior to Operational Test. A second lot of three prototype vehicles will be manufactured, fabricated, and assembled during this period. These vehicles will be used for Prototype Qualification Test-Government. Remoted production model Ground Laser Locator Designators funded by this program will be delivered for use on the Fire Support Team Vehicle for development and operational testing.

2. (U) The total estimated development costs are \$33.8 million. This estimate has been reviewed in detail by the Army and is considered adequate to complete this research project.

<u>Major Milestones</u>	<u>Current Milestone Dates</u>	<u>Milestone Dates Shown in FY 1980 Submission</u>
Start Engineering	4Q FY1981	3Q FY1981
Development Testing II		
Start System Operational	1Q FY1983	3Q FY1982
Testing II		
Complete All Testing	2Q FY1983	4Q FY1982
Production In-process	2Q FY1983	4Q FY1982
Review (IPR)		

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST:

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	7720	8216	9806	7070	33812
Funds (as shown in FY 1981 submission, FISTV only)	6050	8139	9488	5379	30056

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Program Element: #6.46.26.A
DOD Mission Area: #211 - Close Combat

Title: Fire Support Team Vehicle (FISTV)
Budget Activity: #4 - Tactical Programs

Funding requirements shown in the FY81 submission were reduced by OSD from \$13.139 to \$8.139 million. Since the FY81 submission, the development funding requirements have been refined and the lack of available funds for this effort in FY81 has extended the length of development time and has resulted in higher program costs as outlined above. The increase from \$6.050 million to \$7.720 million in FY80 funding was a reprogramming action caused by actual contractor costs versus earlier contractor estimates.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Cost
Weapons and tracked Combat Vehicle Procurement, Army:						
Funds (current requirement)	0	0	0	\$7600	301600	189200
Funds (as shown in FY 1981 submission)	0	0	25000	30400	303600	359000
Quantities (current requirement)	0	0	0	225	755	980
Quantities (as shown in FY 1981 submission)	0	0	57	107	806	970

The FY81 submission estimate for both quantities and dollars was based on preliminary estimates of this FY79 new start development. Quantities and dollar estimates have been refined based on FY80 development efforts. The small change in the total buy is based on unit deployment changes. The cost estimate for the procurement of 980 vehicles has been further refined to show estimated costs.

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Program Element: #6.46.26.A
DOD Mission Area: #211 - Close Combat

Title: Fire Support Team Vehicle (FISTV)
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: Artillery Forward Observer Teams, now called Fire Support Teams equipped with the Ground Locator Laser Designator, have opened a new dimension in artillery warfare--precision fire capability to kill moving enemy targets and more accurate and effective fires to support fast-moving mechanized warfare. Because of this increased effectiveness, it can be anticipated that enemy forces will take extra measures to neutralize or destroy the US Fire Support Teams by all means available. It is the vulnerability of the Fire Support Teams and their equipment to enemy fires which require that the Army undertake a development program to protect the Fire Support Teams and equipment to insure their combat survivability and effectiveness. The Fire Support Teams, when supporting highly maneuverable cavalry, mechanized, and armor units, are particularly vulnerable. Cavalry, mechanized, and armor units rely on their mobility and armor protection for their survivability, and their operations are characteristically fast-moving. Therefore, there is little or no opportunity for the Fire Support Teams supporting these forces to "dig in" for protection of their personnel and equipment. Recognizing the critical need for Fire Support Team mobility and protection, the Army has provided the Fire Support Team a Personnel Carrier when supporting these units. While the M113 Armored Personnel Carrier provides mobility to the Fire Support Team, it does not provide the needed protection to the Fire Support Team directing the fires of the supporting artillery when operating in the battle area. That shortcoming is the genesis for this program request; that is, to protect the Fire Support Teams and their equipment, especially the Ground Laser Locator Designator, while conducting lasing operations and directing fires. The easiest and most cost-effective way to accomplish this task is to develop a remote control capability in the Ground Laser Locator Designator and integrate it into the armored elevated hammerhead developed for the Improved TOW Vehicle program. Since a hand-held magnetic compass normally used by Fire Support Teams to obtain direction is not accurate when used on or near an armored carrier, an additional effort requires the integration of a North-Seeking Gyro compass, also to be located in the hammerhead to complement the Ground Laser Locator Designator. The combination of the Ground Laser Locator Designator, providing distance to target and lasing capability, and the North-Seeking Gyro compass, providing direction and vertical angle, give the Fire Support Team highly accurate, timely data. This new timeliness and accuracy goes far beyond any observer capability in the past which will result in a major increase in firepower effectiveness.

G. (U) RELATED ACTIVITIES: None.

H. (U) WORK PERFORMED BY: The overall in-house program responsibility lies with the Project Manager, Improved TOW Vehicle (ITV)/Fire Support Team, and the US Army Tank-Automotive Materiel Readiness Command (TARCOM), Warren, MI, with assistance from three other agencies: The US Army Communications Research and Development Command (CORADCOM), Ft Monmouth, NJ; the US Army Engineering Topographic Laboratories (ETL), Ft Belvoir, VA; and the US Army Missile Research and Development Command (MICOM), Huntsville, AL. The prime contractor for development is Emerson Electric, current producer of the Improved TOW Vehicle, located in St Louis, MO.

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Program Element: #6.46.26.A
DOD Mission Area: #211 - Close Combat

Title: Fire Support Team Vehicle (FISTV)
Budget Activity: #4 - Tactical Programs

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: The Project Officer was established at the Tank-Automotive Command with the Project Manager, Improved TOW Vehicle, as the responsible officer for this program. A contract for design and integration of the vehicle was awarded to Emerson Electric. A contract to design and modify engineering development Ground Laser Locator Designator with a remote operating capability was awarded to Hughes Aircraft Co. Bendix was selected as the subcontractor for development of the North-Seeking Gyro. The majority of the design effort was completed, and contractor testing of brassboard subsystems was initiated. A systems model was completed and began contractor testing.

2. (U) FY 1981 Program: More extensive contractor testing and Systems Model Testing will be completed using prototype subsystems. The first three prototype vehicles will be fabricated and tested by the contractor prior to Government acceptance planning and support, to include spares and draft technical manuals, will be completed to support Government Engineering Design Testing. A contract to remote six production GLLD's will be awarded.

3. (U) FY 1982 Planned Program: Engineering Design Testing will be completed. Correction of deficiencies and shortcomings discovered during this testing will be incorporated into the first three prototype vehicles. These vehicles will be refurbished and upgraded for training and user operational testing. Three additional prototype vehicles will be fabricated for Government prototype qualification testing. All six prototype vehicles will be equipped with the remoted production Ground Laser Locator Designators. All planning and test support for operational and development testing will take place, and development testing will be initiated.

4. (U) FY 1983 Planned Program: Development and Operational testing will be completed. Reduction and analysis of test data, correction and redesign, and productivity and engineering planning will continue, culminating in a production decision in March 1983. The first production contract will be awarded. Technical publications and the Technical Data Package will be upgraded. Equipment used for testing will be refurbished to a "like new" condition.

5. (U) Program to Completion: Complete production and fielding.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.28.A
DOD Mission Area: #212 - Fire Support

Title: Indirect Fire Training Munitions
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	1094	593	1368	1421	Continuing	Not Applicable
D250	Indirect Fire Training Munition	1094	593	1368	1421	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports the engineering development of a new family of artillery and mortar training projectiles to meet the Army need of significantly reducing the cost of training ammunition while continuing to provide realistic training. The training rounds being developed in this program are full caliber projectiles that use pyrotechnic fuze spotting charges to provide training realism. The cost avoidance associated with substituting this new family of training ammunition for the standard high-explosive ammunition now being used is expected to exceed 25%. The Army will begin to realize this cost avoidance beginning in FY82; i.e., upon receipt of the FY81 procurement quantities.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Completion of engineering development of the 8-inch artillery training projectile.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	1094	593	1368	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	1489	636	1307	0	Not Applicable

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Program Element: #6.46.28.A
DOD Mission Area: #212 - Fire Support

Title: Indirect Fire Training Munitions
Budget Activity: #4 - Tactical Programs

\$395 thousand in FY 1980 funds was reprogramed to higher priority Army requirements. The FY81 decrease is attributable to the application of general Congressional reductions.

The FY82 increase is the result of the amended budget request and the application of higher fuel, inflation, and civilian pay pricing indices than were applied the previous year.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
Ammunition Procurement, Army:						
Funds (current requirements)	0	12800	0	0	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	0	13600	18400	Not Shown	Continuing	Not Applicable
Quantities (current requirements)						
XM804 155mm	0	15300	0	0	Continuing	Not Applicable
XM798 81mm	0	0	0	0	Continuing	Not Applicable
XM816 60mm	0	0	0	0	Continuing	Not Applicable
Quantities (as shown in FY 1981 submission)						
XM804 155mm	0	153000	101000	Not Shown	Continuing	Not Applicable
XM798 81mm	0	8000	115000	Not Shown	Continuing	Not Applicable
XM816 60mm	0	0	26000	Not Shown	Continuing	Not Applicable

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Program Element: 6.36.28.A
DOD Mission Area: 212 - Fire Support

Title: Indirect Fire Training Munitions
Budget Activity: 4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: This program supports development of a new family of artillery and mortar training projectiles which will significantly reduce the cost of ammunition for training purposes and improve the methods of training artillery and mortar crews. Exploratory development efforts demonstrated that low-cost training projectiles can be developed to provide gunner and forward observer training at a cost substantially less than present HE projectiles. The concept being pursued for mortar ammunition is a plastic-jacketed projectile filled with concrete. This projectile provides the same exterior ballistics and will produce a signature for fire adjustment on impact. The mortar training rounds will use the standard fins and propellant ignition system used with high-explosive (HE) rounds, but the conventional fuze will be replaced with a pyrotechnic spotting charge that provides realistic flash, smoke, and noise to train observer personnel. The eight-inch and 155mm artillery projectiles will use thick-walled, inert metal shells, which will be ballistically matched to the current high-explosive projectile. The munitions will be fired using standard propelling charges which will provide realistic training for field artillery units. Cost savings will be derived from reduced shell cost, fuze costs, and packaging costs.

G. (U) RELATED ACTIVITIES: This program is the normal engineering development program supporting advanced development of the artillery and mortar training projectiles conducted in program element 6.36.28.A, Field Artillery Ammunition.

H. (U) WORK PERFORMED BY: US Army Armament Research and Development Command (ARRADCOM), Dover, NJ, ARRADCOM, Aberdeen, MD. To date the only work accomplished on contract was done by Chamberlain Manufacturing Corporation, Waterloo, IA. Other contractual effort will be accomplished upon selection of contractors from current Requests for Proposals.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Prior development in this program was conducted in program element 6.36.28.A, Field Artillery Ammunition Development. Advanced development of the 155mm artillery projectile, XM804, and 81mm mortar cartridge M798 was initiated in FY 1977. In FY 1978 work was initiated on the 60mm mortar cartridge, XM816, applying technology gained in the 81mm effort. In FY79 sufficient quantities of 155mm, 60mm, and 81mm training ammunition were fabricated to satisfactorily demonstrate ballistic similitude and adequate target signature under most terrain conditions. Fuze and spotting signatures and low-cost packaging designs have been evaluated. Both artillery and mortar rounds have been fired for ballistic characterization, fuze suitability, and cartridge integrity. In FY80 sufficient quantities of 155mm artillery training projectiles were fabricated for engineering development testing, safety testing, and the conduct of development test and operational test II (DT/OT II). Development acceptance in-process reviews (DEVA IPR) and type classification action were conducted for the 155mm projectile, and a Technical Data Package (TDP) for production was completed. The previously sched-

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Program Element: #6.46.28.A
DOD Mission Area: #212 - Fire Support

Title: Indirect Fire Training Munitions
Budget Activity: #4 - Tactical Projects

uled Initiation of Engineering Development for the 8", 60mm, and 81mm mortar rounds was rescheduled for FY81. This was necessitated by unexpectedly high costs of development for the 155mm round which exhausted available funds.

2. (U) FY 1981 Program: Engineering development of the 8" artillery training projectile XM844 will be initiated. DT and OT II of the 60mm and the 81mm mortar training projectiles will be initiated.
3. (U) FY 1982 Planned Program: Complete DT/OT II for the 60mm and 81mm mortars and 8-inch artillery practice rounds. Complete engineering development and type classification of these training projectiles.
4. (U) FY 1983 Planned Program: Conduct DT/OT II for the 60mm XM840 one-tenth range and 81mm one-tenth range mortar practice rounds.
5. (U) Program to Completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.30.A

DOD Mission Area: #211 - Close Combat

Title: Tank Gun Cooperative Development

Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	40226	62061	84567	54219	287	287260
	QUANTITIES:						
	Ammunition Rounds						30770
	Cannon (Tube and Breech)						22
	Spare Tubes						43
D060	120mm Gun Development	3000	3010	2971	1388	0	23567
D064	120mm Tank Gun Ammo Development	18500	19207	19539	10450	287	82183
D287	Tank Gun Integration	18726	39844	62057	42381	0	181608

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the technology transfer, fabrication, and testing (TTF&T), and adaptation of the Federal Republic of Germany (FRG) 120mm smoothbore tank gun system to US manufacturing methods, development of improvements to this system, and integration of the system into the XM1 tank. The 120mm gun-equipped XM1 tank has been designated as the XM1E1 tank. This program is required to assure the availability of a future tank main armament system for the XM1 tank to defeat the postulated tank threat equipped with more advanced armor of the late 1980's and beyond and to maintain a high degree of interoperability with the NATO tank fleets equipped with the Leopard 2 tank.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Testing of the 120mm gun tube and breech will be completed. With the exception of the modern technology kinetic energy round and the kinetic energy training round, the ammunition systems contractor will complete final design testing of the ammunition family, and hardware fabrication for ammunition development testing (DT II) will be completed. Development and testing of the modern technology kinetic energy round will continue. Fabrication of ammunition, cannon, four XM1E1 tanks, and necessary supporting hardware for development and operational testing will be completed. The major emphasis of FY82 will be the initiation and conduct of Development Test II (March 1982) and the preparation for the

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Program Element: #6.46.30.A
DOD Mission Area: #211 - Close Combat

Title: Tank Gun Cooperative Development
Budget Activity: #4 - Tactical Programs

Operational Test II. Contractor activity, including systems engineering, system logistics work, producibility, engineering, and planning (PEP) for all US-produced hardware, will continue.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
Tank Main Armament Decision	2QFY78	2QFY78
Start US Development/ Integration of 120mm Gun System	2QFY79	2QFY79
Complete XM1E1 Tank System Development and Operational Testing (DT/OT II)	2QFY83	4QFY82
Convene Defense Systems Acquisition Review Council (DSARC III)	3QFY83	3QFY83
First Production Delivery of XM1E1 Tank	4QFY84	4QFY84

The Development and Operational II test completion date has been slipped to 2Q FY 1983 to insure that sufficient 120mm training ammunition rounds are available to support the operational test of the XM1E1 tank system. The delay has been caused by problems encountered during the technical translation of the German ammunition design.

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	FY 1980	FY 1981	FY 1982	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	40226	62061	84567	54506	2A/260
Funds (as shown in FY 1981 submission)	42069	61492	49303	22820	221594

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Program Element: 06.46.30.A
DOD Mission Area: 0211 - Close Combat

Title: Tank Gun Cooperative Development
Budget Activity: 04 - Tactical Programs

The current submission (Total Estimated Cost) incorporates a reduction from an FY 1980 Army reprogramming action (\$1.99 million) and an increase of \$63.5 million in FY 1982 (\$33.5M) and FY 1983 (\$30.0M) in the D287 Tank Gun Integration portion of the program. The cost growth can be ascribed to a substantial increase in work scope associated with logistical development costs of XM1E1 tank-peculiar hardware and a sizable increase in the magnitude of the number and complexity of tank system-related hardware changes required to integrate the 120mm weapons systems into the XM1 tank. \$7.4 million of TRACE funds has been added in FY 1983. The additional variations of \$4 million from the FY 1981 submission are the result of escalation and minor program adjustments. There is significant risk in attaining the OSD-mandated first-production delivery date of August 1984 because of lack of flexibility in the overall program schedule.

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
Weapons and Tracked Combat Vehicles, Army						
Funds (current requirements)	0	0	12100	6100	0	18200
Funds (as shown in FY 1981 submission)	0	0	13700	0	0	13700
Ammunition Procurement, Army						
Funds (current requirements)	15000	3988	15000	189400	1032300	Continuing
Funds (as shown in FY 1981 submission)	15000	3900	19867	Not Shown	367200	Continuing
Quantities (current requirements)	0	0	0	62000	796000	Continuing
Quantities (as shown in FY 1981 submission)	0	0	0	Not Shown	175000	Continuing

Differences under "Weapons and Tracked Combat Vehicles" reflect a realignment of the funds required for 120mm gun facilitization at Watervliet Arsenal and for XM1E1 system facilitization of Detroit Arsenal Tank Plant and Lima Army Tank Plant. The total facilitization amount has increased over the FY 1981 submission by \$4.5 million due to increased special tool

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Program Element: #6.46.30.A

DOD Mission Area: #211 - Close Combat

Title: Tank Gun Cooperative Development

Budget Activity: #4 - Tactical Programs

requirements. Funds and quantities shown under "Ammunition Procurement" reflect the continuing ammunition requirement and associated procurement costs necessary to support fielding and operation of the XM1E1 tank system. The FY 1983 and "additional to completion" funds are for the facilitization of ammunition production facilities and procurement of service and training ammunition to support the August 1984 XM1E1 first production delivery date. The "Total Estimated Cost" is not shown in recognition of continuing ammunition requirements, both to meet the Authorized Acquisition Objective (AAO) and for training.

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Program Element: #6.46.30.A
DOD Mission Area: #211 - Close Combat

Title: Tank Gun Cooperative Development
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: This program is an outgrowth of the 1975 Tripartite (United States, United Kingdom, and Federal Republic of Germany - US, UK, and GE) Tank Main Armament Evaluation to determine an optimum future tank main armament system, a continuing analysis of future armor threats and recognition of NATO harmonization/standardization efforts. This Program Element consists of three projects, D060 - 120mm Tank Gun Development, D064 - 120mm Tank Gun Ammunition Development, and D287 - Tank Gun Integration, and was originally established in response to Congressional guidance which specified that testing and evaluation of alternative 120mm gun systems would be conducted as a parallel program, separate and apart from the funding of the XM1 program. Evaluation of alternative tank main armament systems was completed in December 1977 and on 31 January 1978, the Army formally announced the selection of the GE 120mm smoothbore gun system for adaptation to US manufacturing methods and future incorporation into the XM1 tank. The objectives of this program include translation and adaptation of GE technology to US manufacturing methods, verification and certification of US-produced hardware, development of a new modern technology Armor-Piercing, Fin-Stabilized Discarding-Sabot Tracer (APFSDS-T) kinetic energy round, development of a range limited kinetic energy training round, and integration of the 120mm smoothbore gun system into the XM1 to meet the postulated tank threat equipped with more advanced armor of the late 1980's and beyond.

G. (U) RELATED ACTIVITIES: This program is related to Program Element (PE) 6.46.20.A, Tank XM1, and is dependent upon technology developed under PE 6.26.18.A, Ballistic Technology and PE 6.26.03.A, Large Caliber and Nuclear Technology. Program activities are fully coordinated to assure no unnecessary duplication of effort, either within the Army or other Department of Defense agencies.

H. (U) WORK PERFORMED BY: Chrysler Defense Incorporated, Warren, MI; US Army Armament Research and Development Command, Dover, NJ; US Army Test and Evaluation Command, Aberdeen, MD; US Army Operational Test and Evaluation Agency, Falls Church, VA; Rheinmetall Limited, Dusseldorf, Germany; and Honeywell Inc., Hopkins, MN.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Following extensive evaluations of UK, US, and GE candidate tank main armament systems spanning the period 1973 through 1977, in January 1978, the Army selected the GE 120mm smoothbore gun system for continued US development and future incorporation into the XM1 tank. An Army Systems Acquisition Review Council (ASARC) convened in April 1978 and approved a 120mm gun program leading to first production delivery of a 120mm gun XM1 (XM1E1) tank in August 1984, and the Office of the Secretary of Defense concurred. Program initiation, however, was delayed pending a satisfactory license agreement with the GE developer, Rheinmetall, for US production of the 120mm system. The program was initiated in March 1979 following the February 1979 signing of the license agreement. A special ASARC in March 1979 approved

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Program Element: #6.46.30.A
DOD Mission Area: #211 - Close Combat

Title: Tank Gun Cooperative Development
Budget Activity: #4 - Tactical Programs

a revised program leading to an August 1985 first production delivery. OSD, however, did not concur with the proposed one-year slip, directing instead that the Army continue planning for first delivery in August 1984. Initial deliveries of technical data and hardware were received from GE in accordance with the license agreement and a hardware contract awarded to GE in July 1979. Systems contracts were awarded to Chrysler Corporation in June 1979 for the validation phase of the systems integration effort and to Honeywell Incorporated in August 1979 for the Technology Transfer, Fabrication and Test of the GE family of ammunition. A US/GE joint feasibility demonstration program for a modern technology kinetic energy round was completed in July 1979. The 120mm gun-equipped XM1 was designated the XM1E1 tank, and system integration activities were initiated. As the result of a 120mm breech design decision review in October 1979, the GE design was selected for adaptation to US production methods and integration into the XM1E1 tank system. Technology transfer, fabrication, and test efforts continued with fabrication of tubes and breeches and initiation of dynamic and verification firing tests. Initial US tubes and breeches for subsequent gun, ammunition and tank system testing were fabricated with the first US-produced gun (tube and breech) delivered from Watervliet Arsenal on schedule. Test quantities of ammunition were fabricated and tested to assure conformance with GE technical data packages and performance requirements determined to obtain a safety release of hardware required for XM1E1 tank system tests. Developmental work on the modern technology Armor-Piercing, Fin-Stabilized, Discarding-Sabot Tracer (APFSDS-T) kinetic energy round (XM829) and a kinetic energy training round (XM832) was initiated. System integration activities continued with the development of hardware and software necessary to integrate the larger gun system into the XM1 tank and assure fightability and survivability comparable to that of the baseline 105mm system. Procurement and fabrication of hardware to convert two XM1 tanks to the XM1E1 configuration for contractor testing and physical teardown/maintenance evaluation (PT/ME) was initiated. Procurement actions were begun to obtain necessary XM1E1 system hardware for development and operational testing (DT/OT II). The test planning for DT/OT II was continued, and a draft test plan developed.

2. (U) PY 1981 Program: Dynamic testing of US-fabricated tubes and breeches will continue, and verification firing tests will be completed. Hardware required for XM1E1 system testing will be fabricated. Validation testing of US-fabricated ammunition will continue concurrent with testing of the German-produced ammunition to assure interoperability of designs. The modern technology kinetic energy round (XM829) will continue in engineering design with various designs being fabricated and tested to optimize penetration and accuracy performance. A kinetic energy training round (XM832) also will continue in engineering design and undergo testing to determine range-limiting capability and dispersion data. Two XM1 tanks are being converted to the XM1E1 configuration for contractor testing and PT/ME and those tests conducted. Fabrication of hardware and assembly of four XM1E1 tanks for DT/OT II will be initiated as will procurement of necessary guns and ammunition to support these tests. Planning and preparation for DT/OT II will continue.

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Program Element: #6.46.30.A
DOD Mission Area: #211 - Close Combat

Title: Tank Gun Cooperative Development
Budget Activity: #4 - Tactical Programs

3. (U) FY 1982 Planned Program: Testing of the 120mm gun tube and breech will be completed. With the exception of the modern technology kinetic energy round and kinetic energy training round, the ammunition systems contractor will complete final design testing of the ammunition family, fabricate hardware for ammunition development testing (DT II) and initiate DT II. Development and testing of the modern technology kinetic energy round and kinetic energy training round will continue. Fabrication of ammunition, cannon, six XM1E1 tanks and necessary supporting hardware for development and operational testing will be completed, and DT/OT II will be initiated. Contractor activity, including system engineering, systems logistics work, producibility, engineering, and planning (PEP) for all US-produced hardware, will continue.

4. (U) FY 1983 Planned Program: The 120mm gun, ammunition, and tank system testing will be completed and data compiled in preparation for a June 1983 Defense Systems Acquisition Review Council (DSARC) production decision. XM1E1 tank systems DT/OT II and System Interchangeability testing will be completed. Producibility, Engineering, and Planning (PEP) and technical data packages will be completed and the six XM1E1 tanks used for testing will be refurbished to a "like new" condition. The modern technology kinetic energy round will begin developmental testing. Current plans envision initial production delivery of XM1E1 tanks in FY 1984.

5. (U) Program to Completion: The Development Test (DT II) of the XM829 modern technology kinetic energy round will be completed and type classified in FY 1984.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D064

Program Element: #6.46.30.A

DOD Mission Area: #211 - Close Combat

Title: 120mm Tank Gun Ammo Development

Title: Tank Gun Cooperative Development

Budget Activity: #4 - Tactical Program

A. (U) DETAILED BACKGROUND AND DESCRIPTION: This program implements the Army decision of January 1978 to select the German 120mm smoothbore gun system for future incorporation on the XM1 Tank to meet the armor threat of the mid-1980's and beyond. This project concentrates on translating, developing, testing, and qualifying a five-round family of 120mm ammunition consisting of: a German Armor-Piercing, Fin-Stabilized, Discarding Sabot, Tracer round (APFSDS-T) (XM827) modified with a US-designed staballoy penetrator; a modern technology APFSDS-T round (mod Tech APFSDS-T) (XM829); a High-Explosive Antitank Multipurpose Tracer round (HEAT-MP-T)(XM830); and two Training rounds. The training rounds are: an Armor-Piercing Fin-Stabilized Discarding Sabot, Target Practice round (APFSDS-TP)(XM832); and a High-Explosive Antitank Target Practice round (HEAT-TP)(XM831) for use with the 120mm-equipped XM1 Tank. These training rounds are necessary to meet range safety limitations and to reduce training costs. The XM827, XM830, and XM831 cartridges will be translated from the German designs. The XM829 will be a new development of US design. German development of the XM832 will be monitored to determine if the projectile will meet US requirements for accuracy; if not, a US design for this round will be pursued.

B. (U) RELATED ACTIVITIES: This project is related to Program Element (PE) 6.46.20.A, Tank XM1; PE 6.46.30.A, Tank Gun Cooperative Development, Projects D060-120mm Tank Gun Development and D287-Tank Gun Integration, and is dependent upon technology developed under PE 6.26.18.A, Ballistics Technology, and 6.26.03.A, Large Caliber and Nuclear Technology. Duplication of effort is avoided through centralized management by Project Manager, Tank Main Armament Systems.

C. (U) WORK PERFORMED BY: US Army Armament Research and Development Command, Dover, NJ; the US Army Test and Evaluation Command, Aberdeen, MD; Rheinmetall Corporation, Dusseldorf, GE, and Honeywell, Inc., Hopkins, MN.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: The program was initiated in February 1979 when a license agreement was signed with the German developer, Rheinmetall. Subsequently, initial deliveries of technical data were received from Germany, and a system contract for technology transfer, fabrication, and test (TTF&T) of the German ammunition family was granted to Honeywell, Inc. A Joint US/German Feasibility Demonstration of the Modern Technology APFSDS-T (XM829) round was conducted. However, initiation of a codevelopment program for this cartridge was not approved by the German government. Initial tests of US-produced propellant and the XM827 staballoy penetrator were conducted. The fuze design program for the XM830 HEAT-MP round was begun and improved sabot and penetrator designs for the Modern Tech XM829 cartridge were tested. Initial firings of the US design for the XM832 were conducted, and monitoring of GE design testing continued.

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Project: #D064
 Program Element: #6.46.30.A
 DOD Mission Area: #211 - Close Combat

Title: 120mm Tank Gun Ammo Development
 Title: Tank Gun Cooperative Development
 Budget Activity: #4 - Tactical Programs

2. (U) FY 1981 Program: Fabrication and testing of APFSDS-T XM827, HEAT-MP-T XM830, and HEAT-TP XM831 cartridges will continue with fabrication of Development Test II hardware. The Modern Technology APFSDS-T XM829 cartridge will continue in the engineering design phase with hardware being fabricated and the selected designs subjected to a series of armor penetration and accuracy tests. The APFSDS-TP XM832 round will continue in ED. Hardware will be fabricated and the selected design will be subjected to maximum range and dispersion tests. A Producibility Engineering and Planning (PEP) effort will be initiated and hardware tested to evaluate producibility of all rounds.

3. (U) FY 1982 Planned Program: The system contractor (Honeywell) will complete the final testing of the design selected for APFSDS-T XM827, HEAT-MP-T XM830, and HEAT-TP XM831 cartridges, complete fabrication of DT II hardware, and initiate DT II. The APFSDS-TP XM832 program will continue with a series of development tests. DT II hardware will be fabricated, and the safety phase of DT II will be conducted to obtain safety release of hardware for the XM1E1 Tank System tests. Hardware will be fabricated and testing of the APFSDS-T XM829 will be conducted to confirm and freeze the design.

4. (U) FY 1983 Planned Program: DT II tests will be completed for the APFSDS-T XM827, HEAT-MP-T XM830, HEAT-TP XM831, and APFSDS-TP XM832 with type classification scheduled for 3QFY83. Hardware for DT II of the Mod Tech APFSDS-T XM829 will be fabricated, and the DT II will be conducted.

5. (U) Program to Completion: DT II of the Mod Tech APFSDS-T XM829 will be completed and the round type classified in the 1QFY84.

6. (U) Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
APFSDS-T XM827		
Type Classification	3Q83	3Q83
Mod Tech APFSDS-T XM829		
Type Classification	1Q84	1Q84
HEAT-MP-T XM830		
Type Classification	3Q83	3Q83

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Project: #D064
 Program Element: #6.46.30.A
 DOD Mission Area: #211 - Close Combat

Title: 120mm Tank Gun Ammo Development
 Title: Tank Gun Cooperative Development
 Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1981 Submission
HEAT-TP XM831		
Type Classification	3Q83	3Q83
APFSDS-TP XM832		
Type Classification	3Q83	3Q83

7. (U) Resources (\$ in thousands):

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	18500	19207	19539	10450	287	82183
Funds (as shown in FY 1981 submission)	18544	19026	19986	Not Shown	10199	82231
Quantities (current requirements)						
APFSDS-T (Rounds)						1570
Mod Tech APFSDS-T (Rounds)						2850
HEAT-MP-T (Rounds)						3925
HEAT-TP (Rounds)						766
APFSDS-TP (Rounds)						1446
Quantities (as shown in FY 1981 submission)						
APFSDS-T (Rounds)						1570

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Project: #D064
 Program Element: #6.46.30.A
 DOD Mission Area: #211 - Close Combat

Title: 120mm Tank Gun Ammo Development
 Title: Tank Gun Cooperative Development
 Budget Activity: #4 - Tactical Programs

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Estimated Cost
Mod Tech APFSDS-T (Rounds)						2850
HEAT-MP-T (Rounds)						1925
HEAT-TP (Rounds)						766
APFSDS-TP (Rounds)						1546

The minor variations from the FY 1981 submission are the result of adjustments made for changes in escalation.

Other Appropriation Funds (\$ in thousands)

	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
Procurement Ammunition, Army Funds (current requirements)	15000 ¹	1933 ²	15300 ³	189400 ⁴	1032300 ⁵	Continuing
						Total
Funds (as shown in FY 1981 submission)	15000	1900	19367	Not Shown	367200	Continuing
Quantities (current requirements)				62000	796300 ⁵	Continuing
Quantities (as shown in FY 1981 submission)				Not Shown	175000	Continuing

1/ FY 1980 funds are for initial payment of licensing fees.

2/ 1981 funds are for Manufacturing Methods and Technology (MMST).

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Project: #D064
Program Element: #6.46.30.A
DOD Mission Area: #211 - Close Combat

Title: 120mm Tank Gun Ammo Development
Title: Tank Gun Cooperative Development
Budget Activity: #4 - Tactical Programs

3/ FY 1982 estimate is for final payment of licencing fees.

4/ The FY 1983 funds are for initial facilitization of ammunition production facilities (\$93.8M) and procurement of service (\$37.6M) and training (\$36.7M) ammunition to support fielding of the XM1E1 tank system. \$21.3M is for procurement of overseas components to insure available ammunition to support the mandated August 1984 XM1E1 first delivery.

5/ Funding for completion includes \$77.9M to complete ammunition production facilities capable of producing both 105mm and 120mm tank ammunition. Also included are \$230.2M for service ammunition and \$724.2M for training ammunition procurement. These figures have increased primarily due to the addition of training ammunition which was not included in last year's submission because requirements had not been established.

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FY 1982 RDT&E CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D287
Program Element: 06.46.30.A
DOD Mission Area: 7211 - Close Combat

Title: Tank Gun Integration
Title: Tank Gun Cooperative Development
Budget Activity: 04 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: This program is an outgrowth of the 1975 Tripartite (United States, United Kingdom, and Federal Republic of Germany - US, UK, and GE) Tank Main Armament Evaluation, a continuing analysis of future armor threats and recognition of NATO harmonization/standardization efforts. Comprehensive testing and evaluation of candidate tank main armament systems (US 105mm rifled bore, UK 120mm rifled bore and GE 120mm smoothbore) continued through December 1977, to determine the best follow-on main armament system for the XM1 tank. This program implements the Army decision of January 1978 to select the GE 120mm smoothbore tank gun system for future incorporation on the XM1 tank to meet the threat of the late-1980's and beyond. This project will concentrate on developing, testing, and qualifying XM1 tank subsystems, i.e., gun mount, turret, and automotive subsystems, and ammunition storage compartments, necessary to integrate the 120mm gun system into the XM1 while maintaining the survivability and fightability of the tank system. In August 1979, the 120mm gun XM1 tank was officially designated the XM1E1 tank.

B. (U) RELATED ACTIVITIES: This program is related to Program Element (PE) 6.46.20.A, Tank XM1; PE 6.46.30.A, Tank Gun Cooperative Development, Project D060 - 120mm Tank Gun Development, and D064 - 120mm Tank Gun Ammunition, and is dependent upon technology developed under PE 6.26.18.A, Ballistics Technology, and PE 6.26.03.A, Large Caliber and Nuclear Technology. All program activities are fully coordinated to assure no unnecessary duplication of effort, either within the Army or other Department of Defense agencies.

C. (U) WORK PERFORMED BY: Chrysler Defense Incorporated, Warren, MI; the US Army Armament Research and Development Command, Dover, NJ; US Army Test and Evaluation Command, Aberdeen, MD; and the US Army Operational Test and Evaluation Agency, Falls Church, VA.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Following the 22 February 1979 signing of a 120mm gun system licensing agreement with the GE developer, Rheinmetall, the US integration program officially commenced on 8 March 1979. A systems contract was awarded to Chrysler Corporation on 1 June 1979 to initiate concept/feasibility studies for integration of the 120mm gun system into the XM1 tank and the 120mm gun XM1 tank was designated the XM1E1. System engineering and design activities were initiated in the areas of 120mm weapon system/vehicle interface, gun mount/recoil system, fire control and bal-

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Project: #D287
Program Element: #6.46.30.A
DOD Mission Area: #211 - Close Combat

Title: Tank Gun Integration
Title: Tank Gun Cooperative Development
Budget Activity: #4 - Tactical Programs

istic protection. Detailed system design analysis for all affected XM1E1 system/subsystem components has been conducted, and procurement and fabrication of hardware and assemblies necessary to convert two XM1 tanks XM1E1-configured tanks have been completed. A full-scale engineering development letter contract has been awarded to Chrysler Defense Inc, and contractor activity in the areas of armor development, ammunition compartmentalization, fire control, system integration/engineering, logistics, product assurance, human factors, value engineering, producibility engineering and planning (PEP), safety and life cycle costing has begun. Fabrication of two XM1E1 tanks for contractor testing and Physical Teardown/Maintenance Evaluation (PT/ME) has been initiated as will procurement of system hardware for development and operational testing (DT/OT II). Formal test planning for DT/OT II and follow-on XM1E1 system interoperability tests has continued.

2. (U) FY 1981 Program: Conversion of two XM1 tanks (less 105mm components) to the XM1E1 configuration will be completed. Contractor tests and PT/ME will be conducted to assess ammunition storage, weapons and fire control performance, and other related system integration factors (fightability, safety, and overall system performance) and conformance to specifications. Fabrication and assembly of four XM1E1 pilot tanks for DT/OT II, incorporating system changes resulting from contractor tests and related system development activities, will be initiated. Procurement of necessary 120mm cannon, ammunition, and system hardware and software to support ongoing and pending contractor and government test programs will continue. System-related activities in such areas as system engineering, quality assurance, logistics, PEP, value engineering, costing, and scheduling will continue as will planning and preparation for conduct of DT/OT II.

3. (U) FY 1982 Planned Program: Procurement and fabrication of the necessary hardware will be completed to convert four XM1 tanks to XM1E1 configuration. The major emphasis of FY82 will be the initiation and conduct of Development Test II (March 1982) and the preparation for the initiation of Operational Test II in October 1982. Contractor activities including system engineering, configuration management, integrated logistics support, PEP, and safety will continue.

4. (U) FY 1983 Planned Program: DT/OT II will be completed during the second quarter, and US interchangeability testing will be initiated. A system confirmatory test using the XM832 kinetic energy training round will be conducted. The six XM1E1 tanks required for testing will be refurbished to a "like new" condition, and contractor activities, including PEP and preparation of the XM1E1 technical data package, will be completed. A Defense Systems Acquisition Review Council (DSARC III) production decision is envisioned in June 1983 with first production delivery of an XM1E1 tank planned for 4QFY1984.

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Project: #D287
 Program Element: #6.46.30.A
 DOD Mission Area: #211 - Close Combat

Title: Tank Gun Integration
 Title: Tank Gun Cooperative Development
 Budget Activity: #4 - Tactical Programs

5. (U) Major Milestones:

<u>Major Milestones</u>	<u>Current Milestone Dates</u>	<u>Milestone Dates Shown in FY 1981 Submission</u>
Initiate integration of 120mm gun into XM1 tank	2QFY79	2QFY79
Equip two XM1 tanks to 120mm configuration for Contractor testing and physical teardown/maintenance evaluation	FY81	FY81
Equip four XM1 production tanks with 120mm system for DT/OT II	FY82	FY82
Complete 120mm gun XM1 tank system DT/OT II	2QFY83	FY82
First Production Delivery of XM1E1 Tank	4QFY84	Not Shown

The DT/OT II completion date has been slipped to 2QFY83 to insure that sufficient US-produced 120mm training ammunition is available to support the operational test of the XM1E1 tank system. The delay has been caused by problems encountered during the technical translation of the German ammunition design.

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Project: #D287
 Program Element: #6.46.30.A
 DOD Mission Area: #211 - Close Combat

Title: Tank Gun Integration
 Title: Tank Gun Cooperative Development
 Budget Activity: #4 - Tactical Programs

6. (U) Resources (\$ in thousands):

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>to Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
RDTE						
Funds (current requirements)	18726	39844	62057	42381	0	181608
Funds (as shown in FY 1981 submission)	20725	39484	26466	11015	0	116290
Quantities (current requirements)						
Ammunition (approximate)						17000
Cannon (Tube and Breech)						10
Spare Tubes						25
Quantities (as shown in FY 1981 submission)						
Ammunition						18200
Cannon (Tube and Breech)						12
Spare Tubes						26
Other Appropriations:						
Weapons and Tracked Combat Vehicles, Army						
Funds (current requirements)	0	0	4700	6100	0	10800
Funds (as shown in FY 1981 submission)						
			None Shown			

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Project: #0287

Program Element: #6.46.30.A

DOD Mission Area: #211 - Close Combat

Title: Tank Gun Integration

Title: Tank Gun Cooperative Development

Budget Activity: #4 - Tactical Programs

The current RDTE submission (Total Estimated Cost) incorporates a reduction in FY 1980 funds of \$1.99 million (Army reprogramming action) and an increase of \$63.5 million in FY 1982 (\$33.5M) and FY 1983 (\$3.0M) in the system integration program costs. The cost growth can be ascribed to a substantial increase in work scope associated with logistical development costs of XM1E1 tank-peculiar hardware and a sizeable increase in the magnitude of the number and complexity of tank system-related hardware changes required to integrate the 120mm weapons systems into the XM1 tank. \$7.4 million of TRACE funds has been added to the FY 1983 increase. The additional variations of \$3.8 million from the FY 1981 RDTE submission are the result of escalation. The additional \$6.1 million under "other appropriations" is required for additional facilitization of Lima Army Tank Plant and Detroit Arsenal Tank Plant to produce the XM1E1 tank and was not specifically identified as 120mm gun-related during the FY 1981 budget submission. There is significant risk in attaining the OSD-mandated first-production delivery date of August 1984 because of lack of flexibility in the overall program schedule.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.31.A
DOD Mission Area: #211 - Close Combat

Title: Field Artillery Ammunition, 155mm
Budget Activity: #4 - Tactical Programs

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	5671	1693	1483	7101	Continuing	Not Applicable
		(Not feasible to list due to number of diverse items)					
D175	Field Artillery Fuzes	0	0	0	0	Continuing	Not Applicable
D286	Field Artillery Ammo (NATO)	309	377	522	837	Continuing	Not Applicable
D373	Ammo Cannon, 155mm	5362	1316	961	0	0	Not Applicable
D369	SADARM	0	0	0	6264	0	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports development of 155mm Field Artillery Ammunition to provide increased lethality, range, accuracy, reliability, and speed in delivering fires required to offset the numerical advantage of the Warsaw Pact Forces. This program also provides for compatibility testing of US Ammunition in NATO country howitzers and NATO ammunition in US howitzers, engineering development of new indirect fire fuzes, and for the engineering development (ED) of the new Sense and Destroy Armor Munition (SADARM), which is expected to enter ED in FY83.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: Funds requested provide for: Continuation of engineering development of the new 155mm XM825 WP Smoke projectile for type classification. Continued evaluation and testing of the collateral (United Kingdom, Germany, Italy) nations' newly developed 155mm projectiles and propelling charges with US 155mm howitzers.

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Program Element: # 06.46.31.A
DOD Mission Area: #211 - Close Combat

Title: Field Artillery Ammunition, 155mm
Budget Activity: #4 - Tactical Programs

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	5671	1693	1483	Continuing	Not Applicable
Funds (as shown in FY 1981 submission)	7657	1821	3330	Continuing	Not Applicable

FY 1980 funds were reduced as a result of decreased funding requirements in project D286 which resulted from increased cooperation among the Trilateral Nations, which reduced testing requirements, and a successful fix to the M509 eight-inch dual-purpose improved conventional munition, which obviated the requirement for RDTE expenditures in project D369. The decrease in FY81 is attributable to the application of general Congressional reductions. The reduction in FY82 results in the delay of projected initiation of Engineering Development of a follow-on electronic time fuse in project D175.

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Program Element: # 6.46.31.A
DOD Mission Area: #211 - Close Combat

Title: Field Artillery Ammunition, 155mm
Budget Activity: #4 - Tactical Programs

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980</u> <u>Actual</u>	<u>FY 1981</u> <u>Estimate</u>	<u>FY 1982</u> <u>Estimate</u>	<u>FY 1983</u> <u>Estimate</u>	<u>Additional</u> <u>To Completion</u>	<u>Total</u> <u>Estimated</u> <u>Cost</u>
Ammunition Procurement, Army:						
Funds (current requirements)	12900	18500	15000	17300	Continuing	Not Applicable
Funds (as shown in FY 1981) submission)	9900	27500	67700	Not Shown	Continuing	Not Applicable
Quantities (current requirements)	79	80	81	82	Continuing	Not Applicable
M203	66	95	60	42	Continuing	Not Applicable
M211	0	0	0	0	Continuing	Not Applicable
Quantities (as shown in FY 1981 submission) (in thousands)						
M203	59	163	126	Not Shown	Continuing	Not Applicable
XM211	3	0	714	Not shown	Continuing	Not Applicable

Significant changes in procurement dollars and quantities in each fiscal year result from the determination that the M203 charge cannot be used with the M109 series self-propelled howitzers and the consequent complete realignment of the Army's procurement profile. The deletion of the projected procurement of the XM211 propelling charge is consistent with the Army's decision to terminate the development program for this item.

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Program Element: # 6.46.31.A
DOD Mission Area: #211 - Close Combat

Title: Field Artillery Ammunition, 155mm
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: A requirement exists to increase the indirect fire capability of field artillery cannon units by providing improved ammunition. The XM795 projectile is ballistically similar to the cargo optimized family of projectiles (M483A1, ICM; M692/M718 mines) and uses high-fragmenting steel to provide significantly increased lethality and, when fired with the M203 propelling charge, has a 23% range increase over the standard high-explosive projectile. The projectiles are in agreement with ballistic parameters contained in a Memorandum of Understanding (MOU) signed in 1978 between the United States and three European nations, Germany, Italy, and the United Kingdom. Project D286 provides for compatibility testing of newly developed NATO weapons and munitions with US howitzers and ammunition. The trilateral nations (United Kingdom, Germany, Italy) have developed the FH70, towed 155mm Howitzer, a new family of propelling charges, and a new high-explosive projectile, the L25. All of these items are in agreement with the ballistic parameters in the MOU mentioned above. Testing to demonstrate compatibility/interchangeability began in FY 1979 consistent with availability of test items. Projects D175 and D369 provide for the Engineering Development of follow-on indirect fire munitions fuzes and the Sense and Destroy Armor Munition (SADARM) respectively.

G. (U) RELATED ACTIVITIES: This program which was previously accomplished under Program Element #6.46.14.A, Field Artillery Weapons and Ammunition, 155mm (prior to FY 1981), is the normal engineering development program for advanced development that has been in Program Element 6.36.28.A, Field Artillery Ammunition, and is dependent upon technology developed under Program Element 6.26.03.A, Large Caliber and Nuclear Technology. Cooperative agreements exist with NATO nations on the characteristics of 155mm Howitzers to include the requirement for ammunition interchangeability. A NATO panel has been constituted to insure that duplication of effort is avoided.

H. (U) WORK PERFORMED BY: United States Army Armament Research and Development Command (ARRADCOM), Dover, NJ, Aberdeen, MD; and Yuma Proving Ground, Yuma, AZ. Contractors on the M198 Howitzer production are: Consolidated Diesel Electric Company, Old Greenwich, CT; and Numax Electronics, Incorporated, Hauppauge, Long Island, NY.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Engineering development was initiated for a new family of 155mm propelling charges (XM211 low zones, XM201 intermediate zones, M203 maximum zones) for the M198 and M109A1 Howitzers. The M203 charge was type classified in FY 1977 with the M198 Howitzer and was tested for compatibility with the M109A1 and found to be incompatible. In FY78 the XM201 charge development program was suspended as a result of the charge's inability to meet cannon tube wear constraints. In the interim, the XM211 charge was modified to provide intermediate zone capability. In FY80 the XM211 charge development was terminated as a result of the design being incompatible with automatic loading hardware and a reorientation of priorities. Advanced development of the XM795 HE cargo optimized projectile was initiated in FY76. A

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Program Element: # 06.46.31.A
DOD Mission Area: #211 - Close Combat

Title: Field Artillery Ammunition, 155mm
Budget Activity: #6 - Tactical Programs

validation in-process review (VAL-IPR) was conducted in FY 1978 and the XM795 entered engineering development. Initial development and operational tests (DT/OT I) were conducted in FY 1978 on two competitive smoke projectile designs, and the XM825 was selected for continued development. Engineering Development on the XM795 HE projectile continued. The Advanced Development program on the XM825 WP Smoke Projectile was completed, and a Validation IPR held in December 1978 approved entry into Engineering Development. In FY79 static tests on the XM825 were conducted at the Chemical Systems Laboratory, Edgewood Arsenal, MD, and ballistic testing with the XM203 propelling charge was accomplished at Dugway Proving Ground, UT. In Project D286 in FY79, UK charges were not received until October 1979. Scheduled testing was initiated in December 1979 at Yuma Proving Ground. DT/OT II tests on the XM795 High Explosive (HE) projectile were delayed as a result of minor technical problems. DT/OT II testing for the XM825 WP Smoke projectile was delayed as a result of technical problems which have subsequently been resolved.

2. (U) FY 1981 Program: DT/OT II testing for the XM795 will be conducted, and a technical data package (TDP) suitable for production will be completed. At present there is no planned procurement for the XM795 since the Army's 155mm High Explosive projectile requirements are met with current assets. The XM795 will be the preferred 155mm HE projectile to meet future Army requirements. DT/OT II testing will be initiated for the XM825 WP Smoke Projectile. NATO interoperability testing will continue.

3. (U) FY 1982 Planned Program: Rationalization, Standardization, and Interoperability (RSI) testing will be performed using trilateral nations' propelling charges and US smoke projectiles in M198 and M109A1 Howitzers to confirm interoperability. DT/OT II testing for the XM825 smoke round will be completed, and a DEVA-IPR for type classification will be conducted.

4. (U) FY 1983 Planned Program: The Trilateral Smoke and Illumination Projectile will be tested for interoperability in the M109 series and M198 Howitzers. Engineering Development of the Sense and Destroy Armor (SADARM) projectile will be initiated in project D369.

5. (U) Program to Completion: This is a continuing program.

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FY 1982 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.32.A

DOD Mission Area: #211 - Close Combat

Title: 105mm Tank Ammunition

Budget Activity: #4 - Tactical Support

A. (U) RESOURCES (PROJECT LISTING): (\$ in thousands)

Project Number	Title	FY 1980 Actual	FY 1981 Estimate	FY 1982 Estimate	FY 1983 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	1844	3717	5297	4576	25128	40562
	QUANTITIES						2725
D173	Tank Target Practice	0	431	0	0	0	431
DG21	Service Ammunition	1844	3286	5297	4576	25128	40131

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The purpose of this program is to develop 105mm tank ammunition to meet near-term and future enemy threats through the improvement of terminal effectiveness, accuracy, range, and reliability; and companion training ammunition. The program element consists of two projects. Project D173 supports development of cartridge 105mm, Target Practice, Fin-Stabilized, Discarding Sabot Tracer (TPFSDS-T) XM797. This cartridge is a ballistically similar training companion to the M735 and M774 Armor-Piercing, Fin-Stabilized, Discarding Sabot Tracer (APFSDS-T) cartridge. A reduced range permits tank crew training on ranges throughout the world which are too small to accommodate firings of service ammunition for training. Project DG21 provides for the Engineering Development of Cartridge, Armor-Piercing, Fin-Stabilized, Discarding Sabot-Tracer (APFSDS-T) XM833, and Cartridge, High-Explosive Antitank Multipurpose Tracer (HEAT-MP-T) XM815. The XM833 employs modern technology to combat threats projected beyond the mid-1980's. The round is required to insure that the fleet of 105mm Gun Tanks will be capable of defeating the newest armors now appearing on threat tanks. The XM815 is a companion to the APFSDS-T cartridge and provides a significantly improved capability against light armored vehicles, fortifications, and personnel.

C. (U) BASIS FOR FY 1982 RDTE REQUEST: The FY 1982 program completes Engineering Development (ED) of the APFSDS-T cartridge XM833 and type classifies the round. Engineering Development of the HEAT-MP-T Cartridge XM815 will be initiated with the fabrication of cartridges for development testing; conduct of tests to verify strength of design, penetration, accuracy, fuze functioning, and subsequent refinement of design.

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Program Element: #6.46.32.A
DOD Mission Area: #211 - Close Combat

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Title: 105mm Tank Ammunition
Budget Activity: #4 - Tactical Support

<u>Major Milestones</u>	<u>Current Milestone Dates</u>	<u>Milestone Dates Shown in FY 1981 Submission</u>
Cartridge, 105mm, XM815		
Validation Inprocess Review	4QFY81	Not Shown
Type Classification	4QFY84	Not Shown
Cartridge, 105mm XM833		
Validation In-process Review	1QFY81	4QFY80
Type Classification	4QFY82	4QFY82

D. (U) COMPARISON WITH FY 1981 RDTE REQUEST: (\$ in thousands)

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
RDTE					
Funds (current requirements)	1844	3717	5297	25128	40562
Funds (as shown in FY 1981 submission)	1400	4231	1959	8136	17689

The increase in FY 1982 is to provide for Engineering Development of the XM815 HEAT-MP-T cartridge. Engineering Development had been postponed pending redefinition of requirements as was reflected in the FY81 submission and was further reduced by the application of general Congressional reductions. Additional to complete and total estimated cost (increases reflect completion of the XM815 Engineering Development and initiation of Engineering Development for the Rocket-Assisted Kinetic Energy projectile in the outyears. This is a continuing program and total estimated cost represents anticipated requirements through FY 1986 only.

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Program Element: #6.46.32-A
DOD Mission Area: #211 - Close Combat

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Title: 105mm Tank Ammunition
Budget Activity: #4 - Tactical Support

E. (U) OTHER APPROPRIATION FUNDS: (\$ in thousands)

	<u>FY 1980 Actual</u>	<u>FY 1981 Estimate</u>	<u>FY 1982 Estimate</u>	<u>FY 1983 Estimate</u>	<u>Additional To Completion</u>	<u>Total Estimated Cost</u>
Procurement of Ammunition, Army						
<u>M4833 Cartridge</u>						
Funds (current requirements)	0	0	0	88300	297300	Continuing
Funds (as shown in FY 1981 submission)		Not Shown				
Quantities (current requirements)	0	0	0	114000	347000	Continuing
Quantities (as shown in FY 1981 submission)		Not Shown				
<u>M4797 Cartridge</u>						
Funds (current requirements)	0	0	0	101200	539100	Continuing
Funds (as shown in FY 1981 submission)	0	0	0	0	336200	Continuing
Quantities (current requirements)			0	178000	995000	Continuing
Quantities (as shown in FY 1981 submission)	0	0	0	0	799000	Continuing

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Program Element: #5.46.32.A
DOD Mission Area: #211 - Close Combat

Title: 105mm Tank Ammunition
Budget Activity: #4 - Tactical Support

F. (U) DETAILED BACKGROUND AND DESCRIPTION: Project DG21, Tank Service Ammunition, supports fielding of the new kinetic energy cartridge XM833. This projectile employs a long-rod staballoy penetrator, lightweight sabot, and high-force propellant to obtain maximum penetration against the newest armors. The project also supports development of the modern-technology high-explosive antitank cartridge XM815 which will provide increased armor penetration and multipurpose capabilities through the use of advanced shaped charge liners and the latest fuzing techniques.

G. (U) RELATED ACTIVITIES: The activities of this Program Element are a continuation of Advanced Development conducted in PE 6.36.33.A, Tank Ammunition Development.

H. (U) WORK PERFORMED BY: In-house agencies include US Army Armament Research and Development Command (ARRADCOM) Dover, NJ; US Army Test and Evaluation Command, Aberdeen, MD; Yuma Proving Ground, Yuma, AZ; contractors include Chamberlain Mfg. Corp., Waterloo, IA; Flinchbaugh Products, Inc., Red Lion, PA; National Lead of Ohio, Fernald, OH; and Nuclear Metals, Inc., Concord, MA. The project is managed by Project Manager, Tank Main Armament Systems, Dover, NJ, to insure no duplication of efforts.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: Development was completed for cartridge 105mm, Armor-Piercing, Fin-Stabilized Discarding Sabot-Tracer, M735. This development was completed and the round type classified standard in FY 1977. It is now in production. Full-scale Engineering Development of the more advanced XM774 kinetic energy cartridge was completed and the round type classified in September 1980. The Target Practice Fin-Stabilized, Discarding Sabot-Tracer XM797 cartridge transitioned to Engineering Development in 1980 and will be type classified in FY82.

2. (U) FY 1981 Program: Engineering Development efforts including fabrication of Development Test II (DT II) hardware and Development Test II of the TPFSDS-T XM797 cartridge will be continued in FY81. This round is planned for type classification in FY82. Full-scale Engineering Development of the APPSDS-T XM833 cartridge was initiated with successful completion of Development Test I. Prototypes will be fabricated and tested to finalize projectile design.

3. (U) FY 1982 Planned Program: Full-scale Engineering Development of the APPSDS-T XM833 cartridge will continue. Manufacture of DT II projectiles will commence and testing will be conducted leading to type classification of the round in 4Q FY82. Engineering Development of the HEAT-MP-T XM815 will be initiated. Prototypes will be fabricated and tested to evaluate design. Subsequent design changes will be integrated and evaluations made of penetration, accuracy, and fuzing.

4. (U) FY 1983 Planned Program: SD of the XM815 will continue with design validation testing and initiation of manufacture of DT II hardware.

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Program Element: #6.46.32.A

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Title: 105mm Tank Ammunition

DOD Mission Area: #211 - Close Combat

Budget Activity: #4 - Tactical Support

5. (U) Program to Completion: The HEAT-MP-T XM815 cartridge will complete Full-Scale Engineering Development and be type classified in FY 1984. The Rocket-Assisted Kinetic Energy projectile will begin Engineering Development during this period.

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