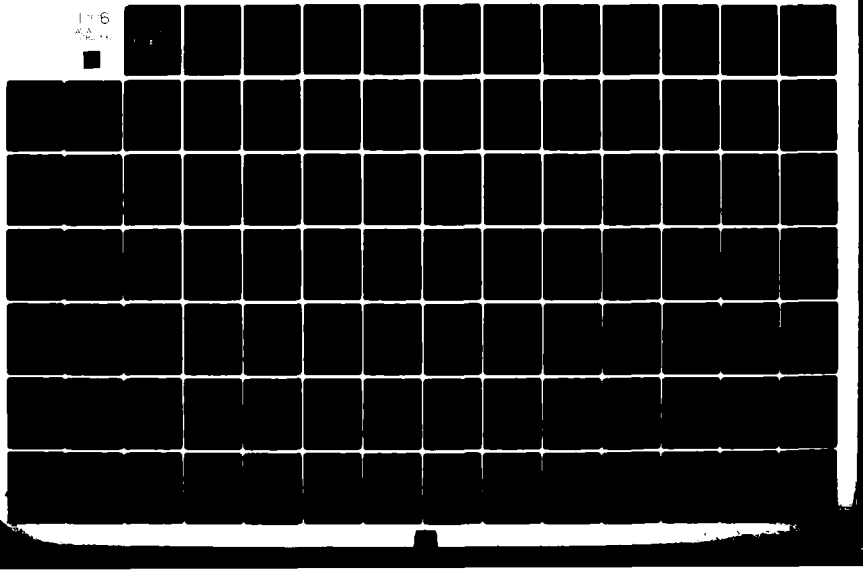
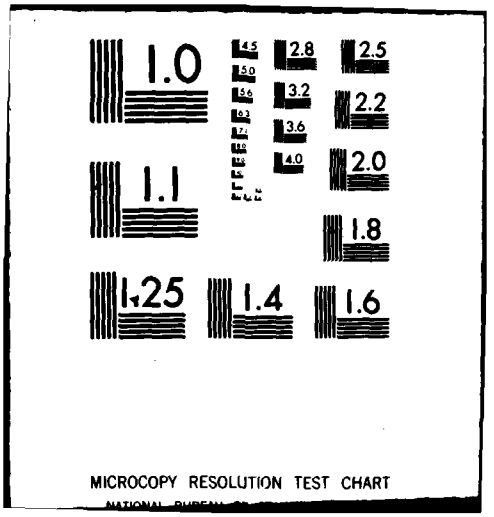
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Army Appropriation FY 1981 (U)

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 1981 (U) Volume II

(11) JANUARY 1980

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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 1981 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 1981. Descriptive Summaries for projects within the program elements to be financed during FY 1981 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 1981. A Test and Evaluation Section is provided for all major weapon systems.

There are seventeen major weapon systems descriptive summaries appearing in Volumes II and III. 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 1979, FY 1980, FY 1981, and FY 1982 data in this Program Element Listing with data shown in the Program Element Listing dated January 1979 will reveal significant differences. Many of the differences are attributable to the following factors:

a. Restructuring of the FY 1979 and FY 1980 programs for comparability to the FY 1981 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. 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 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

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

Title: Ballistic Missile Defense Advanced Technology
Budget Activity: #3 - Strategic 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	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	113510	120804	132751	143535	Continuing	Not Applicable
D215	BMD Advanced Technology	113510	120804	132751	143535	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Ballistic Missile Defense (BMD) Advanced Technology Program is a vigorous research and development effort designed to exploit new and emerging technologies--seeking better and less costly ways to perform ballistic missile defense. The US is faced with a growing Soviet threat to our strategic deterrent force. Further, the US must be conscious of the dangers of nuclear proliferation and the possible requirement in years to come for national options to protect the country from accidental or unauthorized launches or the threat of attack by an Nth Country. Every possible alternative and combination should be considered to maximize the level of national survival and retaliatory capability.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: The budget request for the BMD Advanced Technology Program is designed to maintain the pace of BMD advanced development needed to sustain the national technological lead and to aggressively search for and exploit innovative new concepts as a guard against technological surprise. The program will continue to emphasize experimentation on futuristic concepts which extend our technological bounds and have the potential of providing fundamentally new approaches to ballistic missile defense. The broad scope of the advanced technology program and the intrinsic complexity of such developments call for significant efforts in each technology--radar, optics, interceptors, discrimination, and data processing to allow hardware development and field experiments to validate laboratory and study results.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Designating Optical Tracker Flight	1st Qtr FY81	None Shown
Complete Installation of COBRA JUDY Radar Shipboard	2nd Qtr FY81	None Shown
Modular Missile-Borne Computer Demonstration in Laboratory Environment	4th Qtr FY81	None Shown

Program Element: #6.33.04.A
Title: Ballistic Missile Defense Advanced Technology
DOD Mission Area: #121 - Ballistic Missile Defense
Budget Activity: #3 - Strategic Programs

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	113510	120804	132751	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	113510	113668	127509	Continuing	Not Applicable

The increase in FY80 reflects the restoration of $7136 by Congress to continue the program at a level of effort plus inflation.
The increase in the FY81 estimate reflects a real level of inflation based upon the approved FY79 budget.

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

Program Element: #6.33.04.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 BMD Advanced Technology Program is a vigorous, broad research effort on the technology of all BMD components and functions including reentry phenomenology, advanced discrimination techniques, computer technology in a BMD application, advanced interceptor missiles, optical and radar sensors, and the continuing assessment of new technologies. The objectives of the program are to: provide the advanced technological foundation for future BMD systems concepts, emphasizing approaches which could yield fundamental breakthroughs in BMD capability; provide the technological basis substantial improvements in nearer-term BMD systems; avoid technological surprise brought about by Soviet BMD developments; and assist in the design or evaluation of US strategic offensive systems by the continuing exchange of information on their penetration capability and by technological assessments of future Soviet BMD capabilities. The US BMD Advanced Technology Program has, in recent years, placed increasing emphasis upon exoatmospheric technologies to augment terminal defense elements and the technological upgrading of terminal defense technology which includes homing nonnuclear kill interceptors and distributed defense components.

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 61102A), Air Force Intelligence Gathering (PE 31015F), Air Force Deep Space Satellite Surveillance (PE 63428F), Air Force Flight Test Measurements (PE 63311F), and DOE Particle Beam Technology programs. Every effort is made to prevent duplication of effort among those programs.

H. (U) WORK PERFORMED BY: The five major contractors currently are: Massachusetts Institute of Technology, Lincoln Laboratory, Lexington, MA; Raytheon, Wayland, MA; the Boeing company, Seattle, WA; McDonnell Douglas Corporation, Huntington Beach, CA; and Rockwell International Corporation, Anaheim, CA. There will be approximately one hundred additional contractors and other government agencies for an additional estimated dollar value of $85 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 1979 and Prior Accomplishments: Demonstrated the technology to intercept maneuvering vehicles in the advanced terminal interceptor program. Demonstrated the technology for the defense of MINUTEMAN which has now been transferred to the BMD Systems Technology Program (STP). Major technology elements included the use of large, high-powered commercial data processors, small netted radars, an improved interceptor missile, and new discrimination techniques. Completed and demonstrated an electro-optical signal processor for BMD applications. Completed the design modular missile-borne computer that is capable of performing a multiplicity of data processing functions on board the vehicle. Initiated the assessment of high energy beam technology for BMD applications. Pursued development of the technology base to provide the potential for the

Program Element: #6.33.04.A
DOD Mission Area: #121 - Ballistic Missile Defense
Title: Ballistic Missile Defense Advanced Technology
Budget Activity: #3 - Strategic Programs

utilization of nonnuclear kill (NNK) devices in endoatmospheric ballistic missile defense. High technology engagement constructs in the exoatmospheric regime were synthesized based upon flight-tested optical sensors, homing interceptors technolgoy (HIT) guidance and control technology and micro-data processing technology. The Forward Acquisition Sensor (FAS) technology program was initiated to provide preliminary designs of FAS elements and develop a FAS computer simulation.

2. (U) FY 1980 Program: The FY80 BMD Advanced Technology Program is structured to address each BMD technology area in the contexts of overall program objectives. The radar program will continue to be 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 be continued on the development of millimeter wave radar technology. The optics technology program will provide for the continued development of mosaic sensor technology, evaluation of lasers as BMD weapons, and exploration of promising advanced optical concepts and techniques. The discrimination technology program will emphasize the acquisition and analysis of millimeter wavelength radar data and optical sensor data useful in the development and evaluation of discrimination techniques. Schemes for the use of a combination of sensors in the terminal regime will also be evaluated. In the data processing program, development will continue of a laboratory prototype of the modular missile-borne computer to address the stressing on-board 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. In the interceptor program, critical componenet testing will be completed and large-scale fabrication of the electronics, controls and warhead and structural subsystems initiated. Large-scale motor tests of a very high performance propulsion subsystem will be completed. Forward Acquisition Sensor (FAS) technology developments will continue. Evaluation of strategic options from a defense viewpoint will be continued. Critical component developments for a near-term low-altitude defense system will be initiated. The high energy beam technology program will be continued at a moderate level in FY80, with future BMD development requirements tasked to the Office of Directed Energy Technology.

3. (U) FY 1981 Planned Program: The FY81 BMD Advanced Technology efforts will include research and hardware purchase in the following areas: advanced radars, advanced optics, unique discrimination techniques, advanced data processing networks and software, advanced interceptors, and advanced BMD construct analysis. The radar technology program will include initiation of a Millimeter Wave Instrumentation Radar at Kwajalein, and the initiation of a coherent laser ranger. The optics technology program will include demonstration of on-focal-plane gamma noise suppression, an additional Designation Optical Tracker (DOT) Flight Experiment, and demonstration of a testbed capability for mosaic technology components. The discrimination technology program will include the initiation of hardware procurement and airplane modifications for an Airborne Optical Platform for use in intelligence data collection, and installation of the COBRA JUDY ship-borne data collection radar. The interceptor technology program will include a complete component integration/validation test to support a millimeter wave radar guidance endoatmospheric nonnuclear kill (ENNK) experiment, the completion of full-scale forebody ground tests utilizing advanced materials,

and testing of flight-weight components for a liquid propulsion system for a direct impact kill system. Data processing technology will include the delivery of the modular missile-borne computer (MMBC) prototype to the Advanced Research Center for completion of applications software development and initiation of interactive testing in a simulated operational environment. Completion of the first phase of the Endo/Exo testbed will provide the validation capability for MMBC and endo nonnuclear kill software and hardware. Demonstration of adaptive testers for the testbed and evaluation of advanced circuit technology, such as gallium arsenide and Josephson junction cryogenic processors, will be conducted. Efforts to solve the critical issues for the development of Forward Acquisition Sensors for attack assessment and low-altitude defensive systems will also continue under the FY81 AT program.

4. (U) FY 1982 Planned Program: Continue development and integration of a millimeter wave instrumentation radar at KMR. Complete testing of 35 GHz millimeter wave monolithic solid state transceiver modules. Conduct Design Review on the Forward Acquisition Sensor, evaluate a BMD mosaic sensor, and conduct optical flight test experiments. Acquire and analyze field test data on offensive threat vehicles and penetration aids. Demonstrate prototype modular missile-borne computers with operational software. Complete critical technology integration and flight test planning for the Endo NNK program to allow for flight experiment decisions. Complete integrated system tests of an improved direct impact kill vehicle prototype. Continue analytical simulation and initiate ground testing of components for the Forward Acquisition Sensor program. Continue with technology assessment and integration programs.

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

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.33.08.A Title: Ballistic Missile Defense Systems Technology Program (BMDSTP)
DOD Mission Area: #121 - Ballistic Missile Defense Budget Activity: #3 - Strategic 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	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	114000	120814	133503	176120	Continuing	Not Applicable
D991	BMD Systems Technology Program	114000	120814	133503	176120	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 a minimum capability to initiate design/development of a deployable BMD system, if directed; and conduct systems definition studies and testing of selected components in a systems context to assess responsiveness to a variety of BMD missions.

C. BASIS FOR FY 1981 RDTE REQUEST: This program provides for the validation and merging of technology into systems constructs by validating technical issues associated with the Homing Overlay Experiment and the Low-Altitude Defense Program. The Homing Overlay Experiment will complete design verification testing of missile components and conduct a critical design review in Procurement, fabrication, and assembly of the flight interceptors will begin in System integration and testing of the ground test unit will be conducted in CONUS and at Kwajalein Missile Range. The Systems Technology Test Facility at Kwajalein Missile Range will be closed after the last dedicated target is flown. The Low-Altitude preprototype demonstration will continue with design efforts being initiated in the radar, data processing, and interceptor subsystems.

Program Element: #6.33.08.A Title: Ballistic Missile Defense Systems Technology Program (BMDSTP)
DOD Mission Area: #121 - Ballistic Missile Defense Budget Activity: #3 - Strategic Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
1st Homing and Kill Interceptor Flight	[redacted]	[redacted]
Commence Closing Systems Technology Test Facilities	[redacted]	None Shown
Completion of Low-Altitude Defense Preprototype Demonstration	[redacted]	None Shown

Reprogramming of efforts to allow for start-up of Low-Altitude Defense preprototype demonstration resulted in slipping the Homing Overlay Experiment schedules by two months.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	114000	120814	133503	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	114000	114784	128090	Continuing	Not Applicable

The increase in FY81 is due to new program guidance to reflect inflation. The increase in FY80 ($6100) was provided by Congress to maintain the current level of effort.

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

Program Element: #6.33.08.A Title: Ballistic Missile Defense Systems Technology Program (BMDSTP)
DOD Mission Area: #121 - Ballistic Missile Defense Budget Activity: #3 - Strategic Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: Site Defense Program was initiated in FY 1971 to conduct a prototype demonstration of a defensive system for MINUTEMAN or other high-value targets against Soviet ballistic missile improvements which were becoming a threat to the US MINUTEMAN force. 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. The prime objective of the reoriented program was to provide for a technological base from which full-scale development of a cost-effective ballistic missile defense system incorporating the most advanced technology and providing an acceptable lead-time to development could be initiated. The Systems Technology Program investigates systems capable of defending a variety of national strategic targets with primary emphasis on defense of land-based intercontinental ballistic missiles. This 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. The Ballistic Missile Defense Program insures that the US will be capable to provide a defense, if and when needed, against an attack by land-based intercontinental ballistic missiles (ICBM's) or submarine-launched ballistic missiles.

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 designed 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: The major contractors are: McDonnel 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; and Teledyne Brown Engineering Co., Inc., Huntsville, AL. Government: US Army Ballistic Missile Defense Systems Command, Huntsville, AL.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: In 1975, the Site Defense Program was restructured from a prototype demonstration program to validation of key issues. The Technology Validation Program continued the design and development of hardware for initial bulk filter, discrimination, and realtime data processing. The Advanced Digital Signal Processor (ADSP) was terminated in May 1979. The data processing effort continues to investigate distributed data processing as a means to increase

throughput. Technical studies were conducted on the layered defense system constructs, and analysis for defending a variety of strategic national assets was continuously conducted. The overlay defense system definition studies were completed in Aug 78. Selection of an interceptor supplier and integration contractor (ISIC) and initial development work was started for the Homing Overlay Experiment in Aug 78. The preliminary design review for the Homing Overlay Experiment was completed in Nov 79. System Analysis was completed in Nov 79. System Analysis was completed in FY79 for the Low-Altitude Defense preprototype demonstration, and cost and scheduling of activities for the demonstration were developed during CY79.

2. FY 1980 Program: The Homing Overlay Experiment will design, fabricate, and assemble hardware for design verification testing. Seven major subcontractors will begin 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 test facilities at Kwajalein Missile Range will begin in The first complete interceptor ground test unit will be completed by and integration testing of the interceptor ground test unit will begin thereafter. Hardware testing augmented by system simulation will be performed, and procurement of the first interceptor flight test hardware for the HOE Program will begin in early Advanced data processing hardware configuration experiments will continue and the detailed design of a facility to support the development of tactical distributed data processing software will be initiated. Systems Technology Reentry Vehicle Experiment Program dedicated targets will be flown to complete the evaluation of the discrimination performance of the Site Defense Radar and to provide Soviet-like reentry vehicle data. The Systems Technology Test Facilities will commence closing after these flights in The Low-Altitude Defense preprototype demonstration will begin with major effort directed toward system definition and source selection of contractors for data processing and radar elements of the system. Definition work will continue in the interceptor subsystem and ground support equipment areas.

3. FY 1981 Planned Program: The design verification testing of the Homing Overlay experimental component hardware will be completed, and a critical design review is scheduled for Complete fabrication and assembly of the flight test units for the Homing and Kill phase of the Homing Overlay Experiment (HOE) will then begin and continue throughout the year. CONUS system integration testing for the ground support unit will be complete, and tests at Kwajalein Missile Range will begin. Construction of test facility at Kwajalein Missile Range will be completed for the first HOE flight test scheduled in The Systems Technology Test Facility (STTF) will be closed, and personnel and some equipment returned to CONUS during the fiscal year. System functional design for the Low-Altitude Defense preprototype demonstration will begin. The radar/data processing associate contractor will be selected by mid-to-late FY81. Preliminary design for the radar subsystem, and development and testing of radar brassboard models will begin. Engineering modeling and blast radiation analysis will begin

for the airborne guidance subsystem of the interceptor. Wind tunnel tests of the proposed configuration and design and development of the propulsion system will begin.

4. FY 1982 Planned Program: The fabrication, assembly, and testing of the HOE flight interceptors will be completed along with system integration and testing of the ground test units. flights will be flown respectively. The system engineering for the Low-Altitude Defense preprototype demonstration program with development and testing of components for the radar and interceptors will be continued. Hardware and software development and testing will continue for the data processing and support equipment. Preliminary design reviews are scheduled for the radar and interceptor equipment in the Preliminary design review of the first software release is scheduled for late

5. Program to Completion: This is a continuing program. The last flights of the Homing Overlay Experiment will be completed and the key issues of the program will be evaluated against program data. The Low-Altitude Defense preprototype demonstration will continue with the development and testing of the major subsystems. A flight program will be flown at White Sands Missile Range to evaluate the technical performance, and a flight program will be conducted at Kwajalein Missile Range to demonstrate system performance. An overlay program will be initiated which will develop and evaluate the detection, designation, and discrimination sensor battle assessment in the exoatmospheric region.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.35.A

Title: Worldwide Military Command and Control System (WWMCCS) Architecture

DOD Mission Area: #331 - Strategic Command

Budget Activity: # - 3 Strategic 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	Total Estimated Cost
D1150	WWMCCS Architecture	2200	811	0	0	Not Applicable	Not Applicable

B. (U) BRIEF DESCRIPTION OF PROJECT: The objective of this effort is to develop a single coherent policy guidance document for the transition of existing tactical and strategic command and control systems to those that will be required in the 1980's and beyond. This document will present a comprehensive, cost-effective command and control program which will result in substantial cost savings. This approach allows maximum use of off-the-shelf procurement and minimizes RDTE expenditures.

C. (U) EXPLANATION OF CANCELLATION OR DEFERRAL: DOD Directive 5010.22, dated 22 Nov 79, stated that all studies and analyses to be funded from RDTE funds must be in support of research and development projects. All other studies and analyses will be programed and budgeted in O&M.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.32.15.A
Title: Joint Survivability Investigations
DOD Mission Area: #225 - Air Warfare Support
Budget Activity: #4 - 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	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	600	600	693	914	Continuing	Not Applicable
D079	Joint Survivability Investigations	600	600	693	914	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Based upon analysis of combat experience in Southeast Asia and intelligence gathered from the 1973 Mideast conflict, the JTCG/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 provides the resources for the Army's participation with the Air Force and Navy in the Joint Aircraft Survivability Program. The Joint Technical Coordinating Group on Aircraft Survivability (JTCG/AS) conducts the program for the Joint Logistics Commanders and is chartered to provide a mechanism to: (1) coordinate individual service programs to increase the survivability of aeronautical systems in a nonnuclear threat environment, (2) implement efforts to complement service survivability/vulnerability programs, and (3) maintain close liaison with service levels to ensure all survivability research and development data and systems criteria are made available to developers of new aircraft. This program is jointly funded by separate Air Force and Navy program elements and responds to the Tri-Service Memorandum of Agreement on Aircraft Survivability Equipment (ASE) for use on Helicopters and Low/Slow Fixed Wing Aircraft. The JTCG/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 JTCG/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 1981 RDTE REQUEST: This program funds the Army portion of the joint plan to provide the knowledge required for the design of combat survivable aircraft and equipment. The FY 1981 submittal includes support for the Combat

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

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

Data Information Center; continued engine vulnerability tests to ballistic rounds to determine damage mode and failure effect criteria; investigations to determine the vulnerability of composite joint designs for modular fiber-reinforced airframe construction; further development and evaluation of advanced composite structural elements for helicopters with ballastic/thermal tolerance and radar attenuating characteristics; evaluation of candidate laser protection materials; validation testing of laser/visual aerosol countermeasures effectiveness; and additional measurements of radar cross section of helicopter rotating components.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands):

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	600	600	693	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	600	600	600	Continuing	Not Applicable

Differences in funding profiles between the FY81 and the FY80 Congressional Descriptive Summaries for FY 1981 reflect program adjustments for inflation.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable

Program Element: #6.32.15.A
Title: Joint Survivability Investigations
DOD Mission Area: #225 - Air Warfare Support
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 Commander's Group to acquire and make available technology for designing nonnuclear survivability enhancements into new aircraft. The charter of the JTCG/AS is: (1) to implement interservice efforts to reduce nonnuclear vulnerability of aircraft, (2) to coordinate research and advanced development in nonnuclear survivability, and (3) to maintain liaison between technology experts and those actually designing new aircraft. In the fall of 1972, the JTCG/AS formulated a tri-Service nonnuclear survivability program named Test and Evaluation Aircraft Survivability (TEAS). The TEAS program was approved by 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, evaluation of prototype hardware and development of 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 Commander's Group. Duplication is avoided through joint reviews by that office and individual Service task agencies. Program is specifically related to Army programs 6.37.11.A/DB52, Scout/Attack Helicopter Survivability Equipment; 6.37.11A/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. This program is coordinated and complementary to Air Force (PE 6.32.44.F) and Navy (PE 6.32.62.N) programs. Additionally, coordination is effected with existing and planned programs of the Federal Aviation Administration, NASA, and plans are being developed for exploration of possible 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 1979 and Prior Accomplishments: In 1979 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, characterization of battle damage to composite structures, and development of design enhancement

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

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

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 an Infrared Measurement Guide and design criteria for jam-proof flight controls components and for battle-damage-tolerant composite joint designs for modular fiber-reinforced airframe construction. Data pertaining to vulnerability of personnel to laser weapons effects for use in determining cockpit area protection equipment was assembled. The development of methods and p-ocedures to measure the radar cross section of helicopter rotating components was completed. The Combat Data Information Center data base was expanded to include 10,000 helicopter incidents and laser effects on materials.

2. (U) FY 1980 Program: The program continues engine vulnerability tests, development of semi-empirical laser penetration equations for use in vulnerability assessments, support of Combat Data Information Center, development of systems and component probability of damage given to hit ($P_{d/h}$) estimation techniques, and investigation of the vulnerability of joints in composite aircraft structures. Additional tasks include development of ballistic and thermal tolerant advanced composite structural elements for helicopters, incorporation of radar attenuating materials, development of optical detection/countermeasures effectiveness models for survivability assessment, and development of a low-cost armored helicopter pilot seat using electro-slag-remelt steel.

3. (U) FY 1981 Planned Program: The Army portion of the FY 1981 program is planned to include new tasks in two areas: (1) evaluation and validation of laser/visual aerosol countermeasures effectiveness through field testing, and (2) examination of candidate laser protection materials and their application to current and future aircraft. This effort will lead into an FY 1982 task to examine the feasibility of strippable sheet laser protection for canopies and other transparencies. In addition, the following FY 1980 tasks will continue: engine vulnerability tests to ballistic threats to establish damage mode and failure criteria; investigations to determine the vulnerability tests to ballistic threats to establish damage mode and failure criteria; investigations to determine the vulnerability of advanced composite materials to ballistic and thermal damage and to determine their survivability in structural environments, i.e., structural joints and structural panels; development of parametric test data for candidate laser protection materials; updating of infrared signature measurement procedures and continued effort toward development of standardized methods, procedures, and formats for measurement of electro-optical signatures among the Services and industry; adapt and augment an optical countermeasures effectiveness model developed by the JTCG/AS under an FY 1978-79 task to include threats and scenarios of helicopter operations in the nap-of-earth environment; continued improvement and standardization of survivability/vulnerability assessment analyses.

Program Element: #6.32.15.A
Title: Joint Survivability Investigations
DOD Mission Area: #225 - Air Warfare Support
Budget Activity: #4 - Tactical Programs

4. (U) FY 1982 Planned Program: Continuation of ongoing FY 1980 and FY 1981 efforts. Additional tasks are planned in areas of engine damage modeling, development of engine components design criteria for enhanced survivability, and a design feasibility effort examining strippable sheet laser countermeasures for helicopter canopies and transparencies. Update and improvement of survivability analyses will continue.

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

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.33.02.A
DOD Mission Area: #213 Ground Air Defense

Title: High-Medium Altitude Air Defense-Development (HIMAD-D)
Budget Activity: #4 - 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	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	0	35896	18418	0	54314
D052	HIMAD-D (Anti Standoff Jammer (ASOJ)	0	0	35896	18418		54314

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: An ASOJ capability is required to defeat standoff jammers (SOJ) which disrupt friendly command and control systems, communications systems, and air defense systems. This allows destruction or nullification of airborne SOJ systems and effective employment of friendly systems.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: The engineering design will be completed, simulation capabilities achieved and initial prototype hardware/software developed.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands): Not Applicable

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Missile Procurement, Army						
Funds (current requirements)				5500	109200	114700
Funds (as shown in FY 1980 submission)	Not Applicable					

Program Element: #6.33.02.A
DOD Mission Area: #213 Ground Air Defense

Title: High-Medium Altitude Air Defense-Development (HIMAD-D)
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 two to three years. These studies have continued efforts to produce a viable Antistandoff Jammer system. Specific descriptions are classified SECRET-LIMITED DISTRIBUTION, Special Access Required, and may be obtained from the Deputy Chief of Staff for Research, Development, and Acquisition (DSCRDA).

G. (U) RELATED ACTIVITIES: Specific information may be obtained from ODCSRDA as above.

H. (U) WORK PERFORMED BY: Specific information may be obtained from the ODCSRDA as above.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1980 and Prior Accomplishments: The studies and investigations have allowed a requirements document to be written and submitted to DOD concurrently with the FY 1981 budget. Specific studies and progress are classified SECRET Limited Distribution, Special Access Required and may be obtained from ODCSRDA as above.

2. (U) FY 1980 Program: Not Applicable

3. (U) FY 1981 Planned Program: Specific developments are classified SECRET Limited Distribution, Special Access Required, and information may be obtained from the ODCSRDA.

4. (U) FY 1982 Planned Program: Information is classified as above.

5. (U) Program to Completion: Information is classified as above.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.33.03.A
DOD Mission Area: #212 - Fire Support

Title: Surface-to-Surface Missile Rocket System
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0	984	2692	34533	144099	182308
	QUANTITIES						To be determined
D216	GSRS Terminally Guided Warhead	0	984	2692	34533	144099	182308

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Terminally Guided Warhead (TGW) for the General Support Rocket System (GSRS) will consist of one or more terminally guided sub-munitions (TGSM) packaged within the rocket payload section. The TGW is required to defeat armored point targets. It will primarily be used in the role of battlefield interdiction.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Three or four concept definition contracts will be awarded to define the GSRS TGW concept and development program. Parametric studies will be conducted to determine the optimum GSRS TGW design program schedule and cost. Contractors from those countries participating in the GSRS developoment, i.e., Germany, France, and the United Kingdom will have an opportunity to bid on the Concept Definition Phase contracts. An in-house US Army Missile Command team will evaluate the Concept Definition proposals, establish a government baseline TGW design, and prepare the GSRS TGW Specification and Validation Phase request for proposal (RFP).

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	0	984	2692	178632	182303
Funds (as shown in FY 1980 submission)	0	3000	24000	156800	183800

Program Element: #6.33.03.A
DOD Mission Area: #212 - Fire Support

Title: Surface-to-Surface Missile Rocket System
Budget Activity: #4 - Tactical Programs

Funding requirement in FY 1980 was reduced because the Memorandum of Understanding with Germany, France, and the United Kingdom specifies that any future development programs for the General Support Rocket System will be a joint effort. This resulted in a reduction in the FY 1980 requirement. The FY 1981 program was reduced because the development effort was slowed down to bring it in line with other terminal homing efforts such as the Assault Breaker Technology Demonstration.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable

Program Element: #6.33.03.A
DOD Mission Area: #212 - Fire Support

Title: Surface-to-Surface Missile Rocket System
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 (IR) and millimeter wave (MMW) seekers. After the Defense System Acquisition Review Committee (DSARC) I for the General Support Rocket System (GSRS), the Army was directed to develop a plan for adapting a terminal guidance system to the GSRS. The use of terminal guidance was supported by the Congress in the FY 1977 Authorization Conference Report which requires the Army to include a terminal homing option for the GSRS. 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. Guided munitions considered includes Terminally Guided Sub-Missile (TGSM) using infrared seekers, Sense and Destroy Armor (ARMOR) which uses a millimeter wave sensor, and SMARTLET. TRSM with millimeter wave seekers are also considered as a possible approach. During Concept Definition contractors will be free to propose any alternative which is feasible and cost effective.

G. (U) RELATED ACTIVITIES: The Defense Advanced Research Projects Agency (DARPA) and the Army Missile Command (MICOM) have a joint program underway called Assault Breaker Technology Demonstration. This program consists of developing "smart" munitions and one or more TGSMs and evaluating them through component, captive flight, drop and flight tests. The Air Force also has development programs underway with much the same general objectives as Assault Breaker, except that they are aimed at developing systems to satisfy the unique requirements of aircraft delivery. Their seeker requirements are significantly different than those of a ground-launched delivery system because of the different trajectory. There is full agreement between the Army and Air Force to ensure full exchange of information and data and to eliminate potential duplication of effort in these programs.

H. (U) WORK PERFORMED BY: The US Army Missile Command, Redstone Arsenal, AL, has the overall responsibility fpr development of the GSRS terminally guided warhead. The Request for Proposal for the concept definition will be released in FY 1980.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Not Applicable

2. (U) FY 1980 Program: Prepare and release request for proposal (RFP) for concept studies. Evaluate proposals. Award contrcts for concept studies.

Program Element: #6.33.03.A
DOD Mission Area: #212 - Fire Support

Title: Surface-to-Surface Missile Rocket System
Budget Activity: #4 - Tactical Programs

3. (U) FY 1981 Planned Program: Complete concept studies. Evaluate studies and establish baseline design. Prepare and release RFP for the Validation Phase. Evaluate subsequent proposals and conduct source selection.

4. (U) FY 1982 Planned Program: Complete concept definition and start Validation Phase.

5. (U) Program to Completion: Complete development. During the Validation Phase, the seekers, guidance and control, airframe and lethal mechanism of the submunition will be developed and tested. The submunition optimized for GSRS may be compatible with the TGSM optimized for Assault Breaker and/or the Air Force WASP. If detailed cost-effective analysis does show the difference in the delivery system, requirements dictate different TGSM design, development time and cost will be minimized by integration of the on-going Army/Defense Advanced Research Projects Agency (DARPA) Assault Breaker technology effort and the Air Force terminal munition technology efforts with the GSRS TGW program. The parent warhead, to include the skin and structure, dispersal mechanism and fuzing will be designed, developed, and tested.

FY 1981 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0	0	16822	37878	296991	351691
	QUANTITIES						15
D053	Air-To-Air STINGER	0	0	16822	37878	11991	66691
DB60	Air Defense Supression System	0	0			285000	285000

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program will provide a Multipurpose Lightweight Missile (MLM) System that is required by Army Attack/Scout Helicopters and other selected aircraft for self-protection against armed hostile aircraft. The MLM system will enable friendly aircraft during their normal employment to effectively engage viable aerial threats of both rotary and fixed wing 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 will be based upon the STINGER/STINGER-POST manportable missile and a launcher assembly that will be common to a future air defense suppression version of the MLM system, currently planned for a 1983 start. The STINGER missile is in production and possesses the proper combination of weight, range, and lethality for this application. It is a cost-effective insurance investment for the survivability of these aircraft.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: The Air-to-Air STINGER is a nonmajor, new start program with the following included in FY 1981: extensive engineering development on the missile launcher, controls, and displays; captive and flight testing; and limited research on the integration of RF/IR seekers.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Letter of Agreement Authorized	Oct 79	Not Applicable
Required Operational Capability (ROC)	Dec 79	
Special Program Review	Apr 80	
Award ED Contract	Nov 80	
DT II Completed	Jul 82	

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

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

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	0	0	16822	334869	351691
Funds (as shown in FY 1980 submission)	Not Applicable				

This program is a new start in FY 1981.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Missile Procurement, Army 1/						
Funds (current requirements)	0	0	0	61500	244700	306200
Funds (as shown in FY 1980 submission) 1/						
Quantities (current requirements)	0	0	0	215	2385	2600
Quantities (as shown in FY 1980 submission) 1/						

1/ This is an FY 1981 new start program; therefore, an FY 1980 Congressional Descriptive Summary was not submitted.

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

F. (U) DETAILED BACKGROUND AND DESCRIPTION: Scout and attack helicopters must continue to perform their primary missions of acquiring and destroying enemy armor threats in a hostile environment of armed helicopters, close air support aircraft, and a high density of air defense weapon systems. As presently armed, scout and attack helicopters must rely primarily on field and air defense artillery plus USAF tactical aircraft to provide the necessary suppression of air/air defense threats. However, these systems are not capable of continuously providing the requisite level of suppression. The attack helicopter has some self-protection capability using its 20 mm or 30 mm gun, rockets and antitank missiles, but these weapons were designed for other tasks and are not adequately effective against the described threats. The scout helicopter does not have any armament system. The Multipurpose Lightweight Missile system shall consist of an air-to-air missile (future development will include an air defense suppression version), common launcher, and associated avionics and fire controls. This system will be pilot operated to provide the requisite quick-reaction, fire-and-forget self-protection against hostile aircraft which would otherwise prevent the successful completion of the primary mission. Present configuration is envisaged as a two-round launcher assembly with two launchers per attack (AH-1S) helicopter carried on the inboard stores position. The Scout (OH-58C) helicopter would carry only one launcher on an outboard launcher adapter (must be developed). The air-to-air missile would utilize STINGER/STINGER-POST MANPAD assets. Missiles would be loaded into the launcher assembly which contains the missile electronics for power supply, spin-up of gyros and uncaging of the seeker, fire controls for round selection, and coolant bottle. Cockpit controls and displays would enable the pilot to select individual rounds, search for and acquire targets, and fire.

G. (U) RELATED ACTIVITIES: This program is being closely monitored by the US Air Force and US Marine Corps for application to meet their requirements. It has also been briefed to the Federal Republic

of Germany and the United Kingdom. The Stinger missile is currently in production while the STINGER-POST is in engineering development, Program Element 6.43.06.

H. (U) WORK PERFORMED BY: Development of the missile launcher and missile-peculiar components will be under the direction of the US Army Missile Command, Huntsville, AL. Aircraft integration of the Multipurpose Lightweight Missile (MLM) System will be under the direction of US Army Aviation Research and Development Command and US Army Troop Support and Aviation Readiness Command, St. Louis, MO. The US Army Armament Research and Development Command will be responsible for the sighting and fire controls. Contractors will be selected at program initiation.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS: During the late 1960's, tests were performed in firing of REDEYE missiles from various helicopters to explore the feasibility of such a system. During November and December 1978, a joint US Army/US Air Force team conducted Exercise J-Catch. This was an evaluation of the use of helicopters to defend themselves from

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

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

helicopter counterattacks in the forward battle area. This was done by mounting STINGER TRACKING HEAD TRAINERS on the helicopter and flying various engagement scenarios. Documentation was by video tape recorders, camera, and voice recording. Results of Exercise J-Catch proved the feasibility of using an air-to-air missile on Army helicopters. The air-to-air STINGER program will be an FY 1981 nonmajor, new start RDTE effort.

1. (U) FY 1979 and Prior Accomplishments: Not applicable.

2. (U) FY 1980 Program: Not applicable.

3. FY 1981 Planned Program: The development during FY 1981 will address adapting the STINGER manportable missile to a launcher assembly that will be common to all aircraft and the future air defense suppression missile. Also included will be the various controls and displays required to acquire and fire the missile. All experimental work will be performed and the proposed system will be ready for full-scale development.

4. FY 1982 Planned Program: Development during this period will be the integration of the launcher assembly to various aircraft. During this period firings of fifteen (15) rounds will take place for developmental and operational tests.

5. Program to Completion: Development and/or testing required for final integration per aircraft.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.33.20.A

Title: Corps Support Weapon System (Formerly Assault Breaker)

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - 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	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	9200	7619	26126	To be determined	To be determined
	QUANTITIES						To Be Determined
D302	Corps Support Weapon System	0	9200	7619	26126	To be determined	To be determined

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Defense Advanced Research Projects Agency (DARPA) Assault Breaker concept couples an Air Force-developed airborne target acquisition/tracking/command guidance system with an Army ground tactical fire control center and field artillery surface-to-surface missile (SSM) system containing terminally guided submunitions with engagement effectiveness to support the requirement of attriting large quantities of threat mobile hard point targets (tanks, APC's, trucks, mobile SAM's, etc.) in a very short time up to 150 km beyond the forward edge of the battle area. This Assault Breaker capability is required to accomplish the task of interdiction by destroying, neutralizing, or impeding threat forces enroute to the front, i.e., affecting the arrival rate of enemy second echelon regiments and divisions in the central battle arena. An Assault Breaker capability could provide rapid attrition of enemy second echelon forces to insure that enemy force ratios do not exceed a level that can be contained by the defending NATO ground forces. This antiarmor capability makes assault breaker a viable candidate for worldwide deployment and as a stand-alone, Assault Breaker must be capable of assuming the Corps Support Weapon System role of the present LANCE missile system in all its applications.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: The only delivery missile candidate fully funded in the current technology demonstration by DARPA is a T-16 (a PATRIOT variant), with associated dispensers. The FY 1981 funding request will continue funding begun in FY80 for the T-22 booster (LANCE variant) and associated dispenser work so that this alternative can also be demonstrated. This LANCE variant will provide competition in the demonstration which is considered to be absolutely essential for meeting OMB requirements. The FY 1981 fund request will also provide funds for the Army to continue the concept formulation effort begun in FY80 and required to prepare for assuming Service control of the program for development, if appropriate, at the end of the demonstration.

Program Element: #6.33.20.A

Title: Corps Support Weapon System (Formerly Assault Breaker)

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Mission Element Need Statement Approval (MENS)	May 1980	None
Begin Technology Demonstration	April 1978	April 1978
Complete Technology Demonstration	September 1981	February 1981
Army Systems Acquisition Review Council	November 1981	June 1981
Defense Systems Acquisition Review Council	December 1981	July 1981

(U) Previous dates reflected were those anticipated in the DARPA program. As the Army has progressed in its planning portion of the program, the above adjustments have been made. The purpose of the Concept Formulation Analysis is to look at the demonstrated Assault Breaker System and at all alternatives that could be used in the Corps Support Weapon System role. Should it be decided during the concept formulation to proceed with systems already developed, the Army can proceed to an ASARC II. Should it be decided to recommend alternatives which will require advanced development, then the Army will proceed with an ASARC I.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	0	9200	7619	To be determined	To be determined
Funds (as shown in FY 1980 submission)		9200	7900	To be determined	To be determined

(U) Funds requested for FY 1979 were transferred by the Congress to the Defense Advanced Research Projects Agency (DARPA) to provide for centralized control of the program through the technology demonstration. Adjustments were made to the FY81 program based on change in anticipated cost of program.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable

Program Element: #6.33.20.A

Title: Corps Support Weapon System (Formerly Assault Breaker)

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: Goals of the Assault Breaker technology demonstration are to identify those system elements required to increase the US capability to attack threat second echelon forces under day/night, good/adverse weather and to capitalize on existing programs and technologies to demonstrate the system concept. During the joint Army/Air Force Antiarmor ENGAGER Study, the critical technologies associated with effective long-range antiarmor engagement were identified as those associated with target acquisition, tracking, and command guidance and those associated with the terminal attack phase or endgame. Hence, the Air Force, in conjunction with Defense Advanced Research Projects Agency (DARPA), is conducting a target acquisition, tracking, and command guidance demonstration (scheduled for completion in FY81), and the Army, in conjunction with DARPA, is conducting an endgame technology demonstration (scheduled for completion in FY81). The Army endgame demonstration will include free-flight drop tests of smart munitions, wind tunnel and sled tests of submunition dispensers, warhead lethality assessments, and culminate with a flight test of the total endgame. A joint Army/Air Force technology demonstration integrating the Air Force's target acquisition tracking command guidance system with the Army's endgame is scheduled for mid-FY81. These technology demonstration plans are success oriented, considered to be of medium to high risk, and are absolutely necessary to validate the concept before full commitment to systemization is made. DARPA is presently the lead agency for the program and is scheduled to guide the program through the FY81 demonstration period, at which time DARPA will transfer control of the program to the Services. Therefore, upon successful completion of the planned demonstrations, the Army must be prepared to accept the program in FY81 and commence Corps Support Weapon System development, as appropriate.

G. (U) RELATED ACTIVITIES: The Assault Breaker program will take advantage of ongoing Advanced Research Project Agency Tactical Technology (Program Element (PE) 6.27.02.E) efforts; Missile Technology (PE 6.23.03.A); complementary efforts of the Army Missile Command's Terminally Guided Submunition (TGS) work and the Air Force's Wide Area Antiarmor Munitions (WAAM) Program; Air Force Activity 6.46.13.F; warhead technology associated with the LANCE Missile System and General Support Rocket System (GSRS); target acquisition/tracking/command guidance technology associated with the Army's Standoff Target Acquisition System (SOTAS); and missile booster technology associated with the LANCE and PATRIOT missile systems.

H. (U) WORK PERFORMED BY: DARPA has been tasked to provide overall direction and control of the program through the FY 1981 technology demonstration. The Army's endgame technology (booster, dispenser, seeker/sensor, submunitions) is being worked and managed by the Army's Missile Command, Huntsville, AL. The Air Force's target acquisition/tracking/command guidance system is being worked and managed by Air Force System Command's Rome Air Development Center, Griffiss Air Force Station, NY. The following Phase II (FY79) contracts were awarded for the Army/DARPA Assault Breaker Endgame Demonstration: Boeing Corporation, Seattle, WA, for AT-16 dispenser and Terminally Guided Submunition (TGSM) airframe. Subcontractors are Raytheon Corporation, Bedford, MA, for infrared (IR) seeker and Sperry, Clearwater, FL, for millimeter wave (MMW) seeker; Martin Marietta Corporation, Orlando, FL, for a T-16 dispenser and smart bomblet; General Dynamics (Pomona Division), Pomona, CA, for infrared

Program Element: #6.33.20.A

Title: Corps Support Weapon System (Formerly Assault Breaker)

DOD Mission Area: #212 - Fire Support

Budget Activity: #4 - Tactical Programs

terminally guided submissiles; AVCO, Wilmington, MA, for SKEET submunition; Science Applications, Inc., Huntsville, AL, for systems integration; and a selection of the T-16 integrating contractor (Boeing or Martin) is scheduled to be made 2nd Qtr FY80.

(U) Approval of the FY 1981 funds will permit Vought Corp., Dallas, TX, to continue work on the T-22 booster and associated dispenser. Ballistic Research Laboratory, Aberdeen, MD, is doing the warhead work. Armament Research and Development Command (ARRADCOM), Picatinny Arsenal, Dover, NJ, is conducting nuclear studies for the Corps Support Weapon System.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Awarded eight Endgame 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 and smart bomblets, conducted wind tunnel and sled tests of a submissile dispenser, provided lethality assessments of appropriately sized warheads. Awarded five Technology Feasibility Concept Application Study Contracts to look at alternative concepts.

2. (U) FY 1980 Program: The requested funds will procure and test the T-22 booster and associated dispenser which is the initial Army competitor in FY81 flight tests. A project office will also be established for Service control of the program and possible subsequent development. Major activities include preparation of concept formulation package, cost/performance analyses, engineering estimates, systems integration simulation model, Request for Proposal (RFP), and other required documentation leading to a development decision.

3. (U) FY 1981 Planned Program: Flight test of the total endgame will be conducted under the DARPA technology demonstration program. Standoff Target Acquisition System (SOTAS) command guidance demonstration; and an Integrated Army endgame/Air Force foregame technology demonstration will be conducted.

4. (U) FY 1982 Planned Program: Army Systems Acquisition Review Council (ASARC)/Defense Systems Acquisition Review Council (DSARC) will be held leading to the initiation of a Validation/Maturation Phase for the Corps Support Weapon System. Begin Validation/Maturation development, as appropriate, of the system that is decided upon as the result of the concept definition.

Program Element: #6.33.20.4 Title: Corps Support Weapon System (Formerly Assault Breaker)

DOD Mission Area: #212-Fire Support Budget Activity : #4 - Tactical Programs

5. (U) Program to completion: To be determined based upon results of technology demonstrations and appropriate Studies. The Program will be described in the Army POM FY 82-86.

FY 1981 RDTE 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	1999	1958	*	*	Continuing	Not Applicable
	QUANTITIES	*	*	*	*	*	*
D089	Nuclear Burst Detection System (NBDS)	50	500	0	0	10400	13140
D135	Nuclear Weapon Development Support	720	495	602	705	Continuing	Not Applicable
D148	Atomic Demolition Munition (ADM) Firing and Control System	0	0	-			
D153	Nuclear Effects Support Team (NEST)	400	493	786	934	Continuing	Not Applicable
D390	Tactical Earth Penetrator (TEP)	0	0	0	0	-	-
D443	Nuclear Projectiles Advanced Development	379	173	-	-	Continuing	Not Applicable
D483	Radiac Equipment Advanced Development	450	297	0	0	Continuing	Not Applicable

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

Program Element: #6.36.04.A Title: Nuclear Munitions and Radiacs
DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare Budget Activity: #4 - Tactical Programs

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Army must be able to conduct both offensive and defensive operations. These operations require equipment that provides both offensive and defensive capabilities and which will survive in a nuclear environment. This program provides support for advanced development of new concepts having application to nuclear weapons systems and advanced development of nuclear defensive systems. It supports the transfer of nuclear weapons and system hardening technology to systems having nuclear survivability requirements. It also provides management of RDTE resources and interfaces with other agencies to include joint Department of Energy/Department of Defense (DOE/DOD) Feasibility Study Groups, Design Review and Acceptance Groups and DOE/DOD Project Officers Groups (POG). There is an urgent requirement to develop technology to upgrade Army radiation detection equipment which is old, bulky, has limited response capability and does not provide both individual and tactical monitoring information for prompt radiation (from fireball). Successful advanced development efforts will be transferred to equipment undergoing engineering development. Army systems must be hardened to survive in a nuclear environment. Nuclear hardening must be applied during the development process. This program supports the transfer of accumulated system hardening technology from the Army laboratories to the system developer. The Project Manager for Nuclear Munitions has the responsibility to interface with Project Managers (PM's), of systems having a nuclear capability, the Department of Energy and Army Laboratories, and the Department of Army Staff on nuclear matters. He must also provide support to development efforts that pertain to nuclear programs as a whole as opposed to a particular system. The Nuclear Weapon Development Support project provides the means to meet this requirement. Conventional artillery technology advancements in ballistics, modularization, and range extension must be applied to the family of nuclear projectiles to minimize the proliferation of special purpose artillery projectiles on the battlefield. Modernization of the Army's Atomic Demolition Munition (ADM) is required to ensure a relative to the implementation of barrier plans and/or the denial of selected facilities to an advancing enemy. Development of a versatile, high reliability firing and control system for ADM to

Current ADM's represent the technology of the early 1960's and do not have the level of command and control inherent in modern weapons entering the stockpile. Furthermore, development of a Tactical Earth Penetrator (TEP) as a complement to ADM's must be planned. Engineering development of a TEP weapon is being conducted within the PERSHING II (Program Element 6.43.11A). This program element will provide the Advanced Development effort to augment and support Engineering Development of a second generation TEP weapon for other delivery systems for further modernization of the Army's tactical nuclear weaponry.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: The Project Manager for Nuclear Munitions will continue nonsystem related RDTE to fulfill Army-wide requirements as, directed. Support of Joint DOE-DOD Phase 2 Nuclear Weapon Feasibility Studies and Design Review and Acceptance Groups will continue. The military requirements for an ADM Firing and Control System will be analyzed,

and system and operational concepts to meet these requirements will be formulated. The functional logic, components, and subsystems for the system will be defined. Support for various project managers in the area of nuclear survivability will be expanded as part of the Army Nuclear Survivability Program. Documentation of nuclear hardness assurance will be started using experience from the first systems produced which have been nuclear hardened. Advanced development of cost-effective improvements in nuclear projectile technology such as improved rocket assist propellants will continue.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Atomic Demolition Munition (ADM)		
Firing and Control System		
Feasibility Assessment Completed	3QFY1980	Not Shown
Initiation of Advanced Development	1QFY1981	Not Shown
Tactical Earth Penetrator		
Requirements Documents Completed	3QFY1982	Not Shown
Feasibility Studies Completed	4QFY1982	Not Shown
Advanced Development Initiated	1QFY1983	Not Shown

D. BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	1999	1958	- -	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	2399	1975	- -	Continuing	Not Applicable

The $17 thousand decrease in FY 1980 is a result of a general Congressional reduction. The $400 thousand decrease in FY 1979 was due to a reduction of the Nuclear Burst Detection System (D089) for lack of definition of an operational concept (-$550

thousand) and an increase in Radiac Equipment Advanced Development (D483) (+$150 thousand). The $7969 thousand decrease in FY 1981 over the FY 1980 estimates is due to a lack of relative priority for the Nuclear Burst Detection System (D089) (-$1800 thousand), Nuclear Projectiles Advanced Development (D443) (-$2368 thousand) and Radiac Equipment Advanced Development (D483) (-$415 thousand); a $3109 thousand decrease for the ADM Firing and Control System (D148) pending the outcome of a Joint DOE-DOD assessment of feasible alternatives to modernize the currently stockpiled Atomic Demolition Munition; a $625 thousand decrease for the Tactical Earth Penetrator (D390) pending definition of a requirement for the system; and refinement of the cost estimates for the remaining elements of the program (D135 and D153).

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

Program Element: #6.36.04.A
Title: Nuclear Munitions and Radiacs
DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: Emphasis on the advanced development (AD) of nuclear artillery projectiles is to increase range, reduce collateral damage, and improve safety, security and command and control. The increased range concepts provide substantially improved effectiveness and survivability of the nuclear delivery forces. The reduced collateral damage efforts enhance deterrence by making the nuclear forces a more credible deterrent. Artillery applications of earth penetrator technology offer the potential for cost effective stand-off atomic demolition munitions and for attack of hardened structures with reduced collateral damage. 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 radiac equipment and to transition such improvements directly to production without further engineering development. Potential cost savings in applying this technology are substantial. 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. A Nuclear Effects Support Team will provide technical support to system PM's in the area of nuclear survivability and hardening. This is a key element of the Army Nuclear Survivability Program.

G. (U) RELATED ACTIVITIES: This program complements and is closely coordinated with Department of Energy (DOE) advanced development efforts. 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 6.33.11.A, and those being accomplished by the Defense Nuclear Agency also are incorporated. There is no duplication of efforts under the Department of the Air Force nuclear burst detection programs which are oriented on strategic rather than tactical weapon detonation detection. 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 Materiels 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:

1. (U) FY 1979 and Prior Accomplishments: The Nuclear Burst Detection System (NBDS) continued at a low level. A contractual effort was initiated to develop an advanced development model of a NBDS consisting of three sensor stations, one central processing console and one external calibrator. The Project Manager for nuclear munitions continued to provide assistance

Program Element: #6.36.04.A Title: Nuclear Munitions and Radiacs
DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare Budget Activity: #4 - Tactical Programs

in identifying improvements required in the nuclear weapon stockpile, provided support to the Tri-Service Emergency Disablement Systems program, managed the development effort of warheads for PERSHING II, and the 8-inch and 155mm nuclear projectiles. The Nuclear Effects Support Team provided substantial support to system Project Managers in the area of Nuclear Survivability. Advanced development of various artillery projectiles, atomic demolition munitions and surface-to-surface missile adaption kits was completed in the 1970's. This technology has been transferred to appropriate engineering development programs such as the 8-inch nuclear projectile and the 155mm nuclear projectile. Additional efforts have focused on developing the technology for extended range and improved safety for nuclear artillery projectiles. The radiological detection and measuring equipment level-of-effort development of cost effective digital and large scale integration technology for radiac equipment was continued.

2. (U) FY 1980 Program: Funds for Nuclear Burst Detector System will be reprogrammed to a higher priority program except for enough funds to ensure an orderly close-out of the program. Support by the Project Manager for Nuclear Munitions for nonsystem related programs will be continued. Support to Project Managers will be continued in the area of nuclear survivability. Spin stabilized extended range projectiles, using a super rocket assist, either alone or in conjunction with a base bleeder projectile will be fired to determine maximum range capability. Technological development of radiac components will be continued.

3. (U) FY 1981 Planned Program: The Project Manager for Nuclear Munitions will continue RDTE support for nonsystem related programs. Requirements for an Atomic Demolition Munitions (ADM) Firing and Control System will be investigated, coordinated, and finalized. The Nuclear Effects Support Team will continue to support Project Managers in the area of Nuclear Survivability. Testing of spin stabilized super rocket assist rounds will be conducted to determine the feasibility of an adequate zoning solution.

4. (U) FY 1982 Planned Program: The Project Manager for Nuclear Munitions will continue RDTE support for nonsystem related programs. The Nuclear Effects Support Team will continue to support Project Managers in the area of nuclear survivability.

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

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

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

Title: Antitank Guided Missile (ATGM) Improvements
Budget Activity: #4 - Tactical Programs

TO BE SUBMITTED UNDER SEPARATE COVER

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

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

Title: Lethal Chemical Munitions Concepts
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0	2328	2009	2018	Continuing	Not Applicable
	QUANTITIES						
DE76	Lethal Chemical Materiel	0	1728	2009	2018	Continuing	Not Applicable
DE77	Lethal Chemical Agent Process	0	600	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 1981 RDTE REQUEST: Advanced development will be resumed 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.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Initiate Advanced Development (AD) on 155mm Binary Intermediate Volatility Agent (IVA)	N/A Will enter Engineering Development (ED) directly in FY 1981	1Q FY 1980

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 1980 Submission
Projectile		
Complete AD on 155mm Binary IVA Projectile	Not Applicable	2Q FY 1981
Resume AD on MLRS Lethal Binary Warhead	1Q FY 1981	1Q FY 1980
Complete AD on MLRS Lethal Binary Warhead	2Q FY 1983	2Q FY 1982

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 1980 and FY 1981 milestones for the MLRS is due to a lack of approved requirements documents. The necessary requirements documents are scheduled for approval in FY 1980.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	0	2328	2009	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	721	2340	1654	Continuing	Not Applicable

Funds originally approved for FY 1979 were reprogrammed for higher priority chemical warfare/chemical and biological defense (CW/CBD) RDTE projects. Of the 2328 thousand approved for FY1980, 1800 thousand will be utilized for program element efforts: 1200 thousand for salaries of security guards required by chemical surety regulations and 600 thousand for process technology and pilot production studies. The remaining 528 thousand has been reprogrammed into higher priority CW/CBD efforts because of

Program Element: # 6.36.15.A
Title: *Lethal Chemical Munitions Concepts*
BOD Mission Area: #215 - Land Combat Support
Budget Activity: #4 - Tactical Programs

the lack of approved requirements documents. The increased funding for Project DE76 in FY1981 reflects the increased interest and sense of urgency to develop a chemical capability for the MLRS. DE77 efforts have been restructured into PE 6.26.22.A, Chemical Munitions and Chemical Combat Support, starting in FY81. Slight reduction in FY80 funding level is the result of a general Congressional reduction.

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

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 advanced 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: No comparable work is done by the other Services on lethal chemical munitions development and agent processes. Each of the other Services sponsor 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/project 6.26.22.A/A554, Chemical Munitions and Chemical Combat Support.

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 & Evaluation Command (TECOM), at Aberdeen Proving Ground, MD; and Dugway Proving Grounds, Dugway, UT. Chemical Systems Laboratory performs all toxic chemical agent development work for the Department of Defense.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Data developed in the lethal chemical agent processes project were used in construction of chemical agent production activities at Rocky Mountain Arsenal, CO, and Newport Ammunition Plant, IN. Procedures for designing equipment for filling, closing, and leak testing of chemical munitions were developed. Production techniques for lethal binary chemical agent non-toxic intermediates were studied and small quantities of some intermediates were prepared. Studies were conducted on submunition concepts for missile warhead applications. In FY 1970 advanced development was initiated on the binary GB 155mm projectile. In FY 1971, process chemistry studies for production of the binary intermediates for GB were completed and prototype filling and sealing equipment for the binary GB 155mm projectile was developed. In FY 1972, advanced development was completed on the 155mm binary GB projectile. In FY 1973, advanced development was initiated on the binary VX 8-inch projectile. Process studies for the production of binary VX were initiated. In FY 1974, advanced development on the binary lethal chemical agent 8-inch projectile was completed. Process studies and pilot production studies for binary intermediates were continued. Sub-pilot investigation of binary VX components disposal by means of incineration was conducted and feasibility was demonstrated. Criteria were developed for a pilot filling machine for loading of the

Program Element: J 6.36.15.A
Title: Lethal Chemical Munitions Concepts
DOD Mission Area: #215 - Land Combat Support
Budget Activity: #4 - Tactical Programs

binary VX 8-inch projectile, and the Development Test II (DT II) hardware filling line was completed early in FY 1974. Basic design parameters based on DT II hardware were made available for subsequent production design. In FY 1975, the exploratory development efforts on a binary intermediate volatility agent projectile, air-to-ground munitions, and missile and rocket warheads were closely monitored to provide the design base for advanced development effort. Design criteria for a pilot filling line for the 8-inch binary VX projectile was completed. Process and pilot production evaluations continued. In FY 1976, effort was initiated to determine feasibility of a binary lethal chemical agent warhead for the Multiple Launch Rocket System (MLRS). Evaluation of the lethal agent warhead for the MLRS continued during FY 1977 with emphasis on dynamic flight testing of the proposed design. Also, during FY 1977, chemical process and pilot production efforts continued relative to the binary VX 8-inch projectile program. No advanced development of MLRS binary warheads or other chemical munitions was conducted in FY 1978 or FY 1979.

2. (U) FY 1980 Program: Research in binary agent manufacturing technology and pilot production plant studies will be accomplished under Project DE77. These efforts evaluate binary component reaction processes, yields, stability and safety requirements under large-scale production conditions.

3. (U) FY 1981 Planned Program: Resume Advanced Development of the binary warhead for the MLRS by conducting developmental test to identify and resolve any developmental problems; preparation of Developmental Test I/Operational Test I (DT I/OT I) plans and a cost/operational effectiveness analysis.

4. (U) FY 1982 Planned Program: Continue Advanced Development of the binary warhead for the MLRS to include initiation of DT I/OT I testing.

5. (U) Program to Completion: Completion of Advanced Development of the chemical warhead for the MLRS is scheduled for FY 1983. Advanced Development will be initiated on a family of new lethal binary chemical munitions weapon systems as requirements are defined and validated by the user community.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.19.A
Title: Landmine/Barrier Systems
DOD Mission Area: #214 - Mine Warfare
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	1005	4372	6692	8723	Continuing	Not Applicable
	QUANTITIES						Not Applicable
D005	Landmine Systems	0	2222	5772	4572	Continuing	Not Applicable
D606	Countermine and Barrier Systems	1005	2150	920	4151	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Soviet and Warsaw Pact doctrine advocates the large-scale use of land mines 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 countermine devices and techniques are required to meet the threat. The objective of this program is to improve the Army countermine capabilities by investigating countermine equipment prototypes which aid in the maintenance of battlefield mobility. Additionally, concepts on advanced barrier techniques to reduce the logistic burden normally associated with barrier systems are investigated. Improved field fortifications techniques are devised and evaluated to improve battlefield survivability of friendly forces by hardening tactical positions. Also, it provides for the advanced development of new mine systems. Mines provide a formidable obstacle to the massive tank threat posed by the Warsaw Pact and are required to fortify natural obstacles such as defiles, woods, rivers, and built-up areas in order to delay, canalize, and interdict attacking forces and enhance the performance of direct and indirect fire weapons. Mine components such as sensors, fuzes, logic networks, and power sources are assembled into prototype systems and tested under this program element.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Complete advanced development on a portable mine neutralization system (POMINS) to counter antipersonnel minefields and barbed wire, and a vehicle magnetic signature duplicator (VEMASID) to counter magnetic influence fuze. Continue advanced development on the horizontal action off-route antitank/antivehicular mine system. Initiate advanced development on the universal mine dispensing system, the improved conventional mine system, and a family of improved tactical shelters.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

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

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

RDTE					
Funds (current requirements)	812	4372	6692	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	812	2150	5000	Continuing	Not Applicable

In the FY 1980 submission, project D005, Landmine Systems, was shown in Program Element 6.36.23.A/D005. It was transferred to this program in FY 1981 to consolidate related technology development. In FY 1981, the landmine systems estimate was increased to reflect revised cost estimates on the off-route mine system and an acceleration of the effort on the Universal Mine Dispenser System. There was a decrease in the countermine and barrier system estimate because the Army will be able to modify an Israel Portable Mine Neutralization system (POMINS) to meet Army requirements.

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

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 if the momentum of the attack is to be maintained. 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 Tactical Shelters consisting of metal frames with canvas 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 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 aircraft and ground 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 Munitions Requirements and Development Committee monitors the scatterable mine program with a view towards avoiding service duplication.

H. (U) WORK PERFORMED BY: The US Army Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, VA, is assigned responsibility for countermine and barrier. 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.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

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

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

1. (U) FY 1979 and Prior Accomplishments: Advanced development (AD) was completed on the Surface-Launched Unit, Fuel-Air Explosive (SLUFAE) 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) and a vehicle magnetic signature duplicator (VEMASID) to counter magnetic influence fuzes.

2. (U) FY 1980 Program: Continue Advanced Development on POMINS and VEMASID. Initiate AD on a horizontal action off-route antitank/antivehicular mine.

3. (U) FY 1981 Planned Program: Complete AD on POMINS and VEMASID. Continue AD on a horizontal action off-route antitank/antivehicular mine and improved tactical shelters. Initiate AD on the improved conventional mine systems and the universal mine dispenser system.

4. (U) FY 1982 Planned Program: Continue AD on a horizontal action off-route antitank/antivehicular mine, improved tactical shelters, improved conventional mine system, and the universal mine dispenser system. Initiate AD on an improved fuel-air explosive system and a dedicated counterobstacle vehicle.

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

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D005 Title: Landmine Systems
Program Element: #6.36.19.A Title: Landmine Barrier Systems
DOD Mission Area: #214 - Mine Warfare Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: Provides for the advanced development of new mine systems. Mines provide a formidable obstacle to the massive tank threat posed by the Warsaw Pact. Mines are required to fortify natural obstacles such as defiles, woods, rivers, and built-up areas in order to delay, canalize, and interdict attacking forces and enhance the performance of direct and indirect fire weapons. This project will reduce the risks and costs involved in engineering development of antipersonnel and antitank/antivehicular mines, dispensers and related equipment. This is accomplished by designing, developing, and testing complete systems prototypes and demonstrating feasibility through Development Testing/Operational Testing DT I/OT I prior to initiation of Engineering Development programs. The present approach entails the conduct of three tasks: the off-route antitank mine system (ORATMS), the improved conventional mine system (ICOMS), and the universal mine dispensing system (UMIDS). ORATMS will attack enemy tanks on roads as the primary target. ORATMS warhead will use either an armor piercing shaped charge or a plate which forms into an armor piercing slug. Planned weight is less than 35 pounds with an effective range of 30-50 meters. ICOMS will supplement the family of scatterable mines (FASCAM) and use improved technology to reduce the size and thus the logistical burden of conventional mines. ICOMS will be capable of being buried by machine thereby reducing a one-hour emplacement time of antitank and antipersonnel mines to a 12- to 15-minute emplacement time. UMIDS will provide a second-generation, universal, modular type mine dispenser that can dispense scatterable antitank-antipersonnel mines from fixed positions, aircraft, and ground vehicles.

B. (U) RELATED ACTIVITIES: This program utilizes the components developed under PE 6.36.06.A, Landmine Warfare/Barrier Development and forms the basis for PE 6.46.19.A, Landmine Warfare, where engineering development will be accomplished. In the FY 1980 submission, project D005, Landmine Systems, was shown in Program Element 6.36.23.A/D005. It was transferred to this program in FY 1981 to consolidate related technology development to avoid duplication of effort.

C. (U) WORK PERFORMED BY: The major contractors performing on this project are Honeywell, Inc., Hopkins, MN; Hughes Aircraft Ground Systems Division, Fullerton, CA; and Motorola Government Electronics Group, Scottsdale, AZ. In-house management is provided by Development Project Office for Special Ammunition, US Army Armaments Research and Development Command (ARRADCOM), Dover, NJ.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Not Applicable.

Project: #D005 Title: Landmine Systems
Program Element: #6.36.19.A Title: Landmine Barrier Systems
DOD Mission Area: #214 - Mine Warfare Budget Activity: #4 - Tactical Programs

2. (U) FY 1980 Program: The advanced development of the Off-Route Antitank Mine System (ORATMS) will be initiated, designs will be initiated, and initial brassboard and prototype testing will be conducted.

3. (U) FY 1981 Planned Program: The advanced development effort on the Off-Route Antitank Mine System (ORATMS) will be completed, Development Test I/Operational Test I (DT I/OT I) will be conducted, and a validation In-Process Review (IPR) will be held. The advanced development of Improved Conventional Mines (ICOMS) and the Universal Mine Dispensing System (UMIDS) will be initiated. Handmade models with developed components (brassboards) will be made, and prototype tests will be conducted.

4. (U) FY 1982 Planned Program: The AD effort on Improved Conventional Mine System (ICOMS) and the Universal Mine Dispensing System (UMIDS) will continue, and a final prototype design will be established.

5. (U) Program to Completion: The AD program on the ICOMS and UMIDS will be completed during FY83. DT I/OT I test will be conducted, and a validation IPR held.

6. (U) Major Milestones:

	Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
ORATMS	Development Test I/ Operational Test I	3QFY81	None Shown
	Validation (Val) In-Process Review (IPR)	4QFY81	None Shown
ICOMS	DT I/OT I Completed	3QFY83	None Shown
	Val IPR	4QFY83	None Shown
UMIDS	DT I/OT I Completed	3QFY83	None Shown
	Val IPR	4QFY83	None Shown

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

Project: #D005
Program Element: #6.36.19.A
DOD Mission Area: #214 - Mine Warfare

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	0	2222	5772	4572	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	0	2240	4128	Not Shown	Continuing	Not Applicable
Quantities (current requirements)	Not Applicable					
Quantities (as shown in FY 1980 submission)	Not Applicable					

Other Appropriations: Ammunition Procurement, Army - funds and quantities to be determined.

The FY 1981 RDTE cost increase reflects an acceleration of the effort on the Universal Mine Dispenser System and revised cost estimates on the Off-Route Mine System to improve target identification. The FY80 funding level decrease is the result of a general Congressional reduction.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: 6.36.24.A
Title: Mobility
DOD Mission Area: #216 - Land Combat Service Support
Budget Activity: #4 - 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	Total Estimated Cost
	Total Program Element	98	300	0	0	0	398
	Quantities						0
DH64	High Mobility Tactical Vehicle	98	300	0	0	0	398

B. (U) BRIEF DESCRIPTION OF PROJECT: This program provides for the development of an 8- to 10-ton payload, expanded-mobility truck capable of resupplying Artillery and Armor units with ammunition, fuel and other vital supplies that must be moved forward to units in contact with opposing forces. These vehicles will provide the cargo-carrying capability needed by a modern Army to assure that the most forward positioned units receive supplies that are essential to continued combat operations. The off-road mobility of these vehicles must approach that of armored vehicles and self-propelled artillery. In addition to their off-road mobility, these vehicles must be able to match the on-road speeds associated with wheeled vehicle convoys. These Army requirements are stated in the Joint Service Operational Requirement (JSOR) for a Family of Heavy Expanded - Mobility Tactical Trucks (HEMTT). The program encompasses the testing and evaluation of conceptual and experimental prototype vehicles each of which includes the innovative integration of commercial and military off-the-shelf components.

C. (U) EXPLANATION OF CANCELLATION OR DEFERRAL: No FY 1981 or follow-on funds are being requested for this program in that all efforts relative to the definition of vehicle (HEMTT) technical characteristics, performance requirements, and other specifications requisite to the establishment of a procurement baseline will have been completed. The proposed date for award of the initial procurement contract (open competition) is December 1980.

FY 1981 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	2819	2615	2486	6956	Continuing	Not Applicable
	QUANTITIES						Not Applicable
DE82	Smoke Munitions and Material	2819	2615	2486	6956	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 1981 RDTE REQUEST: Funds are needed to continue 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) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

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

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

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	2819	2615	2486	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	2346	2620	5231	Continuing	Not Applicable

Project DE82, Smoke Munitions and Material, was increased by $473 thousand in FY 1979. This increase was used to initiate advanced development (AD) of a manportable large area screening smoke system (LASS). Department of the Army priorities for tactical and civil disturbance riot control agent (RCA) systems were not high enough to provide an allocation of limited RDTE funds in FY 1981. As a result, $200 thousand in Project DE78, Tactical Riot Control Agents and Munitions, and the $1140 thousand in Project DE79, Civil Disturbance/Internal Security Systems, were deleted from this program. In addition, due to higher priority projects the start of advanced development of a smoke screening round for the 4.2-inch mortar was delayed to FY 1982, thereby reducing the requirement in Project DE82 for FY 1981 by $1.405 million.

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

Program Element: #6.36.27.A
Title: Combat Support Munitions
DOD Mission Area: #215 - Land Combat Support
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 for all combat vehicles 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, Infantry Support Weapons; and 6.46.09, Combat Support Systems. In order to meet other Service needs and to insure that unnecessary duplication of effort does not occur, liaison personnel from each Service monitor the developing agency programs, and a joint smoke 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, Cockysville, MD; and others to be determined.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 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. Work was done at Chemical Systems Laboratory, Edgewood, MD, on the use of wicks embedded in white phosphorus (WP) to improve the burning characteristics and smoke generation capability of 155mm WP WICK projectiles. Because of in-flight instability problems, the program was reoriented to a competitive advanced development program between red phosphorus (RP) and white phosphorus (WP). In FY 197T, a contract was awarded to Buck, KG, Germany, to fill 81mm mortar shells with an RP mixture. In FY 1977, Advanced Development (AD) was initiated on an improved 81mm Mortar Smoke Round under this Program Element. Also, competitive AD commenced on the 155mm WP and RP Smoke Projectiles with the best design to be selected for competition during Development Test (DT) I/Operational Test (OT) I. AD of the 155mm WP wick concept was terminated in 4QFY 1977 when the WP WICK projectile demonstrated instability in flight. Another WP fill design (XM825) prototype was developed in FY 1978, and AD competition continued. AD on new WP and RP submunitions for the 155mm artillery projectiles was completed in FY 1978, and the XM825 prototype was chosen to go into engineering development (ED). This technology from the AD of an improved 155mm smoke projectile is now being utilized in the development of improved 81mm smoke cartridges. Two concepts for development of the improved 81mm smoke cartridge were investigated. The first concept utilized a cartridge with the same shape and ballistic match as the conventional high-explosive 81mm mortar round. The second concept utilized an elongated cartridge with greater WP fill for "maximum screening." This elongated cartridge is not ballistically compatible with the conventional high-explosive 81mm round and will require separate firing tables. Advanced Development (AD) was initiated on a manportable large area screening smoke system (LASS)

Program Element: #6.36.27.A Title: Combat Support Munitions
DOD Mission Area: #215 - Land Combat Support Budget Activity: #4 - Tactical Programs

2. (U) FY 1980 Program: Complete competitive testing of "Ballistic Match" versus "maximum screening" prototype 81mm mortar smoke cartridge. Initiate procurement of hardware for 81mm mortar smoke cartridge development test (DT) I/Operational test (OT) I. Select prototype design and initiate fabrication of DT I/OT I hardware for selected manportable smoke/obscurants generating system. Initiate AD for and infrared (IR) defeating grenade.

3. (U) FY 1981 Planned Program: Continue advanced development (AD) of the manportable large area smoke/obscurants generating system (LASS) and the infrared (IR) defeating grenade system. Complete development test (DT) I/Operational Test (OT)I for both systems.

4. (U) FY 1982 Planned Program: Complete advanced development (AD) of the manportable large area smoke/obscurants generating systen (LASS) and conduct the validation in-process review (VAL IPR) for approval to progress into engineering development (ED). Initiate advanced development for the 4.2-inch mortar cartridge. Complete advanced development (AD) of the infrared (IR) defeating grenade. Initiate advanced development of an infrared defeating vehicle engine smoke generating system. Initiate advanced development of a smoke dissipation system to scatter clouds that adversely affect mission accomplishment. Initiate advanced development of safe training smokes.

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

FY 1981 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	6132	5131	8053	17246	Continuing	Not Applicable
D007	Field Artillery Ammunition	6010	3047	5138	7972	Continuing	Not Applicable
D276	Improved Conventional Ammunition	122	2084	2915	9274	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports the design and development of cost saving training ammunition and more effective 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 anti-armor capability in the indirect fire role which significantly enhances the Army's effectiveness in meeting the armor 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 (to a given range or function mode) thereby improving response and reducing human error. A major objective is the development of new fuzes to meet the requirements of advanced weapons such as the artillery 200 second, batteryless electronic time fuze which does not require a setter. 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 1981 RDTE REQUEST: To provide for: continued development of inexpensive indirect fire mortar and artillery 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).

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

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

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	6132	5131	8053	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	9173	5200	14311	Continuing	Not Applicable

Reduced FY79 funding in both project D007 and D276 reflects reprogramming actions to support higher priority efforts. Reduction in project D007 in FY81 reflects program restructuring. Reduction in project D276 in FY81 is consistent with the decision to terminate the Randon Time Delay Submunition. The decrease in FY80 funding levels is the result of a general Congressional reduction.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable

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 development provides for: Development of thick walled inert artillery training projectiles and 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 non-metallic 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. This program is exploiting the technology for the next generation 200-second, hand-set, electronic time, artillery fuze. Project D276, Improved Conventional Ammunition will continue to support advanced development of the Sense and Destroy Armor (SADARM) to provide a fire and forget anti-tank capability to the Field Artillery. The SADARM is a carrier projectile containing three sub-munitions 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 sub-munition 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 Elements: 6.46.31, Field Artillery Ammunition, and 6.46.28.A, Indirect Fire Training Munitions. 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 development 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 Grounds, MD. Contractors include General Electric Company, Burlington, VT, and Syracuse, NY; Chamberlain Corporation, Waterloo IA; and Aerojet Electro Systems, Azusa, CA.

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 1979 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 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.

2. (U) FY 1980 Program: Continue the gun propulsion program 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. Initiate testing of plastic rotating bands and thin walled projectiles. Initiate advanced development of the Sense and Destroy Armor Munition (SADARM).

3. (U) FY 1981 Planned 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 hi-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).

4. (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. Continue advanced development of the Sense and Destroy Armor Munition.

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

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project #D007 Title: Field Artillery Ammunition and Fuzes
Program Element: #6.36.28.A Title: Field Artillery Ammunition Development
DOD Mission Area: #212 - Fire Support Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: This project provides for: Development of thick walled inert artillery training projectiles and 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 non-metallic 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. Developments 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 1979 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

Project #D007 Title: Field Artillery Ammunition and Fuzes
Program Element: #6.36.28.A Title: Field Artillery Ammunition Development
DOD Mission Area: #212 - Fire Support Budget Activity: #4 - Tactical Programs

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 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.

2. (U) FY 1980 Program: Continue the gun propulsion program 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. Initiate testing of plastic rotating bands and thin walled projectiles.

3. (U) FY 1981 Planned 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 hi-burst artillery proximity fuzes initiated in PE 6.36.13.A, Advanced Fuze Design.

4. (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.

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

6. (U) Major Milestones: Not Applicable.

Project #D007 — Title: Field Artillery Ammunition and Fuzes
Program Element: #6.36.28.A — Title: Field Artillery Ammunition Development
DOD Mission Area: #212 - Fire Support — Budget Activity: #4 - Tactical Programs

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	6010	3047	5138	7972	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	6842	3100	6376	Not Shown	Continuing	Not Applicable

Reduced FY 1979 funding reflects reprogramming actions to support higher priority efforts. Reduction in FY 1981 reflects program restructuring; i.e., the deletion of a portion of the previously anticipated fuze effort. FY80 figure reflects a general congressional reduction.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.29.A
DOD 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	2835	2269	6775	19117	Continuing	Not Applicable
D008	Medium and Heavy Artillery Weapons	2835	2269	6775	19117	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The field artillery provides the maneuver force commander with the capability to rapidly mass firepower, conventional and nuclear, throughout the width and depth of the battlefield. The purpose of this program is to improve the capabilities of the field artillery weapon systems to enable the field artillery to accomplish its mission in the projected threat environment. The Army relies upon the quality of its combat forces to offset the quantitative advantage of the Warsaw Pact combat forces. In the 1990's, the Warsaw Pact is expected to have narrowed the qualitative gap. This seriously jeopardizes the survivability and effectiveness of our field artillery cannon systems. This program provides funds to develop an improved field artillery heavy brigade/division fire support weapon system.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Funds are required to support the Concept Formulation phase of the field artillery brigade/division fire support weapon system program. A Special Task Force/Special Study Group (STF/SSG) will manage the program during this phase and will be responsible for soliciting and evaluating all available alternative system approaches to satisfy the need for an improved brigade/division fire support weapon system defined in the Mission Element Need Statement (MENS). Hardware will be fabricated to demonstrate that high risk, critical technologies which can significantly improve the capabilities of the field artillery fire support system, are available and achievable. These efforts will be used to establish the technology base to support identification and evaluation of potential alternative approaches.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

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

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

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	2835	2269	6775	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	2835	3306	8800	Continuing	Not Applicable

The decrease in FY 1980 funding request is due to Congressional elimination of funds for Project D285, Field Artillery Cannon (NATO). The reduction in the FY 1981 funding request reflects a revision to the development plans for Project D008 and cancellation of Project D285. In an effort to reduce risks and costs in the program outyears, Project D008 was restructured to conduct a comprehensive assessment of technologies available and required, and a demonstration of critical, high risk technologies to show prior to initiation of the advanced development phase that a significant increase in artillery operational capabilities is available, achievable, and affordable. Project D285, which was to be used for evaluation of foreign artillery systems and technology, was cancelled to preclude duplication of efforts with Program Element 6.51.11.D, where funds are provided to conduct evaluation of foreign materiel.

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

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: Field artillery system development focuses on the development of technology to provide revolutionary, improved capabilities for the current or future field artillery weapon systems. The objective of this program is to develop a field artillery heavy brigade/division fire support weapon system for the 1990's. The current heavy brigade/division field artillery fire support weapon system is the M109A2/A3 155mm SP (self-propelled) howitzer which was first fielded in 1962. The trend of threat combat forces has been to increase the ratio of protected to unprotected personnel by proliferating the number of lightly armored and armored vehicles. As the size, survivability and sophistication of the threat forces continue to increase, the effectiveness of existing field artillery weapon systems decreases. A Mission Element Need Statement (MENS) for a field artillery heavy brigade/division support weapon system will be forwarded to the Office of the Secretary of Defense in FY 1980. To prepare for initiation of this program and to support a comprehensive analysis of alternative system approaches, the Army is conducting a detailed assessment of the technology available to improve field artillery cannon systems. Data exchange with allied countries, to include NATO (North Atlantic Treaty Organization) countries will continue in order to identify and monitor their technology and system developments. Critical, high risk technologies will be identified and hardware fabricated to demonstrate that significant increases in operational capabilities are available, achievable, and affordable. The results of these technology efforts will be provided to a Special Task Force/Special Study Group (STF/SSG) to be used in conjunction with an evaluation of alternative approaches to satisfy the need identified in the MENS. These technology efforts are intended to reduce the risks and costs associated with the advanced development and engineering development phases of the program.

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, 6.46.21.A, COPPERHEAD, where engineering development of the COPPERHEAD projectile is being finalized, 6.46.03.A, Improved 155mm Nuclear Projectile, where engineering development of an Improved 155mm Nuclear Projectile is underway, 6.51.11, Foreign Weapons Evaluation, where evaluation of foreign weapon systems is conducted, 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.

H. (U) WORK PERFORMED BY: Contracts for system concept studies have been awarded to Food, Machinery and Chemical Corp (FMC), San Jose, CA and Pacific Car and Foundry Corporation, Renton, WA 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 Activity (AMSAA), Aberdeen, MD; Defense Advanced Research

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

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

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), Fort Sill, OK; US Army Field Artillery School (USAFAS), Fort Sill, OK; US Army Training and Doctrine Command (TRADOC), Fort Monroe, VA; US Army Tank Automotive Research and Development Command (TARADCOM), Warren, MI; and US Army Armament Materiel Readiness Command (ARRCOM), Rock Island, IL.

1. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: From FY 1976 to FY 1979, the bulk of this program funding was used to provide an extended range capability for the M109 series, 155mm self-propelled howitzers using the M203 propelling charge with the M549 rocket assisted projectile. Analysis and testing have shown that range can be increased. The impact of higher overpressure on operator personnel and degraded component reliability was evaluated. Product improvements were developed to improve component reliability. Funding was also provided through FY79 to support the update of the FADAC (Field Artillery Digital Automatic Computer) fire control computer to support the fielding of new weapons and muntions. In FY79, an RFP (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. An engineering study was conducted by an in-house Army team to assess the basic feasibility of significantly improving artillery systems. Conceptual and analytic results indicate significant potential improvements in effectiveness and system survivability are available from emerging technologies.

2. (U) FY 1980 Program: Remaining tasks to improve component reliability which will provide an extended range capability for the M109 will be completed. A decision review will be made to type classify the M203 propelling charge for use in the M109 howitzer. A Mission Element Need Statement (MENS) will be submitted by the Army to the Secretary of Defense requesting authority to initiate a program to develop a field artillery heavy brigade/division support weapon system. To prepare for initiation of this program, a detailed assessment and evaluation of the technology base and technical approaches available to improve the performance of the current heavy brigade/division support weapon system, the 155mm self-propelled (SP) howitzer will be done. Data sources for this assessment will include civilian industry, a detailed examination of foreign systems and technology and the US military technology base. In addition, contracts were awarded in 1st quarter, FY80 to two civilian industry teams, Food, Machinery and Chemical Corp (FMC) and Pacific Car and Foundry (PACCAR) for a 12 month effort to formulate concepts for an enhanced SP artillery weapon system which are intended to provide the basis for identifying civilian technologies and approaches.

3. (U) FY 1981 Planned Program: The Special Task Force/Special Study Group (STF/SSG) will solicit the broadest possible range of qualified sources for candidate system concepts as potential solutions to the MENS. Competition will be exploited to

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

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

the maximum degree necessary to insure identification of all possible system approaches. Three broad categories of alternatives are planned to be considered: modification of existing systems, procurement of foreign systems and development of a new system. The technology base to support the analysis of alternative approaches will focus on initiation of a program to demonstrate high risk, critical technologies. Breadboard and experimental prototype hardware will be fabricated to establish the availability, risk, potential costs and operational payoffs to be derived from the potential application of advanced technologies to current or future artillery systems. Examples of technologies which may be demonstrated are automated loading systems to provide increased rate of fire and improved responsiveness, increased range to improve effectiveness, collective NBC (Nuclear, Biological, and Chemical) protection system to enhance survivability, and automated fire control system to improve responsiveness. The alternative approaches developed by the STF/SSC and data generated by the technology demonstration program will serve as input to a Cost and Operational Effectiveness Analysis to be initiated in FY81.

4. (U) FY 1982 Planned Program: The STF will complete its evaluation of alternative system approaches and will select alternatives that warrant demonstration. These recommendations, a Letter of Agreement (LOA) and an outline acquisition plan will be presented to the Secretary of the Army at an Army System Acquisition Review Council (ASARC I), and to the Secretary of Defense at a Defense System Acquisition Review Council (DSARC I) to secure a decision to initiate the Demonstration and Validation phase. Contracts will be awarded to civilian industry to develop system prototypes.

5. (U) Program to Completion: Conduct competitive developmental and operational testing of advanced development prototypes. Determine the required operational capability, and acquisition plan, and award contract for an engineering development prototype. Conduct additional developmental and operational testing of prototypes to determine suitability for production.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

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

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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	300	4400	3516	1513	20000	29729
	QUANTITIES						Not Applicable
D154	Armored Combat Support Vehicle Family	300	4400	3516	1513	20000	29729

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: To support an Army need for armored combat support vehicles to meet four essential logistics roles and missions. The principal requirement of each role and mission is:

a. (U) Armored Forward Area Resupply Vehicles (AFARV). To resupply tank ammunition to forward deployed and engaged tank forces on position in an environment of suppressive artillery fires.

b. (U) Field Artillery Ammunition Support Vehicle (FAASV). To provide a continuous supply of artillery ammunition to self-propelled artillery weapons in the firing positions which are subject to counterbattery fires from enemy rocket and cannon fires.

c. (U) Maintenance Assist Vehicle (MAV). To provide maintenance, including large component repair and replacement, spare parts, welding, flame cutting, power tools, and lift capability. The MAV will execute these functions at the site of disabled tracked combat vehicles in the forward battle area.

d. (U) Medical Evacuation Vehicle (MEV). To provide protected, mobile facilities for patient treatment on the battlefield and continued care during transport to medical treatment units in the rear.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Using the General Support Rocket System (GSRS) chassis, unchanged, develop protected ammunition modules, including materiel handling equipment, for carrying tank ammunition. Procure one AFARV module and evaluate in an operational environment. The results of the evaluation will to be used to guide an FY81 decision to start a full-scale

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

engineering development program for AFARV. Using the M109 self-propelled howitzer chassis procure four FAASV's for an FY81 Operational Test/Development Test II evaluation, to determine their suitability for artillery ammunition support for armored and mechanized divisions.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Armored Forward Area Rearm Vehicle (AFARV) and Field Artillery Ammunition Support Vehicle (FAASV):		
Release Request for Proposal	2QFY1980	Not Shown
Award FAASV Contract	3QFY1980	Not Shown
Complete FAASV OT II	3QFY1981	Not Shown
Type Classify FAASV	4QFY1981	Not Shown
Award AFARV Test Bed Contract	2QFY1980	Not Shown
Conduct OT I	1QFY1981	Not Shown
Award AFARV Engineering Development Contract	2QFY1981	Not Shown
Complete AFARV OT II	4QFY1982	Not Shown
Type Classify AFARV	1QFY1983	Not Shown

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional to Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	300	4400	3516	21513	29729
Funds (as shown in FY 1980 submission)	302	4400	7300	17800	32100

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

The Armored Combat Support Vehicle Family project is an outgrowth of the Program Element 6.36.24.A/D154 Vehicle Rearm System Project. Differences reflect a restructuring of the project. The reduction in research and development funds is accomplished by using government-accepted chassis already in use and successfully tested by the Army; i.e., the M109 and GSRS chassis using developmental armored modules as logistics carriers.

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

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

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 and artillery ammunition to the combat site for on-position resupply, maintenance, and emergency combat repair, and battlefield evacuation of wounded are the essential elements of the increased logistical demand. There are four current logistical roles and missions which demand increased capabilities. The first priority development is an armored resupply vehicle designed specifically to resupply tanks which are engaged in combat in the forward battle area. The second 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 will initiate the development of the first two priorities in FY 1980. There is no intent in this program to develop a new tracked combat vehicle. Taking the General Support Rocket System (GSRS) chassis as the basic carrier for the AFARV, because it provides cross-country mobility and protection from small arms and splintering munitions, the AFARV program will develop armored modules in which to carry tank and infantry-type ammunition, and attendant on-board materiel handling equipment. The M109 chassis 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. By using this chassis, the FAASV will be as mobile as the system it supports, cause very little training impact on deployed units and uses the same type spare parts. The FAASV will be developed starting in FY80. In subsequent years, the Army will initiate the Maintenance Assist Vehicle (MAV) module which will also ride on the GSRS chassis and will provide power, repair parts, tools, and vehicle retrieval necessary for maintenance operations in the forward battle area. The fourth development is the Medical Evacuation Vehicle (MEV). Recovering wounded from damaged or destroyed combat vehicles, providing emergency medical care to stabilize patients, and evacuation of casualties under fire to a safe position in the rear, require a vehicle and module designed specifically for life-saving in the combat environment.

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, Materials; PE 6.36.21.A, Vehicle Engine Development; and PE 6.33.03, Project 216, GSRS. Duplication of effort is avoided by review and coordination of programs at all Army management levels.

H. (U) WORK PERFORMED BY: US Army Tank and Automotive Research and Development Command, Warren, MI, has the responsibility for implementation of this program. Contractors will be selected in FY 1980.

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

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Engineering evaluation of various configurations of modules and materiel handling equipment.

2. (U) FY 1980 Program: Initiates fabrication of one technology demonstrator Armored Forward Area Rearm Vehicle (AFARV) module and four prototype Field Artillery Ammunition Support Vehicles (FAASV).

3. (U) FY 1981 Planned Program: Conduct Operational Test I on the AFARV module. Conduct Operational Test II on the four FAASV vehicles and type classify.

4. (U) FY 1982 Planned Program: Complete evaluation of FAASV.

5. (U) Program to Completion: Complete Development Test II/Operational Test II on AFARV and type classify modules. Initiate and complete development of module for Maintenance Assist Vehicle. Initiate and complete development of module for Medical Evacuation Vehicle.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.36.33.A
DOD Mission Area: #211 - Close Combat

Title: Tank Ammunition Development
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	1800	3742	0	13063	0	3742
D161	Tank Ammunition and Fuzes	1800	3742	0	0	0	3742

B. (U) BRIEF DESCRIPTION OF PROJECT: The purpose of this project was to support Advanced Development of tank ammunition to counter future enemy threats by improving terminal effectiveness, accuracy, range, and reliability. Project D161 was initiated for Advanced Development of 105mm Armor-Piercing Fin-Stabilized Discarding Sabot-Tracer (APFSDS-T), 105mm High Explosive Antitank Multipurpose-Tracer (HEAT-MP-T) (XM815), and 120mm Multi-Dart APFSDS-T cartridge XM828.

C. (U) EXPLANATION OF CANCELLATION OR DEFERRAL: This project has been cancelled because the APFSDS-T cartridge XM833 will transition to Engineering Development in FY 1981 under Program Element 6.46.32.A/DG21; the HEAT-MP-T cartridge XM815 will remain in Exploratory Development to permit incorporation of new warhead and fuzing technology; and the Multi-Dart APFSDS-T cartridge XM828 development has been terminated because of its inability to defeat future threats. This project may be resumed in FY 1982 to support Advanced Development of the HEAT-MP-T cartridge XM815 if this projectile demonstrates appropriate increases in performance.

FY 1981 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	3500	3500	3281	5817	Continuing	Not Applicable
DK82	Physical Security	3500	3500	3281	5817	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Objective is to conduct advanced development of a tri-Service family of interior physical security sensors, exterior lighting, barriers, and ancillary equipment that will operate worldwide, enabling military commanders to tailor physical security systems to protect assets, installations, bases, facilities, personnel, and the rear area of deployed forces. Physical security equipment is required to better protect weapon systems and critical areas including arms rooms and storage facilities. Significant manpower savings are practical when adequate detection systems are installed. The Department of Defense uses more than 16,000 guard personnel daily. Development is directed toward satisfying requirements for a Facility Intrusion Detection System (FIDS) and for physical security lighting and barrier systems. All developments are aimed at satisfying tri-Service requirements.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: 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, and (2) exterior lighting and barrier systems. A covertly operated duress sensor, a contraband sensor, a radio frequency data link, a response/deterrent subsystem, and lighting and barrier components procured and developed in FY79 and FY80 will be evaluated in-house to demonstrate concept feasibility. Validation In-Process Reviews (VAL-IPR) will be conducted in FY81 for the preceding equipment. Advanced development of improved signal processing techniques and the fiber optic data link initiated in FY80 will continue.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
VAL-IPR - Advanced FIDS Group I	4Q79	Not Shown
VAL-IPR - Electronic	4Q80	Not Shown

Program Element: #6.37.05.A Title: Physical Security
DOD Mission Area: #216 - Land Combat Service Support Budget Activity: #4 - Tactical Programs

Alerting System

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
VAL-IPR - Group I and Lighting Barrier Components	1Q81	Not Shown
VAL-IPR - Advanced FIDS Group II	4Q81	Not Shown
VAL-IPR - Security Locks	FY82	Not Shown
VAL-IPR - Group II Lighting and Barrier Components	FY82	Not Shown
VAL-IPR - Advanced FIDS Group III	FY83	Not Shown

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	3500	3500	3281	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	3500	3500	3541	Continuing	Not Applicable

FY81 funds have been transferred from this Program Element into Program Element #6.47.18.A to continue this effort in the full-scale development phase.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable

Program Element: #6.37.05.A Title: Physical Security
DOD Mission Area: #216 - Land Combat Service Support Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: Objective is to conduct all design, development, test, and evaluation required to provide the technological base and establish the concept feasibility necessary to proceed into engineering development of complete, integrated physical security systems to protect material, bases, facilities, installations, and personnel against theft, sabotage, or espionage. Developments will be directed towards satisfying the Navy, Air Force, and Army's materiel need for an interior security system (Facility Intrusion Detection System (FIDS)), and their requirement for a Physical Security Lighting and Barrier System. The approach to advanced development is to provide a DOD system overview via systems analysis. 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) standardized security equipment and locking hardware; and (7) 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 6.27.33.A, project AH20, 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 leads into engineering development Program Element 6.47.18.A, Physical Security. The Interim Facility Intrusion Detection System is being developed under that Program Element, as directed by the Under Secretary of Defense on 26 July 1979, to provide interior intrusion detection systems to all Department of Defense (DOD) elements. 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 memberships of joint working groups and by 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

Program Element: #6.37.05.A Title: Physical Security
DOD Mission Area: #216 - Land Combat Service Support Budget Activity: #4 - Tactical Programs

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, and the Naval Weapons Support Center, Crane, IN, for development of the Facility Intrusion Detection System Smoke Deterrents. Major contractors are GTE Sylvania, Mountainview, CA; Southwest Research, San Antonio, TX; General Instruments Corporation, Hicksville, NY; Tetra Tech, Incorporated, Pasadena, CA.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: 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. A development plan was completed, concept formulation was demonstrated, and a Concept Feasibility In-Process Review was conducted in June 1974. The In-Process Review authorized full-scale development of a Basic FIDS and continuing advanced development of an Advanced FIDS. No funds were available to continue advanced development during the period FY75 through FY78. During FY79 an Acquisition Plan was prepared and a Validation In-Process Review approved entering into full-scale development of the following Advanced FIDS Group I components: Large Area Console, Satellite Control Processor, Small Area Console, Remote Displays, Interior and Exterior Interfaces between the Air Force's Coder Multiplexer, Sensor Data, and the FIDS' Multipoint Data Transmission System, Portable Duress Sensor, Radio Frequency Motion Sensor, TV Camera, and TV Monitor. Advanced Development was initiated, and contracts were awarded for the following Advanced FIDS Group II components: Covertly Operated Duress Sensor and Contraband Sensor Funds were transferred to the Naval Weapons Support Center to develop FIDS Smoke Deterrents and to the Electronics Research and Development Command to develop the FIDS RF Data Link. The Lighting and Barriers task was not funded until FY78; however, during FY77 the following was accomplished: (a) At the request of the Office of the Deputy Assistant Secretary of Defense (ODASD) (Security Policy), the Office of the Under Secretary of Defense for Research and engineering (OUSDRE), and Deputy Chief of Staff for Research, Development, and Acquisition (ODCSRDA), 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. CINCEUR was also concerned about quick (5-second) start-up lights and noninterruptible power sources. None are currently available. Final report submitted to the DCSRDA contained a proposal for a "Perimeter Lighting Evaluation Program" which is relevant to the effort projected for this task. (b) Points of contact for lighting were established at 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. Coordination was effected with these agencies. In FY78 the Lighting and Barrier requirements were coordinated in particular with BISSPO to insure system compatibility with the BISS exterior sensors and imaging systems. A contract was awarded to review and consolidate available government and nongovernment data to assess the adequacy of the requirements and to identify technological voids. In FY79 contracts were awarded for fence components, luminaires, trailer-mounted light towers, lighting control system, a lighting and barrier

Program Element: #6.37.05.A Title: Physical Security
DOD Mission Area: #216 - Land Combat Service Support Budget Activity: #4 - Tactical Programs

composite system analysis program, models of new high-pressure sodium luminaires, personnel barriers, vehicle barriers, contrasting ground covers, and construction of a test site. 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. Contractor efforts in FY79 consisted of reviewing applicability of the approach selected in the 1973 timeframe, to determine if the recommended approach is still acceptable and to evaluate integration of the EAS with commercial, FIDS, and BISS physical security systems being planned for the installations.

2. (U) FY 1980 Program: Security Lighting and Barriers Systems: Contractual efforts will continue on the construction of a test site. Newly developed luminaires, commercially available luminaries, personnel and vehicular barriers, contrasting ground covers, and noninterruptible power supplies will be evaluated for minimum illumination levels, detection enhancement, lighting efficiency, increase of penetration times, and resistance to severe environment conditions. A Validation IPR will be held for those items showing minimal development risk. Advanced development will continue for those items showing a higher development risk but deemed worthy of further work. Facility Intrusion Detection System (FIDS): Contracts will be awarded to a response device, strain sensor, Radio Frequency Motion Sensor, fiber optic data link, improved signal processing techniques, system analysis, and an investigation to determine the modifications required to make the FIDS monitoring console suitable to serve as a DOD central master control for use with all standardized intrusion detection systems of the various services. Additional in-house efforts will be expended to prepare for an FY81 VAL IPR for these items. Funds will be transferred to the Naval Weapons Center to continue development of the FIDS Fog Deterrent Subsystem, and to ERADCOM to continue development of the RF Data Link. Electronic Alerting System (EAS): Documentation of current and the original EAS operational characteristics will be acquired. A VAL IPR will be conducted.

3. (U) FY 1981 Planned Program: Security Lighting and Barrier Systems: The contractual effort begun the prior fiscal year for development and testing of Group 2 lighting and barrier components will continue. Deficiencies identified during testing will be corrected and the components will be retested to verify that the proper corrective actions have been taken. The most promising components will be subjected to environmental testing. A major portion of the evaluations will involve optical coatings of the luminaires and the physiological and psychological effects of the lighting and barrier components on both the observer and intruder. The assessment of nonvisible light sources on surveillance devices and the effects of contrasting ground covers will continue. Additional supplies and materials to augment the test site will also be procured. 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 to evaluate the improved processing techniques. Advanced Development of a Secure Fiber Optics Data Transmission Link will continue. In-house effort will be required to prepare, award, monitor, and provide support for a contract for this development. The strain sensor

Program Element: #6.37.05.A
Title: Physical Security
DOD Mission Area: #216 - Land Combat Service Support
Budget Activity: #4 - Tactical Programs

procured in FY80 will be tested and evaluated in-house during FY81. Funds will be transferred to Night Vision and Electro-Optics Laboratory (NV&EOL) to initiate advanced development of a Low Light Level TV suitable for the Facility Intrusion Detective System (FIDS). Mobility Equipment Research and Development Command (MERADCOM) will maintain coordination with NV&EOL to insure FIDS requirements are met. The remainder of the in-house effort will consist of preparation and convening of a VAL IPR for Advanced FIDS Group 2 Components. Security Equipment and Locking (SEAL) Hardware: Development of High Security Locking Systems for Nuclear and Chemical Storage Magazines will be initiated including the development of recessed lock systems from two sources.

4. (U) FY 1982 Planned Program: Security Lighting and Barriers Systems: Advanced development validation tests will be completed and a Validation IPR will be conducted for Group 2 components. Group 2 Components are anticipated to be: A. Lights/fixtures to augment existing lighting systems illumination; B. Personnel barriers to enhance intruder delay at existing fences and interface with Air Force Base Installation Security System sensors; C. Vehicle barrier to delay vehicular penetration at existing fences; D. Uninterruptible power supply for perimeter lighting. Facility Intrusion Detection System (FIDS): The Advanced Development contract awarded in FY81 for the adaptive and discriminative sensors and to the intrinsically secure data link will be incrementally funded and development continued in FY82. Development will be initiated on application of physical security equipment for protection of items in transit. This equipment will include detection of entry into vehicles and tracking of vehicles and/or their contents. Advanced development will also begin for rear area physical security devices. These items will provide protection for the Army in the field. These items will be required to function with tactical sensors which may be operating in the vicinity. Funds will be transferred to Night Vision and Electro Optic Laboratory to continue development of a Low Light Level Television suitable for use with FIDS. Mobility Equipment Research and Development Command will maintain coordination. Security Locks and Containers: The Security Equipment and Locking Hardware is a continuing effort. Potential programs are the development of a lock that is an integrated part of an intrusion detection system and the development of a one time key that may be a combination of an identification badge and key using electrically programed solid state read-only memory. Several levels of security would be provided.

5. (U) Program to Completion: This is a continuing program. In FY83 and the outyears, there will be a continuing effort to develop physical security hardware which is capable of counteracting 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.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

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

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	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	3463	4045	5017	13140	Continuing	Not Applicable
D243	IFF Developments	1463	345	406	4703	Continuing	Not Applicable
D288	Combat Reconnaissance Surveillance Target Acquisition Data Link (CRSTADL)	0	0	0	4703	Continuing	Not Applicable
D297	IFF NATO	2000	3700	4611	3734	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 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. Efforts under Project D243, IFF Developments, include development of noncooperative identification signal processors for major Army air defense systems (HAWK, PATRIOT Missiles) and improvement of the current Mark XII air defense IFF interrogators and transponders. Objective of Project D297, IFF NATO, is development of a new IFF system in coordination with NATO, for both air defense and battlefield applications.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Under NATO IFF program (Project D297), obtain NATO agreement on detailed IFF signal architecture, and award the contract for advanced development models of the Battlefield IFF (BIFF) portion of the system. Under Project D243 IFF Developments, install and test a noncooperative IFF (NCIFF) signal processor for the Improved HAWK, and complete tests of circuit improvements for Army Mark XII interrogators to extend the life of existing systems.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Refine NATO Identification System (NIS) Draft Requirement Document	FY80	Not Shown

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
Complete Training and Doctrine Command BIFF Study	FY80	Not Shown
Complete NIS System Definition	FY81	Not Shown
Award Contract, BIFF Advanced Development (AD)	FY81	Not Shown
Test NCIFF for Homing All Way Killer	FY81	Not Shown

Contract for construction of advanced development models of a BIFF system, previously scheduled for FY79 award, has been deferred to FY81 to allow for completion of system definition by Lincoln Laboratory and NATO, and completion of TRADOC effectiveness study.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	3463	4045	5017	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	3463	4050	5700	Continuing	Not Applicable

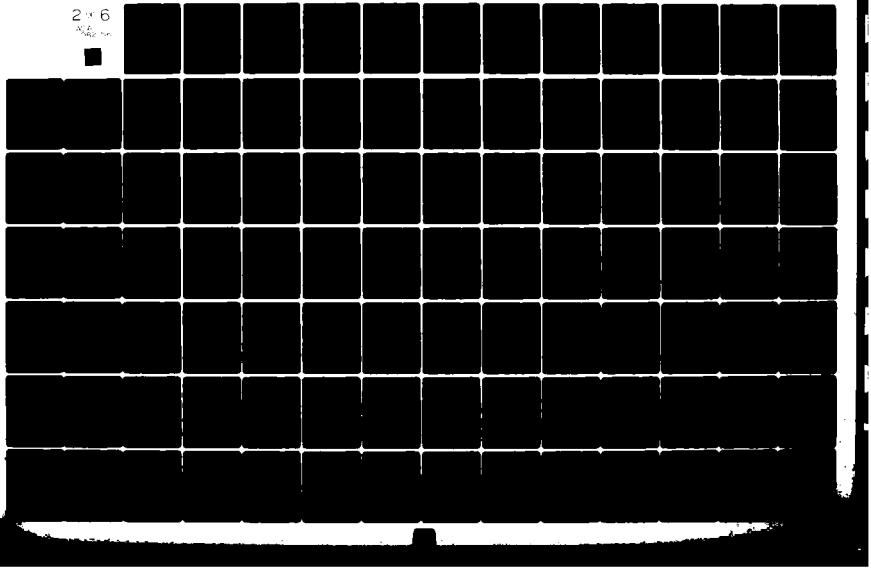
Project D243, IFF Developments, has increased from $350 to $406 in FY81 to cover installation and test of the non-cooperative IFF signal processor for the HAWK missile. Project D297, IFF NATO, has changed in FY81 because advanced development models of Battlefield Identification Friend or Foe (BIFF) will be built for fewer applications.

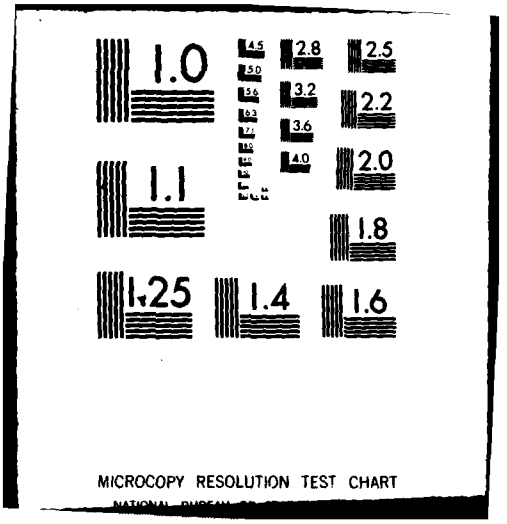
E. (U) OTHER APPROPRIATION FUNDS: Not Applicable

AD-A082 156 DEPUTY CHIEF OF STAFF FOR RESEARCH DEVELOPMENT AND AC--ETC F/G 15/5
DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF THE RESEARCH, DEV--ETC(U)
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MICROCOPY RESOLUTION TEST CHART

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 devasting firepower delivered at extended ranges. In this scenario, existing methods of identification will be inadequate. The effectiveness 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 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. A tri-Service Technical Improvement Program has been initiated to improve Mark XII performance, 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. 6.47.25.F, Tactical Identification Systems. PE 6.35.15.N, Advanced Identification Techniques; PE 6.32.67.N, NATO Identification System, and PE 6.47.25.F, Aircraft Identification Systems. In general, PE 6.47.25.F, will provide the engineering development of techniques that are successfully demonstrated in this Program. all work is coordinated through the US Identification Friend or Foe (IFF) Development Program to preclude duplication of effort.

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 noncooperative 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. Contractors that are expected to bid for development of the NIS hardware include Hughes Aircraft Corporation of Fullerton, CA; ITT, Nutley, NJ; RCA, Camden, NJ; Hazeltine Corporation, Greenlawn, NY; and Texas Instruments, Dallas, TX.

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) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Completed in-house fabrication and testing of two Battlefield Identification Friend or Foe (BIFF) systems employing laser and microwave interrogation. Acted as lead service for preliminary definition of NATO Identification System (NIS) signal architecture. Awarded and monitored tri-Service funded NIS study contract resulting in US input to NATO working group. Participated in the preparation of a NATO draft STANAG for NIS, completed September 1978. Completed Mark XII Electronic Countermeasure (ECM) vulnerability measurements on interrogators for HAWK, PATRIOT, FAAR, STINGER, and US ROLAND Missiles. Contributed to tri-Service funded NIS system definition effort by MIT Lincoln Laboratory. Completed contract for successful design and computer simulation of a noncooperative IFF system for Improved HAWK Missile, establishing basis for advanced development model.

2. (U) FY 1980 Program:

a. (U) IFF NATO (D297): Continue to fund system definition of NIS by MIT Lincoln Laboratory. Participate in Training and Doctrine Command (TRADOC) study to determine potential effectiveness of BIFF. Attend NATO Working Group and tri-lateral meetings to obtain agreement on major frequency and weapon parameters.

b. (U) IFF Developments D243: Award contract for feasibility model of a noncooperative IFF signal processor for Improved HAWK. Award contracts to design, fabricate, and test circuit improvements for Mark XII interrogators for STINGER and ROLAND missiles.

3. (U) FY 1981 Planned Program:

a. (U) IFF NATO community D297: Obtain agreement in NATO on detailed signal architecture for NATO Identification System (NIS). Award contract for advanced development models of Battlefield IFF portion of NIS, for identification of tanks by other tanks and attack helicopters.

b. (U) IFF Developments D243: Complete construction on noncooperative IFF processor for HAWK Missile, and interface with radar. Begin feasibility tests. Complete fabrication and test of improvements to Mark XII interrogators for STINGER and ROLAND missiles.

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

4. (U) FY 1982 Planned Program:

a. (U) IFF NATO D297: Complete fabrication of advanced development models of BIFF systems for tanks and attack helicopters. Prepare for development and operational testing in FY83. Monitor Air Force efforts on air defense portion of NATO Identification System, as it affects application to Army Systems. Attend NATO and trilateral meetings.

b. (U) IFF Developments D243: Award contract for noncooperative IFF signal processor for PATRIOT Missile. Complete tests of processor for HAWK Missile. Award contract for advanced air defense IFF system for Army weapons and aircraft, based on results of NATO work, Mark XII improvements, and JTIDS investigations. Initiate development of airborne interrogator for Army aircraft.

c. (U) ERSTADL D288: Initiate Advanced Development of improved modules for the Modular Integrated Communications Navigation System (MICNS). Program will provide evolutionary growth for MICNS to meet expanding Army requirements by providing technology insertion, increased antijam protection, multiple control usage, and transmission beyond line-of-sight. Initiate Advanced Development of air-ground Intelligence, Surveillance and Target Acquisition (ISTA) system capable of performing electronic intelligence, electronic warfare, and radar functions. The system will use common hardware to perform multiple functions.

5. (U) Program to Completion: This is a continuing program. Future efforts will include development of an advanced air defense IFF system and extension of noncooperative techniques for both air defense and ground targets.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.07.A Title: Communications Development
DOD Mission Area: #256 - Tactical Communications Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	3360	6680	26340	24755	Continuing	Not Applicable
	QUANTITIES						*
D137	Joint Tactical Information Distribution System (JTIDS) Development	2126	3690	3136	0	0	10954
D246	Tactical Communications Development	542	1495	2309	5225	Continuing	Not Applicable
D370	Army Data Distribution System (ADDS)	0	0	18855	15682	17089	51626
D437	Tactical Radio Communications Systems (TRCS)	692	1495	2040	3848	Continuing	Not Applicable

* *Quantity of diversified items.*

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the Advanced Development of tactical communications equipment and systems that are not included in the Joint Tactical Communications (TRI-TAC), the Tactical Satellite Communications Ground Environment (TACSATCOM) and the Single Channel Ground and Airborne Radio System (SINCGARS-V) programs. This program is needed to provide tactical commanders with communications equipment and systems to ensure effective command and control of tactical forces on the modern, highly mobile battlefield. The emergence of highly automated weapons, fire control, intelligence and target acquisition systems requires a realtime data distribution system to provide tactical commanders with the highly perishable information necessary to effectively employ these "force multiplier" systems. Emphasis in this program

Program Element: #6.37.07.A Title: Communications Development
DOD Mission Area: #256 - Tactical Communications Budget Activity: #4 - Tactical Programs

is on applying technological advances that offer significant improvements in the areas of reliability, reduction of power consumption and weight, reduction in vulnerability to electronic countermeasures and nuclear effects, system response, mobility, setup/displacement times, spectrum utilization, message/data handling times and reduced life cycle/manpower costs.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Continue Army participation in the Joint Tactical Information Distribution Systems (JTIDS) Development through the incorporation of Army technical requirements into the development of the Class 2 terminal. Technology advances and a lower power requirement will permit a smaller terminal package more suitable to Army needs. It is expected that the Class 2 terminal will be the JTIDS terminal employed in the Army Data Distribution System (ADDS). Project D370 ADDS will be initiated in FY 1981 to establish a Position Location Reporting System (PLRS)/Joint Tactical Information Distribution System (JTIDS) Hybrid testbed. It will include the procurement of PLRS and JTIDS Engineering Development models, computers and display equipment for integration into a testbed configuration. Continue the missile payout fiber optic system and the fiber optic local area distribution cable systems developments and coordinate test plans. Continue technical efforts on fiber optic cable and millimeter wave radio interoperability. Complete tests of commercial models of millimeter wave radios. Conduct Development/Operational Test (DT/OT-I) on the Survivable Low-Profile Antenna for armored vehicles and prepare for start of Engineering Development. Continue technical support and contract monitoring on the Broadband Vehicular Antenna.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	3360	6680	26340	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	6381	6700	6500	Continuing	Not Applicable

The decrease in actual FY 1979 funding is due primarily to reprogramming actions. Approximately $1495 thousand was reprogrammed from project D437 (Tactical Radio Communications Systems) to Program Element 6.37.46.A (Single Channel Ground and Airborne Radio Subsystems - SINCGARS) for Vehicular Intercom System and Audio Transducers. This action was necessary to insure all SINCGARS developments were funded in the proper Program Element and, additionally, to eliminate the potential for duplicative developments. Project D137 (Joint Tactical Information Distribution Systems (JTIDS) Development) was decreased by approximately $1574 thousand to reflect reduced funding level during the period required to develop, staff, and gain OSD approval for

Program Element: #6.37.07.A Title: Communications Development
DOD Mission Area: #256 - Tactical Communications Budget Activity: #4 - Tactical Programs

the JTIDS/PLRS (Position Location Reporting Systems) Hybrid development as the near-term Army Data Distribution System (ADDS). Increased funding in FY 1981 is predominately due to start of Project D370 (Army Data Distribution System) and associated increase in Army involvement in JTIDS Class 2 development. Project D245 (Strategic Communications Development) was restructured for the FY 1980 submission and was incorporated in Program Element 3.31.26.A/Project D149, Long Haul Commications (DCS). FY 1979 funds for Project D245 are reflected in the Descriptive Summary for PE 3.31.26.A. Decrease in FY80 is the result of a general Congressional reduction.

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

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: This program provides the Advanced Development for tactical communications equipment and systems other than those developed under the Joint Tactical Communications (TRI-TAC), the Tactical Satellite Communications Ground Environment (TACSATCOM) and the Single Channel Ground and Airborne Radio Subsystems (SINCGARS-V) programs. Efforts are accomplished in four projects as shown in paragraph A above. The Joint Tactical Information Distribution System (JTIDS) is a joint service program to develop and acquire an integrated tactical data communications, navigation, and identification system which is secure and jam resistant. The Army's program is structured to capitalize on previous Air Force/Navy JTIDS development to reduce development time. It provides for improving the Army's information distribution and position location capability required by realtime command and control and weapons systems. Project D246 is concerned with advanced developments employing new technology to provide significant improvements in the areas of Terminal Equipment (Information Entry/Exit Devices) such as a Tactical Document Copier to reduce manpower and lost time in the reproduction of record traffic (messages) in the tactical environment; Trunk and Loop Transmission (multichannel) Devices such as fiber optic cables and intercept resistant millimeter wave radios to improve mobility, reduce size/weight/power consumption, increase reliability, improve system vulnerability to electronic countermeasures and electromagnetic pulse, and provide a signal-hiding capability; and Tactical Antenna Systems to overcome the existing limitations such as low physical survivability, high visibility, excessive installation/displacement time, vulnerability to countermeasures and direction finding, and poor efficiency due to mechanical or electromechanical tuning mechanisms. Project D370 (Army Data Distribution System) is an integration of two systems, Position Location and Reporting Systems (PLRS) and the Joint Tactical Information Distribution System (JTIDS) Class 1 terminal. This hybrid program was initiated by the Army in recognition of the potential of such a merger to meet an early fielding of a critical need to improve data distribution and position location/reporting to support automated battlefield systems that provide a significant force multiplier in the conduct of tactical operations. Project D437 is concerned primarily with the advanced development of tactical net radio (single channel radio) equipment and ancillary devices such as a Survivable Low-Profile Antenna for armored vehicles, a Log Periodic Antenna to provide range extension and improved electronic countermeasures resistance for netted radios, a Broadband Antenna to improve coupling efficiency with minimum tuning for manpack and vehicular radios used in a frequency hopping mode, and a family of Quick Erection Antenna Masts to improve installation/displacement of command posts. Portions of Project D437 efforts are in support of and are complementary to the Single Channel Ground and Airborne Radio Subsystem (SINCGARS-V) program.

G. (U) RELATED ACTIVITIES: Exploratory developments for this program are conducted in Program Element 6.27.01.A, Communications-Electronics. Projects proceeding into Engineering Development are funded in Program Element 6.47.01.A, Communications Engineering Development. These efforts are closely coordinated by the Army with developments in Program Elements 2.80.10.A (Joint Tactical Communications Program) and 6.37.46.A (SINCGARS-V) to insure all programs are complementary and to avoid any duplication of efforts.

Program Element: #6.37.07.A Title: Communications Development
DOD Mission Area: #256 - Tactical Communications Budget Activity: #4 - Tactical Programs

H. (U) WORK PERFORMED BY: In-house developing agencies are the US Army Communications Research and Development Command (CORADCOM), Project Manager, Army Tactical Communications Systems (ATACS), and Project Manager, Single Channel Ground and Airborne Subsystem (SINCGARS-V), located at Fort Monmouth, NJ; and the US Army Electronics Research and Development Command (ERADCOM) located at Adelphi, MD. Contractual efforts include MITRE Corporation, Bedford, MA; Hughes Aircraft Company, Fullerton, CA; Network Analysis Corporation, Great Neck, NY; International Business Machines (Federal Systems Division), Oswego, NY; Singer-Kearfott Co., Little Falls, NJ; GTE-Sylvania, Needham Heights, MA; Hazeltine Corporation, Long Island, NY; and Microwave Power Devices Inc., Plainview, NY. In addition, 4 contracts totaling $800 thousand are expected to be awarded during FY 1980. Several contracts are planned in FY 1981 to procure equipment, computers, and display devices to establish an Army Data Distribution System Testbed (Project D370).

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Participated in studies related to Army application of Joint Tactical Information Distribution System (JTIDS). Awarded concept development contracts for the Class 3 Joint Tactical Information Distribution System (JTIDS) terminal for manpack and missile applications in 1977. Advanced Development models of the Tactical Automatic Message Entry Device were successfully tested in a European Field exercise and demonstrated that the device can replace nine teletypewriters and operators, and reduce message-processing time by 70 percent. A Letter of Agreement (LOA) for Optical Cable Transmission Systems was approved by the combat developer in June 1977. Field tests for a 38-gigahertz Millimeter Wave Radio were initiated. Advanced Development efforts on the Low-Profile Vehicular Antenna and a Capacitive Tuning Element were continued. Awarded advanced development contract in September 1978 for High-Power Amplifier design and model. Completed analyses pertaining to Army application of JTIDS and completed concept definition contracts for the JTIDS Class 3 low-cost terminal for size- and weight-constrained applications. In FY 1979 JTIDS efforts involved conducting ground propogation testing; participation in joint net management technical analyses; interoperability testing with the AN/TSQ-73 Missile Minder for air defense; definition of interfaces with other weapons systems such as Tactical Fire Direction (TACFIRE) and Positon Location and Reporting System (PLRS); and pursuing cost reduction approaches in terminal development. Project D246 efforts involved Advanced Development contract award and technical support for a fiber optic local distribution cable system to interconnect the two shelters of the AN/TYC-39 Automatic Message Switch and continued technical support and evaluations of field tests for a 38-gigahertz millimeter wave radio. Project D437 involved continued technical and engineering design plan efforts on the High-Power Amplifier and Broadband Vehicular Antenna, and the AD contract award for a Survivable Low-Profile Antenna for tracked combat vehicles. Continued engineering support and evaluation of candidates for a family of Quick-Erect Antenna Masts.

2. (U) FY 1980 Program: Project D137 efforts will include conducting ground propagation testing and participation in joint and service-related net management technical evaluations to provide the baseline for management techniques to be

Program Element: #6.37.07.A Title: Communications Development
DOD Mission Area: #256 - Tactical Communications Budget Activity: #4 - Tactical Programs

incorporated in JTIDS terminal software. Continue interoperability testing with the AN/TSQ-73 Missile Minder Air Defense System. Participation in joint assessments of competing technologies, i.e., Time Division Multiple Access (TDMA), Advanced Time Division Multiple Access (ATDMA), and Distributed Time Division Multiple Access (DTDMA). Project D246 efforts will involve conduct of a Development and Operational Test (DT/OT-I) using the AN/TYC-39 TRI-TAC Message Switch to test the systems application of fiber optics technology to replace the bulky, heavy multipair metallic cables used to to interconnect the two switch shelters. The long-term payoff is to reduce switch installation/displacement time and eliminate the trucks required to carry the palletized metallic cables currently needed for each switch. Other efforts will involve the award of Advanced Development contracts for a local area distribution fiber optic cable system to replace the standard 26-pair metallic distribution cables used from Brigade thru Theater level, for a Millimeter Wave Command Post Radio to augment and interoperate with long-haul fiber optic systems, and for a fiber optic missile payout system to be used on antitank weapons employed from defilade positions. Project D437 will involve continuation of AD efforts on the Survivable Low-Profile Antenna for tracked combat vehicles, and continuation of investigations, testing and modification of existing equipments, commercial and other available candidate items to develop solutions to user requirements for a family of Quick-Erectable Antenna Masts. AD contracts will be awarded for a High-Power Amplifier and a Broadband Vehicular Antenna.

3. (U) FY 1981 Planned Program: Project D137 will include completing of interoperability testing of the AN/TSQ-73 Missile Minder and the Joint Tactical Information Distribution System (JTIDS) Adaptable Surface Interface Terminal (ASIT) leading to a production decision for the ASIT. Continue participation in the JTIDS Class 2 terminal developments efforts which will lead to definition and design parameters for a suitable Class 2 terminal for Army ground environment use. The Joint Net Management analysis will be completed, and the assessment of the JTIDS architecture to ensure that Army requirements have been properly considered will continue. Project D246 will continue the local area distribution fiber optic cable system and the missile payout fiber optic system development efforts and coordinate the Development/Operational Test (DT/OT I) for both. Continue technical efforts on fiber optic and millimeter wave radios to enhance the employment utility of these systems. Complete tests and evaluations of commercially available millimeter wave radios to assess their potential for military applications. Prepare and process the determinations and findings documentation for FY 1982 starts for secure fiber optic cable repeaters and an extended range fiber optic missile payout system. FY 1981 is the first year for Project D370 (Army Data Distribution System). Initial efforts will be to establish a Position Location Reporting System (PLRS)/Joint Tactical Information Distribution System (JTIDS) Hybrid testbed. It will consist of procuring JTIDS and PLRS development models, plus computers and display equipment for integration into this testbed configuration. The design and fabrication of user interfaces and conducting of initial testbed demonstration will begin. Efforts will also be initiated on the interface design and integration of JTIDS Class 2 engineering development model terminals into the testbed. All necessary experimental work will be performed, and the proposed systems will be ready for operational verification upon completion of the testbed activities. In Project D437 the Survivable Low Profile Antenna for combat tracked vehicles advanced development models will be delivered and

Program Element: #6.37.07.A Title: Communications Development
DOD Mission Area: #256 - Tactical Communications Budget Activity: #4 - Tactical Programs

tested at the Armor Center. Preparations for an engineering development contract award for FY 1982 will be initiated. Continue to provide technical support and contract monitoring on the Broadband Vehicular Antenna. Start Electromagnetic Compatibility/Electromagnetic Vulnerability (EMC/EMV) analysis which will be incorporated into the Single Channel Ground and Airborne Radio System (SINCGARS) Phase III EMC/EMV analysis. Continue technical efforts on bit error detection and correction techniques for quasi-analog and digital single channel radios systems.

4. (U) FY 1982 Planned Program: Project D137 transitions to Engineering Developments (ED) in FY 1982 and ED efforts are funded in Program Element 6.47.01.A (Communications Engineering Development) Project D451 (Army Support of JTIDS). Project D246 efforts will involve completion of advanced development efforts for the Local Area Distribution Fiber Optic Cable System and the Fiber Optic Missile Payout System, and transition of the Local Area Distribution System to Engineering Development. Continue Millimeter Wave Radio developments and transition the Command Post Radio effort to ED. Award AD contract for Secure Fiber Optic Cable Repeaters. Project D370 efforts will involve the initial integration of the Joint Tactical Information Distribution System (JTIDS) and modified Position Location and Reporting System (PLRS) terminals into the hybrid testbed. The JTIDS Adaptable Surface Interface Terminal (ASIT) will begin interface testing in the testbed to determine applicability to Army operations. Project D437 will continue technical support on the High-Power Amplifier, Survivable Low-Profile Antenna and Broadband Vehicular Antenna. Complete AD efforts on the Quick-Erect Antenna Masts and transition to Engineering Development in Program Element 6.47.01.A Project D488.

5. (U) Program to Completion: Projects D246 and D437 are continuing efforts. Project D370 interface design developments, upgrading of PLRS and JTIDS terminals, and incorporating final segments of software program and interface units into the testbed configuration will be completed. Project will be completed in FY 1985 after operational verification testing of the hybrid system by equipping selected division elements with hybrid terminals and evaluating the PLRS/JTIDS Hybrid capability to perform the data distribution system requirement.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D370 Title: Army Data Distribution System (ADDS)
Program Element: #6.37.07.A Title: Communications Development
DOD Mission Area: #256 - Tactical Communications Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: The Army Data Distribution System (ADDS) is an integration of two systems which are completing engineering development, Position Location and Reporting System (PLRS) and the Joint Tactical Information Distribution System (JTIDS) Class 1 Terminal. This hybrid program was initiated by the Army in recognition of the potential of such a merger 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 hybrid system will satisfy requirements for realtime data distribution, position location, and identification. The heart of the system is the Net Control Unit/Master (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 will be furnished users that have a relative small amount of data to transmit. Combination terminals will be furnished those few users that need to send information to user units or JTIDS users. It is envisioned that there will be JTIDS terminals operating as stand-alone units or in combination with enhanced user units. 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.

B. (U) RELATED ACTIVITIES: Program Element 63704A/D135 (JTIDS Development) accomplishes the exploratory and the advanced development work for this project. This project will also be supported by Program Element 64701/D451 in the Engineering Development phase.

C. (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.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS: Efforts for this program begin in FY 1981. A Letter of Agreement (LOA) for the PLRS/JTIDS Hybrid was approved by the Combat and Material Developers and on 6 July 1979 by Department of the Army. The Army was authorized to proceed with the hybrid development by the Office of Secretary of Defense on 8 August 1979. This program will be carried out in a series of evolutionary development 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 program. The establishment of a hybrid testbed will be initiated in FY 1981 integrating the engineering development models of PLRS and JTIDS 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

Project: #D370 Title: Army Data Distribution System (ADDS)
Program Element: #6.37.07.A Title: Communications Development
DOD Mission Area: #256 - Tactical Communications Budget Activity: #4 - Tactical Programs

and current software/firmware. System test and evaluation is scheduled in FY 1984 and 1985 by exercising the hybrid within a representative slice of a combat division.

1. (U) FY 1979 and Prior Accomplishments: Not Applicable

2. (U) FY 1980 Program: Not Applicable

3. (U) FY 1981 Planned Program: Efforts will initiate in FY 1981 to establish a Position Location Reporting System (PLRS) Joint Tactical Information Distribution System (JTIDS) testbed. It will include purchase of engineering development hardware from the JTIDS and PLRS program. Computers and display equipment for visual readout will also be integrated into this testbed configuration. Design and fabrication of user interfaces and conducting of initial testbed demonstrations will begin. Work will also begin on interface design and integration of Army JTIDS Class 2 engineering development model terminals into the testbed. All necessary experimental work will be performed to allow for firm testbed design.

4. (U) FY 1982 Planned Program: Continuation of design and testing efforts of the PLRS and JTIDS terminals. Initial integration efforts of the JTIDS and modified PLRS (enhanced user units) terminals into the testbed will begin. Begin interface testing of the JTIDS Adaptable Surface Interface Terminal (ASIT) into the testbed to determine applicability to Army operations.

5. (U) Program to Completion: Efforts to completion will include design and development of interfaces with potential hybrid users, upgrading the PLRS and JTIDS terminals to provide the increased communications capability, and adding the final segment of the computer program and interface units to the testbed configuration. Finally an operational verification of the hybrid will take place by equipping a representative number of elements of a division with hybrid terminals for an extensive testing of the PLRS/JTIDS capability.

6. (U) Major Milestones: Not Applicable

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

Project: #D370 Title: Army Data Distribution System (ADDS)
Program Element: #6.37.07.A Title: Communications Development
DOD Mission Area: #256 - Tactical Communications Budget Activity: #4 - Tactical Programs

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	0	0	18855	15682	16769	50504
Funds (as shown in FY 1980 submission)	Not Shown					
Quantities (current requirements)	Not Applicable					
Quantities (as shown in FY 1980 submission)	Not Applicable					

FY 1981 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	3593	6975	7324	13938	Continuing	Not Applicable
D852	Scout/Attack Helicopter Survivability Equipment	1900	2665	5209	7445	Continuing	Not Applicable
D653	Special Electronic Mission Aircraft (SEMA) Survivability Equipment	1693	4320	2115	6493	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program develops the technology and supports the system engineering/effectiveness efforts which are required to provide the US and allied aircraft with the needed protection against enemy infrared, optical, laser and/or radar-directed threats. The program is the continuation of a deliberate, proven approach to achieve the survivability urgently 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. (See Related Activities). This program responds to the Required Operational Capability (ROC) for Aircraft Survivability Equipment (ASE). ASE is needed for both current and future fielded Army aircraft in order to survive to accomplish combat missions and reduce combat attrition to acceptable levels.

C. BASIS FOR FY 1981 RDTE REQUEST: The FY81 funds are required for developments which address the current and future threat to Army aviation as represented by the 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 lie in air defense fire control systems employing

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

The FY81 program provides a major hardware thrust in each area with (1) the continued development of the optical warning location/detection (OWL/D) system, (2) countermeasures, (3) tri-Service program of countermeasures development and testing, and (4) a vulnerability reduction program to provide ballistic hardening/fire protection for tactical helicopters.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	3593	6975	7324	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	3793	6995	7249	Continuing	Not Applicable

Differences in the FY79 funds reflect a decrease due to reprogramming of funds for a higher priority Army program. Differences in the FY81 estimates reflect program adjustments for inflation. The FY80 reduction is the result of a general Congressional reduction.

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

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

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 in 1971 after the Soviets introduced the SA-7 shoulder fired surface-to-air missile (SAM) in the Mideast. The objectives of DB52 ASE concentrate on systems engineering, signature reduction, infrared (IR) suppression, effectiveness measurements and evaluations, and ballistic hardening or vulnerability reduction. Project D653, Special Electronic Mission Aircraft Survivability Equipment developed 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 (PE 6.32.62.N). The Air Force is responsible for IR missile warning detectors for fixed-wing aircraft and selected helicopters (PE 6.32.44.F). International coordination is achieved through North Atlantic Treaty Organization (NATO), NATO Army Armaments Group (NAAG), and Quadripartite Working Groups.

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

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, Nutley, 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.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1979 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 front line 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), 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 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 radars were initiated with the development of a capability for the APR-39 radar warning receiver (RWR). Development of a ballistic hardening/fire protection for tactical aircraft fuel cells continued through FY 1979.

2. FY 1980 Program: Flight testing of the optical warning location/detection (OWL/D) system for scout and attack helicopters was installed first quarter FY80 and will continue thru fourth quarter with emphasis upon definition of the optimum configuration/specification for the next development phase. An integrated development program which addresses the radar threat will be initiated to include active and passive countermeasures. A brassboard design of a warning receiver subsystem for the currently deployed APR-39(V)1 radar warning receiver (RWR) will be tested with Advanced Development scheduled for completion in FY81. chaff and jammer development requirements will be defined for FY81 starts. A multi-faceted tri-Service Quick Reaction Capability (QRC) development and test program directed at the radar threat will begin in mid-FY80. This urgent high priority program will utilize Army, Navy, and Air Force hardware assets and contractors and will define techniques and hardware modification necessary to upgrade the ALQ-136 and ALQ-162

jammers with a jamming capability. A study of the USN/USAF advanced self-protection radar jammer (ASPJ) will be made to assess its suitability/adaptability for special electronic mission aircraft (SEMA) use. Flight testing of the tri-Service ultra-violet missile detector will be completed with the Army conducting missile firings at Sandia Base, NM. Development of ballistic hardening/fire protection for tactical helicopter fuel cells will continue. Evaluation/exploitation of air defense systems and test of countermeasures will continue.

3. FY 1981 Planned Program: The second phase of advanced development (AD) for the optical warning, location/designation (OWL/D) system will be initiated based upon the FY80 field tests and program definition. With feasibility fully demonstrated in FY 78-80, the major emphasis will be on cost, complexity and size reduction, and aircraft integration. The development and test of countermeasure technique/hardware will continue utilizing tri-Service hardware and facilities. Program emphasis will be on hardware implementation of techniques evaluated in FY79-80 under the tri-Service program. Final configuration changes and tests will be made on the radar warning receiver (RWR) modification to the APR-39(V)1 RWR. Measurement of the radar cross section (RCS) of Army aircraft at frequencies will be completed. Development of a chaff cartridge for the M-130 chaff/flare dispenser will be initiated. Development of a jamming capability for the ALQ-136 radar jammer will be initiated. Advanced development (AD) of a low radar cross section (RCS) hub cover for the AH-1S will be initiated based upon exploratory development efforts.

4. FY 1982 Planned Program: Efforts will continue for AD completion of the optical warning location detection system (OWL/D) and chaff and radar countermeasures with completion of development test/operational test (DT/OT) I testing in preparation of engineering development in FY83. AD will continue on the jammer and low RCS hub cover. AD will begin for addition to the laser warning receiver and for a radar warning receiver capable of detecting and identifying complex radar systems. Development of laser designated countermeasures will be initiated.

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 (JTCG/AS).

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

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^3I Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: The objective of this project is the 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 Material 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 in a cost-effective manner. 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 (JTCG/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 PE 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 PE 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; Perkin-Elmer, Norwork, CT; Honeywell Inc., Lexington, MN.

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^3I Budget Activity: #4 - Tactical Programs

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 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-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). Development of a ballistic hardening/fire protection system for tactical aircraft fuel cells was initiated and is continuing.

2. (U) FY 1980 Program: Flight testing of the optical warning location/designation (OWL/D), system for scout and attack helicopters was installed first quarter FY80 and will continue thru fourth quarter with emphasis on definition of the optimum configuration specification for the next development phase. This system will detect fire control optics found on all Soviet air defense weapons; i.e., visual telescopes, TV cameras, and night vision devices. Flight testing of the tri-Service ultraviolet missile detector will be completed with the Army conducting missile firings at Sandia Base, NM. Development of ballistic hardening/fire protection for tactical helicopter fuel cells will continue. Evaluation/exploitation of air defense systems and test of countermeasures will continue.

3. FY 1981 Planned Program: The second phase of advanced development (AD) for the OWL/D will be initiated based upon the FY80 field tests and program definition. With feasibility fully demonstrated in FY78-80, the major emphasis will be on cost, complexity, size reduction, and aircraft integration. Measurement of the radar cross section (RCS) of Army aircraft at frequencies will be completed. Development of a chaff cartridge for the M-130 chaff/flare dispenser will be initiated. Advanced development (AD) of a low RCS hub cover for the AH-1S will be initiated based upon exploratory development efforts.

4. FY 1982 Planned Program: Efforts will continue for AD completion of the Optical Warning Location/Detection Systems (OWL/D) and chaff with completion of development test/operational test (DT/OT) I testing in preparation of engineering development (ED) in FY83. Advanced development will continue on the low radar cross section hub cover.

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^3I Budget Activity: #4 - Tactical Programs

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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	1900	2655	5209	7445	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	2100	2670	5533	-	Continuing	Not Applicable

Aircraft Procurement Army: Not Applicable

Differences in FY79 funds reflect a decrease of $200 thousand due to reprogramming of funds for a higher priority Army program. Decrease in FY80 was due to a general Congressional reduction applied to this project. Differences in FY81 estimates reflect a net decrease of $324 thousand as a result of project adjustments for inflation and reprogramming of funds for a higher priority Army program.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.19.A Title: Special Purpose Detectors
DOD Mission Area: #255 - Tactical Surveillance, Reconnaissance and Target Acquisition Budget Activity: #4 - 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	Total Estimated Cost
DK72	Nettable Radar	0	0	0	1307	0	0

B. (U) BRIEF DESCRIPTION OF PROJECT: The Nettable Radar will be a lightweight, highly mobile, all-weather ground surveillance radar to provide surveillance and target acquisition data on hostile targets. The Nettable Radar will detect and locate targets with sufficient accuracy and timeliness to provide effective counterfire and intelligence data to units within each brigade. The Nettable Radar will replace the AN/TPS-25, AN/TPS-58, and AN/PPS-5 radars. Each brigade will be equipped with a radar control center capable of integrating, netting, and controlling the individual radars, and disseminating data to fire support and intelligence units. The distributed nature of netting radars will increase survivability and effectiveness, and decrease the number of presently required radars.

C. (U) EXPLANATION OF CANCELLATION OR DEFERRAL: FY 1980 funds were not authorized by Congress. During FY 1981, the Army will review and finalize the requirements for this system, and respond to Congressional concerns expressed by the HASC. The program is expected to resume in FY 1982 as an Engineering Development effort under Program Element/Project 6.47.23.A/DL72.

FY 1981 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	8440	17230	23217	23678	Continuing	Not Applicable
	QUANTITIES						
DE80	Individual Cml Protection Materiel	0	500	3736	1875	Continuing	Not Applicable
DE81	Cml Decontamination Materiel	1500	4985	5720	4550	Continuing	Not Applicable
DJ30	Collective Protective Material for Armored Vehicles	0	3941	4704	5225	Continuing	Not Applicable
D601	Cml Detection & Warning Materiel	2500	4794	6230	6741	Continuing	Not Applicable
D604	Collective Cml Protection Materiel	4440	3010	2827	5287	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 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 Department of Defense (DOD) wide. 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.

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

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Complete advanced development (AD) on: residual gas life indicator, (2) simplified collective protection equipment for field shelters, (3) special applications decontamination system, (4) decontamination system for clothing, (5) decontamination station kit, and (6) apparatus for rapid decontamination. Continue AD on Automatic Liquid Agent Detector (ALAD). Conduct Development Test I/Operational Test I (DTI/OTI) on hybrid collective protection equipment for armored vehicles. Continue AD on detector kit for waterborne chemical warfare agents. The water kit will be a component of the water quality analysis set for use by engineer and preventive medical personnel. The above items are essential toward maintenance of a totally integrated chemical-biological (CB) defense posture.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	8440	17230	23217	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	10792	17345	25988	Continuing	Not Applicable

Project DE80, Individual Chemical Protection Materiel, was increased by $1806 thousand in FY 1981 to support the evaluation of alternatives to the flexible lens design of the new mask. Project DE81, Chemical Decontamination Materiel, was increased by $2499 thousand in FY 1981 to support the initiation of advanced development on selected decontamination items that are/will be supported by approved requirement documents. The minor difference ($369 thousand in FY 1979) between the current requirements and those shown in the FY 1980 submission of Project DE81 is the result of refinements in cost estimates. Project DJ30, Collective Protective Material for Armored Vehicles, was reduced by $1637 thousand in FY 1981 due to funds reprogramed into higher priority nonchemical Army projects. Project D601, Chemical Detection and Warning Materiel, was reduced by $2183 thousand in FY 1979, $66 thousand in FY80, and $4824 thousand in FY 1981 because the balances, $2500 thousand, $4,794 thousand and $6230 thousand, respectively, were adequate to support initiation of advanced development of those detection and warning devices that are/will be supported by approved requirement documents and proven technology. Project D604, Collective Chemical Protection Materiel, was increased by $200 thousand in FY 1979 because of refinement in cost estimates and reduced by $615 thousand in FY 1981 due to funds reprogramed into higher priority nonchemical Army projects.

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

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

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

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is conduct advanced development for all Services on rapid detection and warning systems, and protective materials and equipment to warn of the presence of and to protect against chemical attack. 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 US and Canada on the protective mask and canisters provides for the US developing face mask pieces and the UK 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.

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; Donalson, Minneapolis, MN; American Air Filter, Ellicott City, MD; and Brunswick, Marion, VA.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: During FY 1977 and FY 1975 respectively, advanced development (AD) was completed on: (1) the new nuclear, biological, and chemical protective mask, and (2) the XM9 liquid agent detector paper. Also, 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-liter decontamination apparatus for vehicles and decontamination procedures for weapons systems. (3) The information gap study program related to collective protection for armored vehicles was expanded to cover areas such as: ventilation parameters, liquid agent transport, transport due to personnel entry, and crew compartment decontamination.

2. (U) FY 1980 Program: Continue AD on decontamination apparatus for vehicles. Complete AD on decontamination of weapons systems that examine the effects of agents, decontaminants, and toxic byproducts on plastics parts, optics, and

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

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

avionics, etc. Complete AD on remote chemical agent sensing alarm, XM21. Initiate AD on: (1) jet exhaust decontamination/smoke system, (2) decontamination station kit, (3) special application decontamination kit, (4) clothing decontamination kit, (5) detector kit for waterborne chemical warfare agents, (6) the hybrid collective protection system for armored vehicles, and (7) Automatic Liquid Agent Detector (ALAD). Additionally, initiate protective mask program to evaluate alternatives to flexible lens design, including modifications of standard masks, foreign masks, and special purpose masks. Program will include a reassessment of the incompatibility of the M17 mask with weapons with consideration for special adapters to improve compatibility.

3. (U) FY 1981 Planned 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, and improved individual protection equipment. Complete AD on: (1) residual gas life indicator, (2) simplified collective protection equipment for field shelters, (3) special applications decontamination system, (4) decontamination system for clothing, (5) decontamination station kit, and (6) apparatus for rapid decontamination. Continue AD on Automatic Liquid Agent Detector (ALAD). Conduct Development Test I/Operational Test I (DTI/OTI) on hybrid collective protection equipment for armored vehicles. Continue AD on detector kit for waterborne chemical warfare agents, and the program initiated in FY 1980 to evaluate alternative protective mask designs.

4. (U) FY 1982 Planned Program: Complete AD on the Automatic Liquid Agent Detector (ALAD) and detector kit for waterborne chemical warfare agents. Conduct Development Test II/Operational Test II (DT II/OT II) on the hybrid collective protection equipment for armored vehicles. Also, conduct Development Acceptance Inprocess Review (DEVA-IPR) and type classify the hybrid collective protection equipment directly from AD. Continue AD on those efforts not completed during FY81.

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

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #DE81 Title: Chemical Decontamination Materiel
Program Element: #6.37.21.A Title: Chemical Defense Materiel Concepts
DOD Mission Area: #215 - Land Combat Support Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: The Union of 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 and 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 6.27.06A553, Chemical-Biological Defense and General Investigations. In accordance with Department of Defense (DOD) Directive 5160.5, 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 are transferred to Engineering Development under Project 6.47.25DF97, Chemical Decontamination Materiel, of Program Element 6.47.25, Chemical Defense Materiel.

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

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Advanced Development on the XM13, Decontamination Apparatus, Portable (formerly called the Decontamination Apparatus for Vehicles), 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 FY79, two concepts were selected for further competitive development. Work continued on the technical report providing information on the decontamination of nuclear weapon systems. 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.

Project: #DE81 Title: Chemical Decontamination Materiel
Program Element: #6.37.21.A Title: Chemical Defense Materiel Concepts
DOD Mission Area: #215 - Land Combat Support Budget Activity: #4 - Tactical Programs

2. (U) FY 1980 Program: Complete Advanced Development on the Decontamination Apparatus, Portable, the report for decontamination of nuclear weapon systems, and the polyurethane paint application pilot program. Initiate Advanced Development on: decontamination system for clothing; rapid decontamination apparatus for vehicles and equipment; decontamination station kit for casualties; special application decontamination system for electrical and corrosion-sensitive components; improved individual decontamination system. All efforts support the Army's accelerated decontamination program.

3. (U) FY 1981 Planned Program: Complete Advanced Development on the special application decontamination system for electrical and corrosion-sensitive components and decontamination station for casualties. Continue efforts on decontamination system for clothing, rapid decontamination system, and the improved individual decontamination system. Initiate Advanced Development on an interior surface decontamination system for armored vehicles.

4. (U) FY 1982 Planned Program: Complete Advanced Development on the improved individual decontamination system. Continue development of the rapid decontamination system, the decontamination system for clothing, and the interior surface decontamination system.

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

6. (U) Major Milestones: Not applicable.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	1500	4985	5720	4550	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	1869	5035	3221	-	Continuing	Not Applicable

Decrease in FY 1979 expenditures was due to a lack of approved requirements necessary to transition items from Exploratory Development to Advanced Development. The funds were reprogrammed to continue Exploratory Development on selected decontamination items. The increased funding in FY 1981 reflects the increased emphasis on the accelerated decontamination

Project: #DE81 Title: Chemical Decontamination Materiel
Program Element: #6.37.21.A Title: Chemical Defense Materiel Concepts
DOD Mission Area: #215 - Land Combat Support Budget Activity: #4 - Tactical Programs

program to reach at least parity with the USSR/WP capability. The decrease in FY80 is the result of a general Congressional reduction .

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D601 — Title: Chemical Detection and Warning Materiel
Program Element: #6.37.21.A — Title: Chemical Defense Materiel Concepts
DOD Mission Area: #215 - Land Combat Support — 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. 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 chemical agent detection and warning systems for field use, chemical agent detection systems for rapid survey of contamination of terrain and other surfaces, chemical agent detector kits, and chemical field laboratories.

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 (PE) Project: 6.47.25/D020, Chemical Detection and Warning System.

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

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: During earlier years Advanced Development (AD) was completed on the M256 chemical detector kit and the XM9 liquid agent detector paper. During FY 1979, the key effort was the reinitiation of AD on the remote sensing chemical agent alarm, XM21. In support of the reinitiation of AD on the XM21, the following were accomplished: (1) AD contract was written and awarded; (2) an intermediate sensor was designed and fabrication begun; (3) data acquisitions systems and signal processors were designed and procured; and (4) the XM21 sensor design was begun.

2. (U) FY 1980 Program: Complete advanced development on the remote sensing chemical agent alarm, XM21. The XM21 is also known as Scanning Infrared Remote Agent Chemical (SCI-REACH). In support of the completion of AD on the XM21, the following will be accomplished: (1) Complete fabrication of the intermediate sensor and obtain critical detection and discrimination data for Sep 1980 In-Process Review; (2) complete XM21 sensor design and fabrication; and (3) design XM21 signal processor. Continue Advanced Development on the Automatic Liquid Agent Detector (ALAD). Initiate Advanced Development on the detector kit for chemical agents in water.

Project: #D601 Title: Chemical Detection and Warning Materiel
Program Element: #6.37.21.A Title: Chemical Defense Materiel Concepts
DOD Mission Area: #215 - Land Combat Support Budget Activity: #4 - Tactical Programs

3. (U) FY 1981 Planned Program: Complete Advanced Development on the Automatic Liquid Agent Detector (ALAD) and the detector kit for chemical agents in water. Emphasis will be placed on testing, debugging and modifying prototypes of the ALAD and water kit as required. Initiate Advanced Development on Advanced Chemical Agent Detection Alarm (ACADA).

4. (U) FY 1982 Planned Program: Continue Advanced Development on the Advanced Chemical Agent Detection Alarm (ACADA). Complete Advanced Development on the Automatic Liquid Agent Detector (ALAD) and the detector kit for chemical agents in water.

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

6. (U) Major Milestones: Not Applicable.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	2500	4794	6230	6741	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	2500	6520	5207	-	Continuing	Not Applicable

Decrease in FY 1980 funding is due to funds reprogramed into higher priority nonchemical Army projects. Increase in FY 1981 funding supports the completion of advanced development on the remote chemical agent alarm, XM21.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.22.A
DOD Mission Area: #254 - Tactical Command and Control
Title: Tactical Operations System (TOS)
Budget Activity: #4 - 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	Total Estimated Cost
D494	TOS	36772	0	0	0	0	Not Applicable

B. (U) BRIEF DESCRIPTION OF PROJECT: The Tactical Operations System (TOS) was a computer-assisted command and control system which would increase the capability of ground combat commanders and their staffs to manage the employment of Army combat power. Highly sophisticated automated intelligence and combat surveillance support systems are being fielded to obtain information needed by Corps and Division Commanders and Staffs to "see" the battlefield more clearly to greater depth. The volume of required information generated by these systems is beyond the capability of the current manual system. TOS would have provided the required automated assistance to collect, process, store, display, retrieve and disseminate this volume of data quickly to provide commanders accurate, up-to-date information on status, deployment and capability of friendly and enemy forces which is critically needed in combat.

C. (U) EXPLANATION OF CANCELLATION OR DEFERRAL: The FY 1980 Authorization Bill deleted all RDTE funding for TOS. The committee language supported the concept for the system but not the program presented by the Army. Therefore, the funding request was denied without prejudice. While the TOS program has been zeroed, the need for an executive system remains. Accordingly, the Operations Control and Command Support System has been established under PE 2.37.40 starting in FY 1981. In addition, the Tactical Computer System/Tactical Computer Terminal project has been established as project D184 in PE 6.47.27.A.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.23.A Title: Command and Control
DOD Mission Area: #254 - Tactical Command and Control Budget Activity: #4 - 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	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	10334	8964	12998	25902	Continuing	Not Applicable
D101	Tactical Automation	10334	8964	12998	25902	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The battlefield today is a highly mobile, fast-changing environment. Weapons are more accurate and destructive. Sensor systems are more sophisticated and generate realtime information which must be exploited. Commanders must be provided the capability to know and understand the complete tactical situation on a near-realtime basis to preclude the unexpected, take advantage of enemy weaknesses, detect potential weaknesses, and determine courses of action. To provide the commander with this capability, information from many sources must be received, processed, and analyzed rapidly. Existing manual and voice procedures and techniques are inadequate to handle the large amounts of required data which must be available to the commander. This requirement can only be satisfied through survivable automated systems with their inherent communications and processing efficiencies. This program pursues these goals through a disciplined engineering approach of a total program to accelerate the fielding and the survivability of battlefield automated systems. This approach is to provide a common, compatible family of computers, 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.), and to provide testbeds for system validation experimentation, and integration/interoperability testing. This approach will allow continued competition while standardizing, reduce proliferation of computer types, and prevent small production bases with sole source follow-on procurements due to lack of vendor independence. By providing project managers common software tools and a common set of hardware, development cycles can be shortened by focusing development efforts on unique applications while enhancing battlefield survivability with training and logistics commonality.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: These funds are essential to continue development of Ada, (Department of Defense common high-order computer programming language) and necessary software support tools to insure effective implementation and reduction of life cycle support costs for software. Major external efforts are planned for development and testing of a compatible family of military computers, peripherals, and intelligent microprocessor-based terminals. System Management

Program Element: #6.37.23.A
Title: Command and Control
DOD Mission Area: #254 - Tactical Command and Control
Budget Activity: #4 - Tactical Programs

engineering and verification and validation will continue to insure effective automated systems for the battlefield. Efforts will expand to provide increased capability for interoperability testing.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Configure software development facility for Post-Deployment Software Support efforts	FY81	None
Initiate development of life cycle software tools	FY81	
Complete development of Ada language system	2Q FY82	
Contract for Ada rehosting to additional computers	2Q FY82	
Initiate Development of Common Operating System (TACEXEC)	FY82	
Tactical Display System		
Initiate parallel contracts for MCF computer hardware	FY81	
Development Test for brass-board of MCF computers	FY82	

Program Element: #6.37.23.A Title: Command and Control
DOD Mission Area: #254 - Tactical Command and Control Budget Activity: #4 - Tactical Programs

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	10334	8964	12998	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	10984	18590	24563	Continuing	Not Applicable

In FY 1979, $500K was reprogrammed to PE 6.46.17, and $150K was reprogrammed to PE 6.47.27 for higher priority unfunded requirements. Funds in FY 1980 were reduced by Congressional action. Changes in FY81 are necessary to accommodate FY80 reductions and reduce risks in the procurement of the Military Computer Family hardware, based on a common instruction set architecture.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable

Program Element: #6.37.23.A Title: Command and Control
DOD Mission Area: #254 - Tactical Command and Control Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: To meet the mission need, this program provides for advanced development of software languages (including Department of Defense's common high-order programming language, Ada) with a compiler and necessary development tools to create an efficient software development environment for tactical automated systems allowing eventual standardization for tactical systems. This program provides for advanced development for a compatible family of military computers (MCF), intelligent microprocessor-based terminals and peripheral devices, data distribution, operating systems, and associated equipment to insure survivable battlefield automated command and control systems. The Teleprocessing Design Center of the Center for Tactical Computer Systems (CENTACS) is included and provides for multiple system interoperability testing, checking compatibility of new equipment and concept designs, as well as measurements for evaluation and validation. This project ensures CENTACS can provide technical and managerial support to project managers, system developers, laboratories, and other Army organizations in the development and acquisition of tactical systems utilizing computer resources. Advanced development and enchancement of tactical computer-based components are included in this project.

C. (U) RELATED ACTIVITIES: This project is related to the Tactical Fire Direction System (TACFIRE), 2.37.26.A; Communication Electronics, 6.27.01.A; Tactical Automation Technologyy, 6.27.46.A; Automatic Test Support Systems, 6.47.46; Missile Minder (AN/TSQ-73), 6.43.02.A; and other Command and Control programs by developing new technology, tools, equipment, interfaces, and systems engineering for these systems. Coordination to avoid duplication and provide program guidance is accomplished through the Department of Defense Computer Resources Technology Panel, the Management Steering Committee for Embedded Computer Resources, the High-Order Language Work Group (HOLWG), and meetings between project managers of services and agencies.

H. (U) WORK PERFORMED BY: Carnegie-Mellon University, Pittsburgh, PA; EG&G, Washington, DC; Computer Sciences Corporation, Moorestown, NJ. Contracts will be awarded in FY80 for the Ada Language System, terminals and peripherals and engineering support. Total contracts in the amount of $4,995,000 will be awarded in FY80. In-house development is performed by the US Army Communications Research and Development Command.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: The Military Computer Family (MCF) project is an approach to effect necessary standardization of hardware and software elements of Army battlefield automated systems. Contracts were awarded for assistance in planning and control of MCF instruction set architecture and hardware. Also initiated were the development of a tactical display system overlay generator and enhancements for the UYK-19 standardization. The Teleprocessing Design Center (TDC) emulation of the Tactical Fire Direction System TACFIRE was used to verify interoperability between TACFIRE and

Program Element: #6.37.23.A Title: Command and Control
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the emulated Tactical Operations System Operable Segment (TOS2). Since tactical systems have some classified software modules which must be exchanged for testing and measurement, plans were made to interface commercial and tactical systems over a secure communications network. To accomplish this, an interface of the Microprogrammable Multiprocessor (MMP) to the Defense Advanced Research Project Agency Network (ARPANET) was begun. An Army-wide Post-Deployment Software Support study was conducted, and a management plan developed. Acquisition of a Software Development Support System (SDSS) was initiated. Plans were prepared for the development of an Ada compiler. A systems engineering support contract was awarded in FY79. Technical and managerial support was provided to Army organizations in the development and acquisition of tactical systems utilizing computer resources. 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 5000.29, 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 1980 Program: The Military Computer Family (MCF) Project is an approach to effect standardization of the major hardware (computers, peripherals, and terminals) and software (language, operating systems, tools, and products) elements of battlefield automated systems. Specifications for MCF equipment and a standard for MCF instruction set architecture will be developed. The results will be used for planned development to begin in FY 1981. Continued cooperation with DOD Agencies to develop and implement the DOD high-order programing language, Ada, is planned. Army's representation to the DOD High-Order Working Group, as well as coordination of the test and evaluation of the Ada language is planned. In order to provide an adequate environment for developing and managing computer-driven systems, the Software Development Support System (SDSS) facility will be enhanced with the purchase of additional memory and terminals. Software packages to aid in configuration management of software will be developed and hosted on the SDSS system. Also, an aid in requirement specification will be completed. Assistance will be given to Project Managers by defining and developing tools for life cycle support of their systems. Special purpose tools and PM tools are required to be transitioned to the SDSS system. The Microprogrammable MultiProcessor (MMP) emulation system executes the actual software and provides performance monitoring and analysis data to the PM's during system development/test, which cannot be acquired on the actual equipment. The integration of a Tactical Computer System (TCS) into the MMP system will allow performance monitoring data to be taken and analyzed. Maintenance and technical services for the MMP System and maintenance for the scenario generation system will be provided. A contractual effort will be initiated for the MCF compatible family of intelligent terminals and peripherals. The management and 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.

Program Element: #6.37.23.A Title: Command and Control
DOD Mission Area: #254 - Tactical Command and Control Budget Activity: #4 - Tactical Programs

3. (U) FY 1981 Planned Program: The Military Computer Family (MCF) project continues, and parallel development contracts for MCF computer hardware are planned for initiation. This accounts for a major portion of the funding increase over FY80. This effort will result in development of competitive brassboard models as well as preproduction models of the computers. The compiler development for Ada should be complete leading to use of Ada system developments in 1982. Development of life cycle software support tools on the Software Development Support System (SDSS) will be initiated. The Microprogrammable Multiprocessor (MMP) system is an emulation facility in the Teleprocessing Design Center. It is used to verify and validate the performance of tactical computer systems, support experimentation in this area, and test for interoperability between systems. Tactical emulation capability on the MMP will be expanded to include smart peripherals on post-deployment emulations. The support for the integration of primary tactical data and feeder systems will be continued, and system engineering support to satisfy MCF requirements will be expanded. Participation on NATO, joint service, and Army panels involved with computer resource management and standardization will continue.

4. (U) FY 1982 Planned Program: The development of MCF computer hardware will be continued. MCF is a program to effect standardization of the major hardware (computers, peripherals and terminals) and software (language, operating systems, tools and products) components of battlefield automated systems. Development of MCF standard terminals, peripherals, and software will be continued. Development of the Ada language will be completed. The Ada verification and validation will continue. Ada rehosting and retargeting to other computers will be initiated. Development of life cycle software support tools will be continued. The development of tactical operating systems (TACEXEC) will be initiated. The Microprogrammable Multiprocessor System installed in the Teleprocessing Design Center is used to support experimentation on battlefield automated systems both before and after deployment. Systems are emulated to verify and validate performance, operating independently and to check interoperability between systems. The improvements of the MMP emulation capability for support of tactical systems development will be continued. System engineering support for MCF and the support of integration of tactical data and feeder systems will be continued. Participation on NATO, joint service, and Army panels involved with computer resource management and standardization will continue.

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

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.26.A
Title: Combat Support Equipment
DOD Mission Area: #216 - Land Combat Service Support
Budget Activity: #4 - 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	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	5741	8576	6897	9630	Continuing	Not Applicable
DG01	Combat Engineer Equipment	2542	2895	3116	3004	Continuing	Not Applicable
DG14	Container Distribution Equipment	0	230	253	429	Continuing	Not Applicable
DK39	General Support Equipment	305	748	0	1031	Continuing	Not Applicable
DK41	POL Distribution Systems	2187	3863	2903	3024	Continuing	Not Applicable
D428	Tactical Rigid-Wall Shelters	22	400	625	775	Continuing	Not Applicable
D471	Camouflage	685	440	0	453	Continuing	Not Applicable
D526	Marine Oriented Logistics Equipment	0	0	0	914	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 and mobility requirements of the current and future battlefield. The effectiveness and survivability of the combat forces in a hostile situation is highly dependent on the capabilities to supply vital cargo, such as fuel, ammunition, food, and medical supplies, to field units quickly and in the required quantities. The increased use of commercial containerships and fuel tankers requires military equipment capable of offloading, transporting, and handling containerized cargo and bulk fuels. A primary objective of this program is to provide equipment for logistics resupply. This program also provides the Army with materiel that will increase the Army's tactical mobility, increase battlefield survivability, and reduce the logistics burden through: a new family of standard, multipurpose tactical bridging to improve capabilities for crossing rivers and other natural barriers; new water purification equipment that can, for the first time, provide potable water from any source and provide it more efficiently than can existing equipment; a new family of standard, multipurpose tactical shelters to replace the myriad of existing vans and shelters of various sizes and types, and to provide hardening of shelters protecting sophisticated communication/electronic equipment against nuclear, ballistic, and chemical/biological threats; new and more efficient environmental control equipment (heating/air-conditioning); and new camouflage techniques to defeat an increasingly more sophisticated enemy surveillance threat.

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

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

C. (U) BASIS FOR FY 1981 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; container restraint for transporting ammunition; bulk fuels distribution equipment to include large-capacity fabric storage tank, rapidly emplaceable pipeline, low-temperature fuel dispensing, flexible hoseline, and field blending of fire safe fuels; a 50-foot accordion tactical shelter; and kits to provide protection for tactical shelters against nuclear, ballistic, and chemical/biological threats.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	5741	8576	6897	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	7886	8751	12949	Continuing	Not Applicable

The net decrease in FY 1979 funding reflects the combined effects of: reductions in scope of efforts in projects DG01 (Combat Engineer Equipment), DK39 (General Support Equipment), D428 (Tactical Rigid-Wall Shelters), and D471 (Camouflage) due to budgeting reprogramming actions to fund higher priority Army programs; deferral of planned efforts in project DG14 (Container Distribution Equipment) due to lack of approved user requirements documentation; and an increase in DK41 (POL Distribution Systems) to respond to identified critical equipment deficiencies in combat refueling capabilities. The decrease in funding for FY 1980 is a result of a Congress-directed reduction in project D526 (Marine Oriented Logistics Equipment) to eliminate all planned efforts on Army watercraft. The net decrease in funding requirement for FY 1981 reflects the combined effects of: reduction in project DG01 due to revised scheduling for bridging efforts to complete negotiations to achieve a unified international requirement for the program; reduction in project D428 is due to revised priorities and rescheduling for various specific items in the program; deferral of proposed efforts in DK39 is due to revised Army priorities; deferral of proposed efforts in project D471 (Camouflage) and D526 is due to lack of anticipated approved user requirements documentation for specific items; and a partial offset increase in project DK41 is due to refined program estimates based on improved definition of requirements, revised priorities, and rescheduling for various specific materiel items.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable

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 the advanced development (AD) of various items which are essential to the Army to provide the land combat support functions during combat and contingency operations, to include: the capabilities for rapid combat engineer construction; resupply of increasingly greater amounts of containerized cargo; mobile water purification units; environmental control for shelters and vehicles housing critical electronic equipment and personnel in all climates; resupply of bulk fuels, oils, and lubricants (POL); techniques and equipment to counter the surveillance threats; tactical shelters to replace vans; and marine-oriented logistics support items for ship-to-shore movement of supplies.

G. (U) RELATED ACTIVITIES: Coordination to avoid duplication and provide program guidance is accomplished through trilateral (United States, United Kingdom, and Federal Republic of Germany) Memorandum of Understanding and the Steering Committee for Bridging for 1985 and Beyond, Department of Defense Joint Container Steering Group, Joint Committee on Tactical Shelters, and Program Advisory Group for Bulk Petroleum Fuels Distribution. 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; the US Army Waterways Experiment Station, Vicksburg, MS; and the US Army Natick Research and Development Command, Natick, MA. Current and potential contractors include Pacific Car and Foundry, Renton, WA; Johns-Manville, Denver, CO; Maxnord 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.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Evaluation of the wheeled vehicle launcher for tactical Bridging for 1985 and Beyond has resulted in the selection of a traversing beam as the best alternative to pursue for dry-gap crossing. Design and fabrication of mechanisms to push the bridge over the gap and to emplace and retrieve the bridge were initiated. A self-propelled inflatable boat demonstrated feasibility for military reconnaissance and was entered into engineering development (ED). Improved reverse osmosis filters to remove chemical and radiological contaminants from water were developed. Control components for a total environmental control system (TECS) were designed and tested. Tropic climate tests of a high-strength Kevlar fabric fuel storage tank were completed. Tests were done on components of a low-temperature fueling system, and a new pump for use in extreme cold was fabricated. Analysis of a quick coupling for petroleum pipelines was made, and design and fabrication of a rapid-laying mechanical pipe-joining system was begun. A cost-sharing program with Canada was initiated to develop a 20-liter plastic fuel container as a replacement for the current 5-gallon metal can. Design features for tactical rigid-wall shelters were examined. The use of polyurethane paint for camouflage was evaluated. Efforts were

Program Element: #6.37.26.A Title: Combat Support Equipment
DOD Mission Area: #216 - Land Combat Service Support Budget Activity: #4 - Tactical Programs

initiated on heat signature suppressors for tactical power generators. An analysis was started of the Pershing missile system to identify design goals against enemy sensor detection.

2. (U) FY 1980 Program: Components of Bridging for 1985 and Beyond will be tested in the wet gap support role, and the fabrication and testing of bridge launch and retrieval mechanisms will be completed. The design of bridge components using composite structural elements, and the design of expedient systems for access to and egress from wet-gap crossing sites will be initiated. Work will be initiated on component analysis leading to design of tunnel detection systems. Design of prestaged ammunition loading system to provide efficient transport of containerized ammunition will begin. Development of improved water purification membranes is continuing. Development of a system to provide cool potable water in arid hot climates will be started, and components for a field system to treat and recycle waste water will be examined. Prototype fabric bulk fuel storage tank will be procured for operational testing (OTI). Component development and tests of low-temperature refueling system, quick-connect couplings for pipeline, and pipe-joining equipment are continuing. A flexible hoseline system for short-haul fuel transfer will be designed. Prototype plastic fuel containers will be obtained from Canada for US Army tests. A 50-foot-long accordion-type shelter will be fabricated for test, and the use of monocoque and frame panel structures for rigid-wall shelters will be investigated. Camouflage design goals for the Pershing missile system will be established. Development will begin of thermal signature suppressors for tactical power generators.

3. (U) FY 1981 Planned Program: Fabrication and tests of a modified transporter design for Bridging for 1985 and Beyond, and of bridge components of composite and metal matrix structural elements will be completed. Tests will be conducted on access and egress systems for current bridging. Prototype tunnel detection system will be procured for test. Fabrication of prestaged ammunition-loading systems will be completed. Tests of a 10,000-barrel fabric fuel tank, a rapidly emplaceable pipeline outfit, and low-temperature fuel dispensing system components will be conducted. Tests will begin on a flexible petroleum hoseline system. Prototype system for field blending of fire-safe fuels will be fabricated. Plastic 20-liter fuel containers will be evaluated. Development of a 50-foot accordion shelter will be continued. Kits to provide nuclear, ballistics, and chemical/biological agent protection for tactical shelters will be designed and fabricated.

4. (U) FY 1982 Planned Program: Design of a full-scale metal matrix bridge bay will be started. Advanced development (AD) will be completed on access/egress solutions for current inventory bridging, and efforts will begin to develop access/egress for future bridging. Development test (DT I) will be done on tunnel detection system. Tests of prestaged ammunition loading system prototype will be conducted. AD will be resumed on system to provide cool potable water in hot arid climates. Efforts will begin on air conditioning for combat vehicles and van-type air conditioner using waste heat energy. AD of fabric fuel tank will be completed and transitioned to engineering development (ED). Testing (DT/OT I) will be completed on a low-temperature fueling system, flexible hoseline, and mixing equipment for fire-safe fuels. AD will begin to improve

Program Element: #6.37.26.A
Title: Combat Support Equipment
DOD Mission Area: #216 - Land Combat Service Support
Budget Activity: #4 - Tactical Programs

refueling of combat vehicles under combat conditions, and on construction equipment for an automatic pipeline-laying system. AD will continue of a 50-foot accordion shelter. A shelter with nuclear, ballistic, and chemical/biological agent protection kits will be fabricated for test. AD will be resumed on thermal signature kits for generators. AD will be initiated on 60-ton, high-speed amphibian resupply watercraft, with emphasis on Navy-developed amphibious assault landing craft.

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

FY 1981 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 Programs

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

Project Number	Title	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	7916	11720			Continuing	Not Applicable
D560	Tactical Surveillance System	7916	11720			Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports the Army's Tactical Exploitation of National Capabilities (TENCAP) program (Part A) 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. Such intelligence/information is essential to the tactical commander to enable him to fight and win while outnumbered in a highly intensive, but short duration, 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. Since the enemy has the advantages of great numerical superiority and the choice of time, 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 provide that information to the tactical command and control environment in a sufficiently timely and useful form to greatly assist the commander in defending the enemy.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Continue Advanced Development (AD) work on hardware/software interfaces between existing and future strategic sensor systems and Army tactical exploitation systems. Conduct 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 1981 and FY 1980 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

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	7916	11720		Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	7916	11730		Continuing	Not Applicable

Change in FY 1981 request is based upon refinement of estimate as better cost data became available.
The decrease in FY80 is the result of a general Congressional reduction.

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 fuzed 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 collection, transmission, and manipulation 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; TRW, Los Angeles, CA; Aerospace Corp., El Segundo, CA; US Army Electronic Research and Development Command (ERADCOM), Adelphi, MD; Electromagnetic Systems Laboratories, Sunnyvale, CA; Ford Aerospace Corp., Palo Alto, CA; Systems Planning Corp., Arlington, VA; MRJ, Inc., McLean, VA.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: The systems interface elements for one system were completed and tested. Necessary experimental work was completed and the first system was prepared for an engineering demonstration. System development for interface with a second collecton system was continued. Advanced development (AD) of subsystems for an advanced exploitation system was continued.

2. (U) FY 1980 Program: Engineering demonstration of first system was completed early in the fiscal year. Advanced system development for interface with a second collection system will be completed. Operational testing (OT) and development testing (DT) will be performed by the program executive agent. Development of interface with other collection systems will continue.

3. (U) FY 1981 Planned Program: The development of advanced subsystems/systems for improved interface with and exploitation of other collection systems will continue. In addition, support to other test bed (Battlefield Exploitation and Target Acquisition) (BETA) systems will be provided.

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

4. (U) FY 1982 Planned Program: The development of a prototype system will be initiated based upon the results of first system engineering demonstration and contracted study efforts.

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

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

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

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

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

Project Number	Title	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	3612	5545			Continuing	Not Applicable
D181	Anti-radiation Missile Countermeasures	3612	5545			Continuing	Not Applicable

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED:

This program provides the broad, non-system-specific technology base for the development of countermeasures to the anti-radiation 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 and electronic warfare equipment. The effort addresses five areas of activity: threat evaluation and simulation, countermeasures development, laboratory simulation and testing, establishment and maintenance of a tri-Service field test capability, and support of tri-Service Joint Working Group on Anti-radiation Missile Countermeasures.

C. (U) BASIS FOR FY 1981 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 dual mode (radio frequency and infrared) capability; provide field test instrumentation, field test support, and data reduction for planned field tests of advanced development models of ARM-CM's for the PATRIOT and FIREFINDER (AN/TPQ-37) radars; continue development and test of passive decoy concept and a low-cost modular decoy (MODEC); continue development of countermeasures for application to continuous wave (CW) systems; continue analysis of anti-ARM radar techniques for application to future radar system design; continue development of main beam ARM 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: Anti-radiation Missile Countermeasures (ARM-CM)
Budget Activity: #4 - Tactical Program

D. BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	3612	5545		Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	4292	5545		Continuing	Not Applicable

Decrease in funding for FY79 of $680 was due to reprogramming to meet higher priority requirements. Decrease in FY81 is due to budgetary constraints not anticipated in FY80 submission.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable

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

Title: Anti-radiation 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 anti-radiation 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 threat. The objectives of this program are to characterize and simulate the known threat missile systems, develop appropriate countermeasures, provide laboratory and field test instrumentation, and provide triservice data exchanges and development capability.

G. (U) RELATED ACTIVITIES: Development of anti-radiation 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 system 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 Elements 6.35.16.N (Radar Surveillance Equipment), and the Air Force in 6.37.18.F (Electronic Warfare Technology) and 6.37.50.F (Counter-Countermeasures Advanced Development). The field test instrumentation and simulations developed under this D181 program directly support the Navy and Air Force work. The three Services 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, AL; General Dynamics, Pomona, CA; HRB-Singer, State College, PA; Brunswick Corporation, Defense Division, Costa Mesa, CA; System Planning Corporation, Arlington, VA. Additional Contractors are expected as a result of executing the FY80 program. The in-house developing organizations responsible for executing the program are Harry Diamond Laboratories, Army Electronic Research and Development Command, Adelphi, MD; US Army Missile Command (MICOM), Redstone Arsenal, AL, and Naval Weapons Center (NWC), China Lake, CA.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: In FY78 the generic seeker was developed for laboratory instrumentation; digital simulations of friendly ARMs 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 MICOM, and hardware-in-the-loop simulations were performed in support of evaluation of ARM-CM techniques for the HAWK and PATRIOT missile systems. The generic seeker was modified for mounting in the nose of a test aircraft with a real time computer control to provide a "flyable" generic ARM seeker (FGAS) capability. The FGAS is being integrated in an A-3 aircraft for use in a HAWK ARM-CM test planned for the 2nd quarter FY80 and for PATRIOT missile and AN/TPQ-37 (FIREFINDER) RADAR field tests planned for FY81. A reference aircraft-mounted instrumentation pod to be utilized with the FGAS was also developed for the HAWK missile tests. The passive decoy concept analysis continued. The study on 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.

2. (U) FY 1980 Program: In the 1st quarter of FY80 the Flyable Generic ARM Seeker (FGAS) will be integrated as the test aircraft with its instrumentation pod. In the 2nd quarter the FGAS will be utilized in a HAWK missile ARM-CM field test to provide data for HAWK ARM-CM simulation verification and data related to FGAS operation. Threat ARM simulation development will continue. MODEC decoy unit design will be initiated. The feasibility analysis of the passive decoy concept will be completed, and prototype hardware design will be started. Analysis of anti-ARM radar techniques for future radar design will be initiated. Analysis of continuous wave (CW) ARM homing methods and CM techniques against CW ARM's will be started in FY80. Feasibility analysis of mainbeam ARM and possible countermeasures will continue. Feasibility analysis of active ARM-CM Techniques will be provided to NATO, and support of the tri-Service ARM-CM Working Group will continue.

3. (U) FY 1981 Planned Program: Efforts to decrease the vulnerability of tactical radars to ARMs will continue. The Flyable Generic ARM Seeker with its instrumented aircraft will provide field test support for ARM-CM tests of the PATRIOT missile planned in the 2nd quarter of FY81 and for ARM-CM tests with AN/TPQ-37 (FIREFINDER) RADAR planned in the 3rd quarter of FY81. Threat ARM simulation development for use in ARM-CM effectiveness analysis will continue. Low-cost modular decoy (MODEC) and passive decoy hardware should be completed during FY81 and field test planning to evaluate the hardware will be started. Analysis of anti-ARM radar techniques for future radar design will continue. Analysis of continuous wave (CW) ARM homing methods and development of countermeasure techniques against CW ARMs will continue. Development of countermeasures against the mainbeam ARM concept will continue. Hardware implementation of a flyable dual mode (radio frequency (RF) - infrared (IR)) seeker will begin during FY81. Analysis of active ARM-CM techniques will continue through FY81. Modest efforts on determining susceptibility and possible countermeasures against airborne emitters and possible RF-IR countermeasure techniques will be started. Support for NATO and the tri-Service ARM-CM Working Group will be continued.

Program Element: #6.37.37.A
Title: Anti-radiation Missile Countermeasures (ARM-CM)
DOD Mission Area: #213-Ground Air Defense
Budget Activity: #4 - Tactical Program

4. (U) FY 1982 Planned Program: Threat ARM simulation development for use in ARM-CM effectiveness analysis will continue. From FY80 and FY81 investigations specific countermeasures techniques for CW systems will be implemented, and new radar techniques will be evaluated for their anti-ARM effectiveness. Hardware implementation for a flyable dual mode (RF-IR) seeker will continue. Field testing of the low-cost modular decoy and passive decoy hardware is planned during FY82. Additional efforts in active ARM-CM techniques are planned to be continued.

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

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.40.A Title: Short Range 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0	3000	15583	17112	26286	61981
	QUANTITIES						4
D593	SHORAD-C2 System	0	3000	15583	17112	26286	61981

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Short range air defense (SHORAD) weapon capabilities have outstripped the force commander's ability to manage air defense operations effectively. The present command and control system does not provide for effective flow of air battle management information. This lack of effective flow of air battle management information results in battle management decisions being made based on incomplete knowledge and slow, error prone dissemination of airspace control orders. The inability of the current system to provide SHORAD fire units timely and accurate sensor information to support detection, identification, and engagement, results in missed opportunities to engage the air threat, and increased risk to friendly aircraft. The new SHORAD Command and Control system will improve the effectiveness of the division air defense by integrating weapons, sensors, and command posts into a single, functional, automated system. Near time information processing and air threat warning will enhance the combat power of appropriate weapons, conserve resources, and reduce the risk to friendly aircraft. The SHORAD Command and Control development is based on a phased approach designed to initially correct serious deficiencies in Europe, and subsequently to field a complete, upgraded command and control system.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: The requested funds will continue the system integration contract effort begun in FY80. The contractor will upgrade current systems and hardware where appropriate, and will develop the required software programs and weapon system simulation devices necessary for the test bed. Design and fabrication of prototype command post assemblages will be initiated along with hardware and software developments for all command posts and weapon systems. Logistics support and training packages for the initial system will be completed. Documentation for the upgraded system will begin.

Program Element: #6.37.40.A Title: Short Range Air Defense Command and Control (SHORAD-C2 System)
DOD Mission Area: #213 - Ground Air Defense Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission 1/
Initiate System Design	2Q79	
Complete Initial System Design	2Q80	
Test Bed, Phase I System to Meet Immediate Requirements	4Q80	
Validation In-Process Review (IPR), Phase I System	1Q81	
Operational Effectiveness Demonstrations, Europe, Initial System	1Q83	
Test Bed Upgraded System	4Q83	
Validation IPR, Upgraded System	4Q83	
Operational Effectiveness Demonstrations, Europe, Upgraded System	2Q85	Completed early in FY 1985

1/ The milestones listed in the FY 1980 submission did not clearly reflect the development of this two phased program. The milestones have been changed to those listed above. The final milestone in the FY 1980 submission, "Test Corp/Theater NATO Integration and Air Defense Weapon Systems and Command and Control," was to be "Completed early in FY 1985." The current milestones reflect a similar completion date for the European effectiveness demonstration.

Program Element: #6.37.40.A Title: Short Range Air Defense Command and Control (SHORAD-C2 System)
DOD Mission Area: #213 - Ground Air Defense Budget Activity: #4 - Tactical Programs

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	0 1/	3000	15583 2/	43398 2/	61981 3/
Funds (as shown in FY 1980 submission)	500	3000	3600	28400	35500

1/ Since no requirements document was available for the program in FY79, funds were reprogramed from this program to higher priority programs.

2/ Funding was increased significantly beginning in FY 1981 to support fielding of the Command and Control System in conjunction with the new air defense weapons.

3/ The changes reflected in 1/ and 2/ resulted in a new program Total Estimated Cost.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Other Procurement, Army						
Funds (current requirements)				13370	281430	294800 1/
Funds (as shown in FY 1980 submission)					68000	68000
Quantities (current requirements)					16	16
Quantities (as shown in FY 1980 submission)					16	16

Program Element: #6.37.40.A
Title: Short Range Air Defense Command and Control (SHORAD-C2 System)
DOD Mission Area: #213 - Ground Air Defense
Budget Activity: #4 - Tactical Programs

1/ The FY 1980 submission was incorrect and should have reflected $294,800 thousand. The $68000 thousand was the FY79 Congressional Descriptive Summary Total Estimated Cost and did not include all of the hardware that is currently envisioned to be purchased under this program to satisfy the short-range air defense (SHORAD) Command and Control requirements.

Program Element: #6.37.40.A Title: Short Range 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, the division air defense (DIVAD) requires an integrated command and control (C^2) system capable of supporting the Division Commander's tactical plan. The C^2 system will improve the effectiveness of the DIVAD by integrating weapons, sensors, and command posts into a single functional system, by realizing the full combat power of the weapons, by conserving resources, and by reducing the risk to friendly aircraft. The short-range air defense (SHORAD) C^2 system includes command post facilities at the Division Airspace Management Element and SHORAD battalions, batteries, and platoons. It also includes the necessary communications and data terminals to interface with the air defense weapons and sensors in the division. The SHORAD C^2 system will interface with joint service air defense systems above division through the high-to-medium air defense group and battalion, and may interface directly with Air Force forward air control posts. The SHORAD C^2 system configuration will vary as new concepts and equipment capabilities evolve. Sensor integration will be able to exploit the improved Forward Area Alerting Radar, onboard radars of new Division Air Defense weapons, use of passive and active sensors, such as the Standoff Target Acquisition System and the AN/TPQ-36, as well as inputs from sensors external to the division such as the Airborne Warning and Control System and Improved [illegible]WK. The time-critical nature of the air battle dictates automation of information processing functions and reliable data communication nets to disseminate critical data. New communication technologies, such as time-division multiple-access, will provide faster, more reliable and survivable netting. Human interaction devices for data display and system interface will provide the means for each component of divisional air defense to perform to its designed capability.

G. (U) RELATED ACTIVITIES: Program Element 6.47.79.A, Joint Interoperability Tactical Command and Control Systems (JINTACCS) (Army). The JINTACCS program will provide data related to overall improvement in tactical effectiveness of US armed forces in joint battlefield operations by insuring compatibility and interoperability among the joint services/agencies, operating facilities, and their supporting command and control computer systems. Duplication of effort will be precluded by establishing and maintaining open lines of communication between responsible segments, assuring constant data exchange and coordination of ongoing team efforts.

H. (U) WORK PERFORMED BY: Program Management will be performed by Project Manager, Missile Minder, supported by US Army Communications Research and Development Command (CORADCOM), Ft Monmouth, NJ, US Army Missile Command (MICOM), Redstone Arsenal, AL, and Armament Research and Development Command (ARRADCOM), Picatinny Arsenal, NJ. Contracted efforts will be performed by contractors to be selected competitively.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: The U.S. Army Communications Research and Development Command (CORADCOM) and the U.S. Army Air Defense School (USAADS) coordinated a study titled "Division Air Defense Command and Control Analysis" which

Program Element: #6.37.40.A Title: Short Range Air Defense Command and Control (SHORAD-C2 System)
DOD Mission Area: #213 - Ground Air Defense Budget Activity: #4 - Tactical Programs

examined reaction time versus weapon effectiveness under different levels of command, control and communication (C^3); cost of C^3 versus cost of weapon systems or aircraft; and potential test bed equipment and configurations. The results of the study were that operational effectiveness, reaction time, kill ratio, and aircraft identification could be improved with the introduction of automated command and control. In-house efforts at US Army Communications Research and Development Command (CORADCOM), were begun to define a system exploiting existing, off-the-shelf tactical data systems. Communication developments and technologies were examined. Compatibility and interoperability requirements for on-going air defense weapon systems were also identified. CORADCOM allocated $600 thousand from program element 6.27.01.A, Project W92, Communications Technology, in FY 1979 to initiate a phased system development program that would lead to development of an improved system to meet urgent requirements in Europe by 1982 and evolve into an upgraded system by 1985 that could fully exploit the capabilities of new weapons systems. A concept for the overall system was developed and component design for the initial system was initiated.

2. (U) FY 1980 Program: Full-scale development of the initial system was begun with a system engineering and management effort, and a system integration effort primarily covering a one-year development to correct immediate European deficiencies. Data related to operator technical training and government-furnished equipment for the test bed will be obtained and components comprising the revised technical configuration will be assembled and thoroughly tested. The test bed will be designed to insure that the initial system improves the reliability of communications and provides for dissemination of more reliable Forward Area Alerting Radar (FAAR) data. Test bed efforts will culminate in a demonstration of the operational effectiveness of the initial system design.

3. (U) FY 1981 Planned Program: Full-scale development of the upgraded system will begin with a continuation of the system integration contract effort, begun in FY80 to operate and maintain the test bed. The contractor will upgrade related systems hardware; develop required software programs for the revised command and control concept; develop devices to simulate weapon systems not present in the test bed; design and develop operational software; develop required interfaces to weapon systems; develop test and training plans; and develop and maintain configuration control. Hardware for the test bed will be procured. Design and fabrication of prototype command post assemblages will be initiated, together with hardware and software developments (displays, processors, and communications) for all command posts and weapon systems (STINGER, ROLAND, Division Air Defense Gunk Improved CHAPARRAL, etc.). Preparation of logistical support and training for the initial system will be completed. Generation of documentation for the upgraded system will begin.

4. (U) FY 1982 Planned Program: The system integration contractor will continue to provide support in the areas of equipment/system development and improvement, software program generation and maintenance, and simulation device design and manufacture. Advanced systems/equipment will be integrated into the test bed and evaluated.

Program Element: #6.37.40.A Title: Short Range Air Defense Command and Control (SHORAD-C2 System)
DOD Mission Area: #213 - Ground Air Defense Budget Activity: #4 - Tactical Programs

5. (U) Program to Completion: Development of the test bed for the upgraded system will be completed. All pertinent documentation and training will be completed. Command, Control, Communication, and Intelligence (C^3I) and system effectiveness resulting from the integration of short-range air defense (SHORAD-C^2) command posts, weapons, and sensors will be evaluated. Interfaces with the high-to-medium air defense system and air forces systems will be evaluated and finalized. Based on the results of the test bed operation, upgrading of the initial systems fielded in Europe will be completed in 1985. Subsequent procurement of systems for the complete inventory will be based on the results of operational effectiveness demonstrations of the upgraded system in Europe.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.45.A
Title: Tactical Electronic Support Measures Systems
DOD Mission Area: #255 - Tactical Surveillance, Reconnaisance, & Target Acquisition
Budget Activity: #4 - Tactical Programs

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

Project Number	Title	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	11774	15119			Continuing	Not Applicable
	QUANTITIES						Not Applicable
D905	Tactical Electronic Support Measure Systems	250	89			Continuing	Not Applicable
D907	Tactical Electronic Surveillance Systems	5934	10781			Continuing	Not Applicable
D925	Tactical Electronic Warfare and Intelligence Command and Control Systems	5590	4249			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 non-Signal Intelligence (SIGINT) 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 force. 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.

Program Element: #6.37.45.A
DOD Mission Area: #255 - Tactical Surveillance, Reconnaisance, & Target Acquisition

Title: Tactical Electronic Support Measures Systems
Budget Activity: #4 - Tactical Programs

C. (U) BASIS FOR FY 1981 RDTE REQUEST:

1. (U) Continue advanced development of the SIGINT/EW subsystem (SEWS) of the All Source Analysis System (ASAS). A Corps level prototype module with attendant software will continue to be fabricated. Software will be evaluated.

2. (U) Continue investigation of applications to exploit strategic sensor programs.

D. BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	11774[1/]	15119[2/]	[3/]	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	12474	17313		Continuing	Not Applicable

1/ Decrease of $.7 million in FY 1979 (project D925) was due to reprogramming to a higher priority project.
2/ Decrease of $2.19 million in FY 1980 due to Congressionally directed reduction in scope of effort in FY 1980 budget decision (Project D907).
3/ Aggregate increase of $1.118 million in FY81 results from additional requirements and incremental funding adjustments in advanced development of the SIGINT/EW subsystem of the All-source Analysis System (D925), deferral of project D905, and increase in project D907 to expand efforts in exploiting national assets for the tactical commander. The D905 RDTE effort was reevaluated based on threat projections and technological forecasts versus priorities of other FY 1981 program requirements. Results dictated an indefinate deferral until such time as requirements and threats justify a concerted developmental program.

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

Program Element: #6.37.45.A
DOD Mission Area: #255 - Tactical Surveillance, Reconnaisance, & Target Acquisition

Title: Tactical Electronic Support Measures Systems
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is to establish the technical feasibility and military potential of projects being developed in three functional areas: tactical electronic support measures (ESM) (D905), 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). Although there is no FY 1981 developmental effort, project D905 is concerned mainly with collection, analysis, and location of electro optical emitters and their associated weapons and/or units. 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

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 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). Following Air Force/Navy/NSA PEs apply: 2.56.74.N, Electronic Countermeasures Reponse; 6.42.55.N, Electronic Support Measures Equipment; 6.37.97.N, Surface Electro-Optic Systems; 6.47.10.F, Reconnaissance Electronic Warfare Equipment; 6.37.43.F, Electro-Optic Warfare, and 3.58.85.G, Tactical Cryptologic Program. Prior to FY 1978, efforts in this project were found in PE 6.47.11.A, D905, General Support Electronic Warfare Systems.

H. (U) WORK PERFORMED BY: The major contractors for the two projects are: Aerospace Corp, El Segundo, CA; Electromagnetic Systems Laboratories, Sunnyvale, 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; Program Manager, Control and and Analysis Centers, 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, Reconnaisance, & Target Acquisition

Title: Tactical Electronic Support Measures Systems
Budget Activity: #4 - Tactical Programs

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments:

a. (U) D905 - Investigations into the feasibility of an Electro-optics Collection Analysis and Reporting system were terminated in FY79 pending refinement of threat and operational requirements which would warrant further developmental study.

b. (U) D907 - System design was completed for interface of two strategic electronic surveillance systems to render them more responsive to tactical commanders' needs. Installation of interface hardware was begun.

c. (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 evolution of the Battlefield Exploitation and Target Acquisition (BETA) program and the Technical Control and Analysis Center (Division) (TCAC(D)) (see PE/Project 6.47.45.A/D926-Tactical Electronic Warfare and Intelligence Command and Control Systems).

2. (U) FY 1980 Program:

a. (U) D905 - No planned program.

b. (U) D907 - Install hardware interface with one strategic system and commence initial testing. Continue advanced development of strategic electronic surveillance system interfaces. Investigate advanced design work for interface with strategic communications intelligence systems.

c. (U) D925 - Advanced Development of the ASAS SIGINT/EW module hardware and software will continue.

3. (U) FY 1981 Planned Program:

a. (U) D905 - No planned program.

Program Element: #6.37.45.A Title: Tactical Electronic Support Measures Systems
DOD Mission Area: #255 - Tactical Surveillance, Reconnaisance, & Target Acquisition Budget Activity: #4 - Tactical Programs

b. (U) D907 - Continue advanced development of strategic interfaces.

c. (U) D925 - Advanced development model of the All-Source Analysis System (ASAS), SIGINT/EW subsystem (SEWS) will be completed and delivered. CONUS testing will be conducted. Developmental/Operational Testing Type I (DT/OT I) will be initiated. The results of these evaluations (BETA OVERSEAS TEST, SEWS DT/OT I) and feedback from the Technical Control and Analysis Center (TCAC(D)) (6.47.45.A/D926) employment will be used to begin ASAS Required Operational Capability (ROC) preparation.

4. (U) FY 1982 Planned Program:

a. (U) D905 - No planned program.

b. (U) D907 - Continue advanced development of strategic interfaces.

c. (U) D925 - Complete DT/OT I. Finalize and issue ROC. Prepare to proceed into engineering development phase of the All-Source Analysis System (ASAS) scheduled to begin in FY 1982.

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 Support Measures Systems.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D907
Program Element: #6.37.45.A
DOD Mission Area: #255 - Tactical Surveillance, Reconnaisance 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 program 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. 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 fuzed 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 collection, transmission, and manipulation 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; Electromagnetic Systems Laboratories, Sunnyvale, CA; US Army Electronics Research and Development Command (ERADCOM), Adelphi, MD; US Army Communications Research and Development Command, Fort Monmouth, N.J.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Studies were completed which provide the technical basis for the equipment, techniques, systems development and interface definition with three strategic systems. Advanced development work was initiated on one strategic electronic surveillance system to rendere it more responsive to tactical commanders' needs. System design was completed for interface with two strategic electronic surveillance systems. Installation of interface hardware was begun. Advanced development work was to improve tactical utility of three strategic electronic surveillance system was initiated on two and continued on one.

Project: #D907 Title: Tactical Electronic Surveillance System
Program Element: #6.37.45.A Title: Tactical Electronic Support Measures Systems
DOD Mission Area: #255 - Tactical Surveillance, Reconnaisance and Target Acquisition Budget Activity: #4 - Tactical Programs

2. (U) FY 1980 Program: Install hardware interface and implement software upgrade on one strategic electronic surveillance system and commence initial testing. Continue Advanced Development (AD) of interface with second strategic electronic surveillance system. Investigate advanced design work on interfaces with two strategic communications intelligence systems and commence initial system modifications.

3. (U) FY 1981 Planned Program: Continue hardware interface and software upgrade with one, strategic Electronic Intelligence (ELINT) system. Continue Advanced Development of interface with second strategic ELINT system. Continue advanced design work to allow the Interim Tactical ELINT Processor (ITEP) to operate with a new strategic electronic surveillance system. Continue with Advance Development (AD) of interface with strategic communications intelligence system.

4. (U) FY 1982 Planned Program: Complete hardware interface and software program with one strategic Electronics Intelligence (ELINT) system. Continue AD of interface with second strategic system. Complete AD design work for ITEP interface with new strategic ELINT system. Continue AD of interface with two strategic systems.

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

6. (U) Major Milestones: Not applicable.

7. Resources ($ in thousands):

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	5934	10781	-	-	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	5934	12690	-	-	Continuing	Not Applicable

(U) The reduction in FY80 was due to Congressional appropriation reduction. Increase in FY81 was due to increased efforts in Tactical ELINT Processor (TEP) design, and interface with one strategic system.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.46.A
Title: Single Channel Ground and Airborne Radio System (SINCGARS)
DOD Mission Area: #256 - Tactical Communications
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	14116	18476	15587	6698	8100	69278
	QUANTITIES						129
D555	Single Channel Ground and Airborne Radio System (SINCGARS)	14116	18476	15587	6698	8100	69278

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the advanced development of the Single Channel Ground and Airborne Radio System - Very High Frequency (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 the severe electronic warfare environment which is projected for the 1980's. The electronic counter-countermeasure (ECCM) Technique being validated is frequency hopping (FH).

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Funds requested are required to continue monitoring and funding three (3) competitive contractors. The three competitive prototyping contractors will be completing Brassboard Evaluation Testing and final design of the Advance Development Models (ADM) of the radios. Fabrication and test of the ADM's will be accomplished in FY81 with deliveries scheduled for 1st Qtr FY82. In-house efforts will consist of engineering support to monitor the three contracts as well as planning support for Development Testing/Operational Testing (DT/OT). DT I will be conducted during FY81.

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

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Advanced Development (AD) Contract Award	April 1978	April 1978
Development Test/Operational Test I (DT/OT) Completed	February 1982	August 1981
Army Systems Acquisition Review Council/Defense Systems Acquisition Review Council	May 1982	October 1981
Engineering Development (ED)	July 1982	November 1981
DT/OT II Completed	July 1984	December 1983
ASARC/DSARC III	November 1984	April 1984

Change in milestone dates was due to a change in the SINCGARS threat which required a review of the program's direction. The program is now proceeding as previously planned, although a schedule delay has been incurred.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	14116[1/]	18476[2/]	15587[3/]	8100	70905[4/]
Funds (as shown in FY 1980 submission)	12721	18501	14190	33450	87258

1/ (U) Increase in FY79 program constituted a reprogramming action in transferring the Vehicular Intercom and Audio Transducer tasks from program element 6.37.07.A to this program.

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

2/ (U) Decrease in FY80 reflects a reduction by Congress.

3/ (U) Increase in FY81 was an adjustment for inflation.

4/ (U) Change in cost to complete was caused by the generation of a new program element for Engineering Development (PE 6.47.51.A) which begins in FY82.

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

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 radio has the following key development goals (1) modularity with maximum commonality of components in the various configurations; (2) capable of operating with an add-on Communication Security (COMSEC) and Electronic Counter-Countermeasure (ECCM) modules; (3) interoperable with combat net radios of our NATO allies; and (4) capable 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 AF, 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 facimile. To insure a total systems approach on critical ancillary devices, the following are under this element:

1. (U) Vehicular Intercom System: This is the intercom system of the future to replace the antiquated AN/VRC-I. 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. (U) Transducers: New transducers are being developed that will 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) to 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 Product Division, Rockwell International, Cedar Rapids, IA. In-house developing organization is the US Army Communication 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) FY79 and Prior Accomplishments: The Army Science Board evaluated the revised Threat on the SINCGARS-V and recommended to the Army in Jul 78 not to direct a change to the contract. This was accepted by the Army 1 Sep 78, and both

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

contractors were advised. A six month schedule delay was negotiated and finalized in Jan 79 due to the Threat situation. The Germans continued their interest in participating in the ECCM competition with the other contractors. A revised Memorandum of Understanding (MOU) with Germany is in process of being formulated. Cost/Schedule Control Systems Criteria (C/SCSC) Reviews were held at Cincinnati, ITT, and Collins. Preliminary Design Reviews following Breadboard design efforts were held with the three contractors.

2. (U) FY 1980 Program: Continue monitoring performance of the three SINCGARS-V contractors during the Brassboard Design and Formulation Phase. Finalize NATO Memorandums of Understanding (MOU's). Conduct C/SCSC redemonstrations with Cincinnati and ITT to determine if all deficiencies have been corrected. Independent Government monitoring of Engineer Design Testing (EDT) will be accomplished.

Advance Development (AD) contracts will be awarded on the Vehicular Intercom System and the Transducer programs.

3. (U) FY 1981 Planned Program: Continue monitoring contractors performance. Start and complete Development Testing (DT-1) on SINCGARS-V. Prepare Request for Proposals (RFP) for the next phase of program. The development models of the new Intercom System and the Transducers will be delivered for concurrent DT/OT-1 testing with SINCGARS-V. Preliminary models of the new Combat Vehicle Communications (CVC) helmet will be received for testing with the Vehicular Intercom and SINCGARS-V to insure overall system compatibility. Results of an Electromagnetic Compatibility/Vulnerability (EMC/EMV) analysis for frequency hopping radios will be applied to the contractual effort.

4. (U) FY 1982 Planned Program: Advance Development models will be delivered for Operational Testing (OT I) testing. Contractors will provide sustained engineering support during OT I. ASARC/DSARC II will be held to approve decision on next phase of the program. Engineering Development (ED) contract will be awarded; all necessary experimental work will be performed and the SINCGARS system will be ready for full scale development. Validation In Process Reviews (IPR's) will be conducted on the Vehicular Intercom and the Transducer Programs.

5. (U) Program to Completion: This program is continued in Program Element 6.47.51.A, Project Number IX464751D282. Continue monitoring and providing engineering support to the ED contracts awarded. Start and complete DT/OT-2 testing. ASARC/DSARC-III will be held. Type classification approved and production contracts awarded. Initial Operating Capability (IOC) is scheduled for May 1987.

Program Element: #6.37.46.A Title: Single Channel Ground and Airborne Radio Subsystem (SINCGARS-V)

DOD Mission Area: #256 - Tactical Communications Budget Activity: #4 - Tactical Programs

J. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation:

a. (U) Developmental testing of Single Channel Ground and Airborne Radio Subsystem (SINCGARS-V) will consist of: Engineer Design Testing (EDT) to determine the degree to which the contractors meet the technical criteria as defined by the user required operational characteristics (ROC) and Advanced Development Verification Tests (ADVT) designed to validate that the AD models meet the technical performance requirement of the specification. EDT is scheduled to begin in July 1980 and ADVT in April 1981. All testing for this program is in the planning stage. A Coordinated Test Program (CTP) for the system has been distributed. Test plans are being formulated to reduce test duplication to the minimum; i.e., EDT will be conducted in the contractor's plants with government monitors to witness and validate test results. Additionally during ADVT, the government will independently test only those specific items which are deemed necessary or which cannot be tested by the contractor. The SINCGARS-V equipment to be tested in DT is expected to be representative of the end items to be procured in the production phase. The equipment to be tested is the vehicular, backpack, and airborne configuration of the Army's future Very High Frequecy-Frequency Modulated (VHF-FM) Combat Net Radio (CNR). All SINCGARS-V equipment contracted for will be available for all required tests. Current forecasts reveal no availability problems with necessary support equipment.

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. For DT tests, US Army Test and Evaluation Command (TECOM) has contracted with Bell Technical Operational Corporations, Sierra Vista, Arizona, for test and evaluation support. SINCGARS-V is a major Army Program managed by a fully chartered Project Manager Office. TECOM is the agency responsible for the conduct of the Development tests. Operational Test and Evaluation Agency (OTEA) is the Army agency responsible for the conduct of Operational tests. US Army Materiel Systems Analysis Activity is the independent DT test designer and evaluator. The major test facility to be utilized in the conduct of DT 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 will be used to conduct the contractor portion of the Development Testing (DT), which will be performed by contractor personnel. Army Electronic Proving Ground (AEPG) personnel will monitor these tests.

c. (U) The schedule for developmental testing is:

(1) (U) Engineer Design Testing (EDT) Draft Plan - January 1980

Program Element: #6.37.46.A Title: Single Channel Ground and Airborne Radio Subsystem (SINCGARS-V)

DOD Mission Area: #256 - Tactical Communications Budget Activity: #4 - Tactical Programs

(2) (U) EDT - July-September 1980 *

(3) (U) Final Design Review - October 1980 *

(4) (U) Advanced Development Verification Tests (ADVT) Draft Plan - October 1980

(5) (U) ADVT (Contractor) - April-October 1981 *

*Major Milestones

d. (U) Each contractor will provide 10 receiver-transmitters, in the following configurations:

(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 receive-only capability

(5) (U) Two (2) aircraft

(6) (U) In addition, sixteen (16) Communicative Security Modules and Electronic Counter-countermeasure Modules (ECCM) 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.

e. (U) SINCGARS-V will be utilized by the Navy, Marine Corps, and Air Force in addition to the Army. However, no tests have been conducted by any of these DOD components.

f. (U) Reliability Growth Testing will be performed during Development Testing (DT). Data from this test will identify items requiring frequent maintenance. Sufficient test time will be available in certain instances to verify the adequacy of the design changes incorporated to reduce the frequency of repair. Subsequent to Developmental Tests/Operational

Program Element: #6.37.46.A Title: Single Channel Ground and Airborne Radio Subsystem (SINCGARS-V)

DOD Mission Area: #256 - Tactical Communications Budget Activity: #4 - Tactical Programs

Tests (DT/OT) and prior to production award, 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 also verify the adequacy of certain design changes resulting from DT/OT. The Maintenance Teardown and Evaluation and the Maintainability Demonstration will be conducted to evaluate Technical Manuals (TM's) Maintenance capability (test support equipment, Maintenance concept). Maintenance personnel used during these tests will be military personnel with appropriate Military Occupational Specialty (MOS).

g. (U) The degree of similarity between the items to be tested during Development Testing (DT) and those to be tested during Operational Testing (OT) is expected to be very high. In addition, the production configuration is expected to have the same high degree of similarity between it and the DT/OT items.

h. (U) Environmental testing includes the following (conducted in accordance with MIL-STD-810C): Temperature, high humidity, fungus, high altitude, vibration, aircraft installation, explosive atmosphere, ground installation, salt fog, rain, and dust.

2. (U) Operational Test and Evaluation:

a. (U) Operational Testing (OT) of SINCGARS-V will be conducted between October 1981 and March 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 user troops will operate the equipment. The SINCGARS-V equipment to be tested in OT is expected to be representative of the end items to be procured in the production phase.

b. (U) The test site for OT has not yet been selected. Three (3) test sites are presently being evaluated with regard to frequency availability and operational security. OT will be conducted by a Mechanized Infantry Brigade located on site. The schedule for operational testing is:

Program Element: #6.37.46.A Title: Single Channel Ground and Airborne Radio Subsystem (SINCGARS-V)

DOD Mission Area: #256 - Tactical Communications Budget Activity: #4 - Tactical Programs

(1) (U) OT (Draft Plan) - April 1981

(2) (U) OT - October 1981-February 1982*

Major Milestone*

c. (U) Each contractor will provide the following configurations in the quantity shown:

(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 receive only capability

(5) (U) Six (6) aircraft

(6) Thirty-nine (39) Communication Security (COMSEC) and Electronic Counter-countermeasure Modules (ECCM) will be available for test during Operational Testing (OT). Ancillary devices will also be available and tested as part of the system. SINCGARS-V will be utilized by the Navy, Marine Corps, and Air Force in addition to the Army. However, no tests have been conducted by any of these DOD components.

e. (U) Subsequent to Developmental Test/Operational Testing (DT/OT) and prior to production award, each contractor will be required to conduct a Prototype Reliability Qualification Test (PRQT), a Maintanence Teardown and Evaluation, and a Maintainability Demonstration.

f. (U) All Operational Testing (OT) is scheduled to be completed prior to the program budget year major production contract award.

Program Element: #6.37.46.A

Title: Single Channel Ground and Airborne Radio Subsystem (SINCGARS-V)

DOD Mission Area: #256 - Tactical Communications

Budget Activity: #4 - Tactical Programs

3. (U) System Characteristics:

Operational/Technical Characteristics	Objectives	Demonstrated Performance[1/]
Frequency Range	30-88 MHz	
Number of Channels	2320	
Channel Spacing	25 KHz	
Voice Communication Range		
Manpack	8 km	
Vehicular	35 km	
Airborne	35 km	
Digital Transmission (Data) Range (Bit Error Rate 10^{-3})		
Manpack	4.5 km	
Vehicular	20.0 km	

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Mean Time Between Failure[2/]	
Manpack	1300 hrs.
Vehicular	1250 hrs.
Airborne	750 hrs.
MTTR[2/]	
Organizational	15 min
Direct Support	45 min
General Support	2.5 hrs.

1/ No testing performed to date
2/ Statistical Confidence - 80% or better

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.37.55.A Title: Tactical Electronic Countermeasures Systems
DOD Mission Area: #257 - Electronic Warfare & Counter C^3I Budget Activity: #4 - Tactical Programs

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

Project Number	Title	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	7697	8734			Continuing	Not Applicable
DK12	Division Tactical Electronic Countermeasures Systems	4287	4954	—	—	Continuing	Not Applicable
DK13	Corps Tactical Electronic Countermeasures Systems	930	1155		—	Continuing	Not Applicable
D251	Protective Electronic Warfare Equipment	2480	2625	—	—	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 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 1981 RDTE REQUEST: FY 1981 funds are required to support: development of automatic test equipment applications software for the AN/MLQ-34 Tactical Ground-based Jammer (TACJAM), and the heliborne AN/ALQ-151 jammer (QUICK FIX), to allow for intermediate maintenance to be performed at common automatic test system facilities; continuation of advanced development of a family of expendable jammers; initiation of advanced development of jamming systems; and initiation of efforts

Program Element: #6.37.55.A Title: Tactical Electronic Countermeasures Systems
DOD Mission Area: #257 - Electronic Warfare & Counter C^{3}I Budget Activity: #4 - Tactical Programs

D. BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	7697	8734		Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	7883	8839		Continuing	Not Applicable

Decrease of $512K in Project D251 in FY 1979 was due to reprogramming to meet higher priority needs. Increase of $335K in Project DK12 in FY 1979 was due to increased test support costs. Decrease of $105K in Project DK12 is due to reprogramming to meet higher priority requirement. Increase of $7K in Project DK12 in FY81 is due to readjustment of project funding profile as a result of late contract awards in FY 1979, acceleration of Expendable Jammer development, and inflation. Increase of $420K in Project DK13 in FY81 is due to increased automatic data processing support costs and inflation. Decrease of $2733K in Project D251 in FY81 is due to budgetary constraints which preclude funding of this project to desired level.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Other Procurement, Army*:						
Funds (current requirements)	22400	21400				
Funds (as shown in FY 1980 submission)	22400	21400		Not Shown		
Quantities (current requirements)	7	11				
Quantities (as shown in FY 1980 submission)	10	10		Not Shown		

Program Element: #6.37.55.A Title: Tactical Electronic Countermeasures Systems
DOD Mission Area: #257 - Electronic Warfare & Counter C^3I Budget Activity: #4 - Tactical Programs

*Funds/quantities shown are for AN/MLQ-34 (TACJAM) (Project DK12). Difference between FY 1979, FY 1980, and FY 1981 quantities is due both to inflation and to use of cost data in this submission based on actual FY 1979 multiyear contract award. Difference in cost to completion is due to increased quantity to support the full Army Acquisition Objective (23/$70,000), use of data based on actual FY 1979 contract experience, and inflation.

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Aircraft Procurement, Army**:						
Funds (current requirements)	2300	18900				
Funds (as shown in FY 1980	300	33400		Not Shown		
Quantities (current requirements)	0	5	0	0		
Quantities (as shown in FY 1980 submission)	0	5	0	Not Shown		

**Funds/quantities shown are for AN/ALQ-151 (QUICK FIX) (Project DK12). Difference in FY 1979 ($2000K) is reprogramming due to procurement program restructuring as a result of FY 1979 contract execution. Differences in FY 1980 ($14500K) and FY 1981 ($2300K) are due to FY 1980 Appropriations Act (see Program Element 6.47.50.A, Electronic Warfare & Counter C3I); remaining difference ($3200K) of $5,500K total difference in FY 1981 is due to program restructuring which allowed several expenditures to be deferred until FY 1982. Difference in total estimated cost is due to increased quantity (5/$35,000K), inflation, increased unit cost of basic UH-60A helicopter, and Congressional transfer in FY 1980 Appropriations Act of $17100 to RDTE,A.

Program Element: #6.37.55.A Title: Tactical Electronic Countermeasures Systems
DOD Mission Area: #257 - Electronic Warfare & Counter C^3I Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is to provide for validation/advanced development of electronic countermeasures (ECM) equipment and systems to deny or 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, infra-red and optical battlefield surveillance devices. Equipment developed includes ground-vehicular mounted and airborne ECM systems. Developments include airborne Multiple Target Electronic Warfare System (MULTEWS) Close Air Support Jammer; Heliborne Jamming System (QUICK FIX); Tactical Army Jammer (TACJAM); quick erectable antenna mast assemblies; automated test equipment software development for all systems; expendable jammers, both 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 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. (C) FY 1979 and Prior Accomplishments: Studied techniques for degrading the guidance levels of enemy antitank guided missile (ATGM). Electronic countermeasures (ECM) for ATGM were field tested. Advanced development was completed and military

potential demonstrated for the following systems: The AN/ALQ-143 Multiple Target Electronic Warfare System (MULTEWS) the AN/MLQ-33 Close Air Support Jammer (CAS ECM), and the AN/ALQ-151 Heliborne Jamming System (QUICK FIX). In addition, a program to optimize the communications receivers was completed. Development and Operational Testing, and standard type classification of AN/MLQ-34, Tactical Army Jammer (TACJAM), was completed. Procurement of applications software for the AN/MLQ-34 and AN/ALQ-151 (QUICK FIX) to allow for intermediate maintenance to be performed at common automatic test system facilities 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 begun. A program to develop optimized communications was begun. Advanced Development for a series of expendable electronic countermeasures (ECM) devices was initiated.

2. FY 1980 Program: Efforts initiated in prior years will continue. Development of Automatic Test Equipment (ATE) software for the AN/MLQ-34 Tactical Ground Based Jammer (TACJAM) and the AN/ALQ-151 Heliborne Jammer System (QUICK FIX), to allow for intermediate maintenance to be performed at common automatic test system facilities, 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 continue. A program to optimize communications will be completed and a 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 1981 Planned Program: Efforts initiated in prior years will continue. Automatic test equipment (ATE) applications software for the AN/MLQ-34 and AN/ALQ-151 will continue. Development of the family of quick-erecting tactical antenna masts and assemblies will continue. Development of expendable jammers will be continued, and development testing will be initiated. Development of an air defense electronic warfare system will begin. Development of jamming systems will begin. Efforts to develop Countermeasures will begin.

Program Element: #6.37.55.A Title: Tactical Electronic Countermeasures Systems
DOD Mission Area: #257 - Electronic Warfare & Counter C^3I Budget Activity: #4 - Tactical Programs

4. FY 1982 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 the AN/MLQ-34 and AN/ALQ-151 will be completed. Development of Electronic Warfare devices for self-protection will be reinitiated.

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

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #DK12
Program Element: #6.37.55.A
DOD Mission Area: #257 - Electronic Warfare and Counter-C3I

Title: Division Tactical 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 electronic countermeasures (ECM) equipment and systems to assist the Brigade and Division 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 project provides for the orderly future development of systems to counter a changing threat and to replace systems now fielded and 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.

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.

C. (U) WORK PERFORMED BY: Major contractors are Analytics, Inc., Willow Grove, PA; GTE Sylvania, Mountain View, CA; ESL Incorporated, Sunnyvale, CA; Quest Research, McLean, VA; Cincinnati Electronics, Cincinnati, OH. In-house development and contract monitoring are accomplished by the US Army Signals Warfare Laboratory, Warrenton, VA.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1979 and Prior Accomplishments: A heliborne communications jamming system, AN/ARQ-33 (QUICK FIX I), was developed, tested, and three Quick Reaction Capability (QRC) models were deployed. A follow-on heliborne communications jamming system, AN/ALQ-151 (QUICK FIX II) was developed, tested, and type classified Standard A. Procurement of the AN/ALQ-151 was initiated. A ground-based tactical jammer, AN/MLQ-34 (TACJAM), has been developed, tested, type classified Standard, and a production contract awarded. A program to optimize communications

has been initiated.

Development of a series of devices capable of disrupting hostile tactical

was started.

2. FY 1980 Program: Support to procurement of the AN/MLQ-34 and AN/ALQ-151 will continue. Development of applications software to allow intermediate maintenance to be performed at common automatic test system facilities for AN/MLQ-34 and AN/ALQ-151 will continue. The program to develop optimized communications will be completed and a product improvement program for fielded communications will be developed. Prototype development of various types of expendable jammers will continue. Development of a 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 continue. Use of these antennas will find application in other tactical systems.

3. FY 1981 Planned Program: Efforts initiated in prior years will continue. Development of Automatic Test Equipment (ATE) software for the AN/MLQ-34 (TACJAM), and the Heliborne Jammer QUICK FIX (AN/ALQ-151) to allow intermediate maintenance to be performed at common automatic test system facilities will continue. 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. Advanced development of a variety of expendable jammers will continue. Development of techniques will be initiated.

4. FY 1982 Planned Program. Efforts initiated in prior years will continue. Automatic test equipment applications software for the AN/MLQ-34 and AN/ALQ-151 will be completed. Development of expendable jammers will continue. Development of techniques will continue.

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

Project: #DK12 Title: Division Tactical Electronic Countermeasures Systems
Program Element: #6.37.55.A Title: Tactical Electronic Countermeasures Systems
DOD Mission Area: #257 - Electronic Warfare and Counter-C3I Budget Activity: #4 - Tactical Programs

6. (U) Major Milestones:

Task Name	Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 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	2 Qtr FY 1979

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).

7. Resources ($ in thousands):

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	4287	4954			Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	3952	5059		Not Shown	Continuing	Not Applicable
Quantities: Not Applicable						

*Increase of $335K in FY 1979 was due to increased test support costs. Increase of $7K in FY 1981 is due to readjustment of project funding profile as a result of late contract awards in FY 1979, acceleratoin of expendable jammer development, and adjustments for inflation.

Other Appropriations:						
Other Procurement, Army**						
Funds (current requirements)	22400	21400				
Funds (as shown in FY 1980 submission)	22400	21400		Not Shown		

Project: #DK12 — Title: Division Tactical Electronic Countermeasures Systems
Program Element: #6.37.55.A — Title: Tactical Electronic Countermeasures Systems
DOD Mission Area: #257 - Electronic Warfare and Counter-C3I — Budget Activity: #4 - Tactical Programs

Other Appropriations:						
Quantities (current requirements)	7	11				
Quantities (as shown in FY 1980 submission)	10	10			Not Shown	

**Funds/quantities shown are for AN/MLQ-34. (See Descriptive Summary for Program Element 6.37.55.A.)

Aircraft Procurement, Army***						
Funds (current requirements)	2300	18900				
Funds (as shown in FY 1979 submission)	300	33400			Not Shown	
Quantities (current requirements	0	5	0	0		
Quantities (as shown in FY 1979 submission)	0	5	0	Not Shown		

***Funds/quantities shown are for AN/ALQ-151. (See Descriptive Summary for Program Element 6.37.55.A.)

FY 1981 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	7329	5243	5511	4970	1890	50431
D162	Aircraft Rocket Subsystems	3677	4153	4604	4970	1890	31197
D133	Aircraft Gun-Type Weapons	3652	1090	907	0	0	19234

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program supports the development and test of aircraft weapon subsystems, excluding missiles. These efforts support the requirement for low-cost, reliable, easily maintainable, lightweight, increasingly effective armament subsystems of advanced design for attack helicopters.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: These funds will provide attack helicopters with improved suppressive fire capability at the required standoff ranges. The Technical Data Package for the High Explosive HEI (XM799) and High Explosive Dual Purpose HEDP (XM789) 30mm rounds will be finalized. Transition of these items to single service manager will be implemented. Development and testing of the improved rocket motor and of the multipurpose submunition warhead with remote set fuze for the 2.75-inch rocket will continue. Testing of tactical submunition bodies, fuze and ballute assembly will continue. Manufacturing of propellant grain for rocket motor will be completed. Full engineering development effort will be reestablished for illumination and smoke warheads. Testing will be initiated at component and subassembly level for these warheads.

Program Element: #6.42.02.A
DOD Mission Area: #212 - Fire Support

Title: Aircraft Weapons
Budget Activity: #4 - Tactical Programs

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	7329	5243	5511	6860	50431
Funds (as shown in FY 1980 submission)	10460	5302	5134	2815	48536

Rocket program was decreased in FY 1979, FY 1980, and FY 1981 due to reprogramming action to a program with higher, more urgent priority. Project D133 decrease in FY80 due to inflationary adjustment. FY 1981 Aircraft Gun-Type Weapons project increase due to additional development and testing required for the dual-purpose 30mm round after problem with propellant developed. This has caused the project to be restructured with development and type classification to be accomplished in FY 1982.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Aircraft Procurement, Army:						
Funds (current requirements)	2276	7100	6600	6700	19000	41676
Funds (as shown in FY 1980 submission)	2276	7100	6100	6000	-	21476
Quantities (current requirements)	50	3700	4100	4100	9744	21694
Quantities (as shown in FY 1980 submission)	.8	3.2	5	3	-	12

Program Element: #6.42.02.A
DOD Mission Area: #212 - Fire Support

Title: Aircraft Weapons
Budget Activity: #4 - Tactical Programs

Current lines indicate quantities and funds for 2.75-inch Rocket Lightweight Launchers only. In FY 1979 only 50 launchers were procured since the majority of FY 1979 funds were required for production line setup. Quantities shown under current requirements reflect total lightweight launcher requirements based on projected rocket consumption and the percentage of aircraft with remote set firing. The computation considered the initial allocation for each aircraft, 16 reuses per tube, and an 8.5% float.

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. Guns (turret- and pod-mounted) and rockets that have demonstrated feasibility continue development. Fire control and other associated equipment for total subsystem operation will be developed.

C. (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 6.47.07.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.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Developed and standardized: 7.62mm Suppressive Fire Subsystems for the OH-13, OH-23, UH-1B, UH-1C, UH-1D, and CH-47 helicopters; 2.75-inch rocket systems for the UH-1B, UH-1C, and AH-1G helicopters; a first-generation hard point target missile system for the UH-1B(M22); a 40mm grenade launcher system for the UH-1B, UH-1C, and OH-6A; an improved 7.62mm machine gun for all helicopter systems; a super-quick fuze for the 2.75-inch rocket and proximity fuze for the 40mm grenade launcher and 2.75-inch rocket; repairable/reusable 2.75-inch rocket launchers; an illuminating flare and dispenser system for utility helicopters; and a fixed range smoke screening warhead for the 2.75-inch rocket. Developed a 30mm automatic gun turret, XM140; 40mm grenade launcher, XM129; an integrated fire control system utilizing moving target

Program Element: #6.42.02.A
DOD Mission Area: #212 - Fire Support

Title: Aircraft Weapons
Budget Activity: #4 - Tactical Programs

indicator radar for long-range target detection; TOW missile system on the AH-1G. Completed a Data Acquisition Test (DAT) to acquire data on the performance characteristics and operational parameters of two candidate 30mm cannon systems (XM188 and XM230) for the advanced attack helicopter (AAH). 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 helicopters.

2. (U) FY 1980 Program: The high-explosive, dual-purpose HEDP (XM789), 30mm round will continue in development. Qualification testing leading to standard type classification will be initiated. The high-explosive, HEI, incendiary, 30mm round will be type classified standard. 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.

3. (U) FY 1981 Planned Program: Finalize the technical data package (TDP) for the training practice (XM788) and the high-explosive, incendiary (XM799) 30mm rounds. Implement transition of these items to single service manager as the development program nears completion. Begin closure action of 30mm ammunition project office. Procure high-explosive, dual-purpose 30mm ammunition for the advanced attack helicopter (AAH) operational testing. Development and testing of the improved rocket motor and of the multipurpose submunition warhead with remote set fuze will continue. Testing of tactical submunition bodies, fuzes, and ballute assemblies will continue. Manufacturing of rocket motor propellant grain will be completed. Full engineering effort will be reestablished for illumination and smoke warheads.

4. (U) FY 1982 Planned Program: The remote set smoke screening and illumination warheads will continue in development. Complete type classification action for the high-explosive, dual-purpose (XM789) 30mm ammunition and transition to single service manager. This completes 30mm ADEN/DEFA ammunition development effort.

5. (U) Program to Completion: The remote set smoke screening and illumination warheads are scheduled to complete development in FY 1984.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.03.A
DOD Mission Area: #255 - Tactical Surveillance

Title: Aerial Scout
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	6477	7450	0	0	Not Applicable	Not Applicable
	QUANTITIES						
D281	Advanced Scout Helicopter (ASH)	3977	7450	0	0	Not Applicable	Not Applicable
D304	ASH (NATO)	2500	0	0	0	0	2500

B. (U) BRIEF DESCRIPTION OF PROJECT: Ground commanders require a dedicated highly survivable aerial scout for the conduct of reconnaissance, surveillance, security, target acquisition, and target designation functions in adverse weather conditions and all levels of intensity of warfare. In performing these functions, the aerial scout would have operated in air cavalry, attack helicopter, and field artillery units. The objective of this program was to develop the most cost-effective system to meet this requirement.

C. (U) EXPLANATION OF CANCELLATION OR DEFERRAL: The Aerial Scout Program was cancelled by the Office of the Secretary of Defense (OSD). The decision authorized development of a mast mounted sight (MMS) on either an OH-58 or UH-1 airframe to continue under a new Program Element (PE #6. 42.01.A) and title (Army Helicopter Improvement Program). The OSD decision precluded new airframe development activity and withheld commitment for any procurement.

FY 1981 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	250	450	1230	1653	Continuing	Not Applicable
DC32	Ground Support Equipment	52	0	0	0	Continuing	Not Applicable
DC33	Cargo Handling Equipment	0	200	681	903	Continuing	Not Applicable
DC45	Aviation Life Support Systems	198	250	549	750	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 the items which are directly applicable to the aircraft or which support 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.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Aviation Life Support Equipment continues development of Flotation Kit for helicopter aircrewmen, Helicopter Oxygen System, Improved Lighting System for Army Aircraft (ILSAA), and On-Board Oxygen Generating System (OBOGS). The helicopter oxygen auxiliary system will provide oxygen to aircrewmen during search and rescue (SAR) missions and high altitude training. The OBOGS, an integral system for the RV-1D/RU-21 Special Electronic Mission Aircraft (SEMA), will provide on-board oxygen with filtration for operating at altitude or in a chemical agent environment. In cargo handling equipment project modification and/or development design contracts will be awarded for external cargo handling equipment consisting of spreader bars, apex fittings, and vehicle lift nets. Contract for test High Performance Hoist will be awarded.

Program Element: #6.42.04.A
DOD Mission Area: #261 - Airlift

Title: Air Mobility Support Equipment
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Improved Lighting System for Army Aircraft (ILSAA) complete DT/OT II	FY 1981	FY 1980

Funds were reprogrammed within the project because of internal program priority changes and diversion of funds to higher priority Army projects; consequently insufficient funds will be available to initiate Developmental Test/Operational Test (DT/OT II) to meet milestone projected in the FY 1980 submission.

D (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	250	450	1230	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	443	450	1450	Continuing	Not Applicable

The adjustment to FY 1981 figure from the previous submission reflects a realignment of priorities between cargo handling equipment and ground support equipment within the Program Element and diversion of funds to higher priority Army programs.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable

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 developments, and aviation life support equipments. Engineering development of ground support equipment is to develop equipment applicable to the servicing and maintenance of Army aircraft. The aerial delivery and 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 aircrewmen.

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-Virtol, Ridley Park, PA; Sikorski Aircraft Company, Stratford, CT; Kaman Aviation, Windowlock, CT; Bell Helicopter, Dallas, TX; Brooks and Perkins, Cadillac, MI; Martin-Marietta, Baltimore, MD; Fiber Science, Salt Lake City, UT; Air Research, Phoenix, AZ; Western Gear, Jamestown, ND.

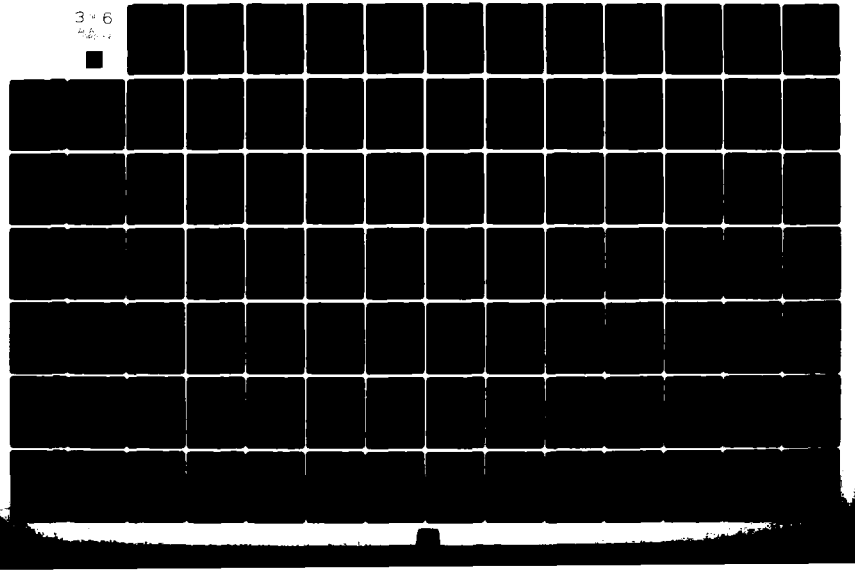
I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

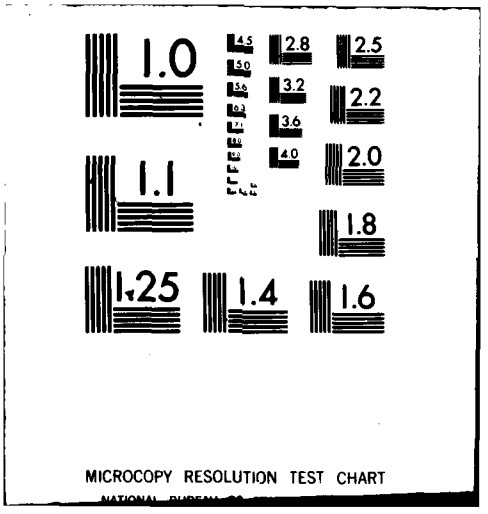
1. (U) FY 1979 and Prior Accomplishments: Ground Support Equipment: Completed development test and evaluation of a self-propelled crane, cleaning and de-icing system and weapons handling vehicle which led to an updated Development Plan. Continued staffing of Letter Requirement (LR) for Small Portable Analyzer-Diagnostic Equipment (SPADE). Conduct developmental testing of commercially available shock-pulse analyzers to refine design specifications. Cargo Handling Equipment: Helicopter slings, 10,000 and 25,000 lb capacity slings were type classified standard. Helicopter cargo nets have completed Developmental Test and Operational Test II, (DT/OT II) type classification, and initial production award. First article unit of the High Performance Hoist has been delivered and successfully tested.

2. (U) FY 1980 Program: Ground Support Equipment: Complete Letter Requirement staffing on the SPADE and proceed with further definition of ground support equipment requirements. Cargo Handling: Participate in Joint Service development of the Air Force Advanced Developmental Transport Aircraft (C-X) and Joint Service developmental testing of C141B for air transportability capability to transport/airdrop Army personnel and equipment. Aviation Life Support Equipment: Continue development

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DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF THE RESEARCH, DEV--ETC(U)
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MICROCOPY RESOLUTION TEST CHART

Program Element: #6.42.04.A
DOD Mission Area: #261 - Airlift

Title: Air Mobility Support Equipment
Budget Activity: #4 - Tactical Programs

of a Flotation Kit for helicopter aircrewmen through incrementally funded program. Continue development of oxygen systems for Search and Rescue (SAR) aircraft. Initiate engineering development (incrementally funded) for the On-Board Oxygen Generating System (OBOGS) for use on Special Electronic Mission Aircraft (RV-1D/RU-21). Begin DT/OT II in late FY80 for Improved Lighting System for Army (ILSAA).

3. (U) FY 1981 Planned Program: Cargo Handling Equipment: Award contracts for modifications and/or development, design and fabrication of vehicle nets, pallet/sling combinations, spreader bars and apex fittings. Initiate development of lightweight apex fittings. Award contract for test Hoist to meet Required Operational Capability requirements Blackhawk. Aviation Life Support Equipment: Complete Developmental Test and Operational Test II (DT/OT II) test of Flotation Kit for helicopter aircrewmen and Improved Lighting System for Army aircraft (ILSAA). Enter Helicopter Oxygen System into DT/OT II. Continue contractual action for the On-Board Oxygen Generating System (OBOGS). Initiate development of AH-1 Cobra crashworthy seat.

4. (U) FY 1982 Planned Program: Ground Support Equipment: Complete development of Small Portable Analyzer-Diagnostic Equipment. Cargo Handling Equipment: Award contract and modify hardware for achieving High Performance Hoist Required Operational Capability (ROC) requirements. Test hardware against existing ROC. Continue contract efforts for vehicle nets, pallet/slings and apex fittings. Initiate DT/OT II for spreader bars and apex fittings. Aviation Life Support Equipment: Initiate On-Board Oxygen Generating System (OBOGS) development testing Conduct Development In-Process Review (DEVA-IPR) for Floation Kit for Helicopter aircrewmen to type classify standard. Complete Helicopter Oxygen System DT/OT II. Initiate developmental actions for Emergency Locator Transmitter, and crashworthy Student Aviator Medical attendant and Gunner Seat (SAMAGS) and development efforts for crashworthy troop seats. Continue development of AH-1 Cobra crashworthy seats.

5. (U) Program to Completion: This is a continuing program. The OBOGS program is scheduled for type classification in late FY 1983. The fielding of Small Portable Analyzer-Diagnostic Equipment is scheduled for 3Q FY 1984.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.07.A
DOD Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter
Budget Activity: #4 - 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	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	179448	176036	171564	58246	0	1104222
	QUANTITIES						9
D425	Advanced Attack Helicopter	179448	176036	171564	58246	0	1104222

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Under this program, the Army is developing an Advanced Attack Helicopter (YAH-64) antiarmor weapon system. The YAH-64 is a twin-engine rotary-wing aircraft designed as a stable, manned aerial weapon vehicle. It will be capable of defeating a wide range of targets, but is optimized for destruction of armored vehicles. The AAH will provide responsive direct aerial fires as an integral element of the ground Combined Arms Team and be capable of performing its mission at night and under adverse weather conditions. This weapon system is required to contribute highly mobile, effective, and accurate firepower to the antiarmor capability of the Army in the field. Aircraft armament includes the HELLFIRE Modular Missile System, 30mm chain gun, and 2.75" rockets. The AH-64 will be the 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. An evaluation of an armed variant of the BLACKHAWK for the attack role in lieu of the AH-64 is required by the Office of the Secretary of Defense to be conducted during FY 1980.

C. BASIS FOR FY 1981 RDTE REQUEST: Contractor and Government testing will continue. Integrated subsystems will be installed in the air vehicles for further development and operational testing. The Government will conduct a user Operational Test (OT II) to evaluate the aircraft, fully equipped with its subsystems, to provide data for the production decision in FY 1982.

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 1980 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 Operational Test (OT) IIa	April 1980	March 1980
Complete OT II	Not Applicable	September 1980
Production Contract Award	August 1981	August 1981
First Production Delivery	December 1981	December 1980
Initial Operational Capability (IOC)	November 1983	December 1982

OT II was combined into a single three month event and production award was changed to December 1981 to meet the development requirements of a reoriented program.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	179448	176036	171564	58246	1104222
Funds (as shown in FY 1980 submission)	177449	176194	137399	0	10083102

Program Element: #6.42.07.A
DOD Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter
Budget Activity: #4 - Tactical Programs

FY 1979 funding was increased by reprogramming for skill performance aids. FY 1980 cost estimate changed as a result of a Congressional general reduction. FY 1981 cost estimate increased from that in the FY 1980 budget submission due to correction of technical difficulties in the tail section, increased logistic support for operational testing, the addition of three months of development effort in FY 1982 prior to production contract award, and escalation resulting from application of updated inflation index.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Aircraft Procurement, Army						
Funds (current requirements)	0	0	50400	427400	3872300	4350100
Funds (as shown in FY 1980 submission)	0	0	0	318033	2854600	3172633
Quantities (current requirements)	0	0	0	14	522	536
Quantities (as shown in FY 1980 submission)	0	0	0	18	518	536

The difference in the procurement funding profile and quantities between FY 1981 and FY 1980 Congressional Descriptive Summaries is due to increases in engine costs; new requirements for survivability equipment and ground support equipment; additional requirements for support equipment, data, and training; adjustment of the procurement schedule to the revised development program; and the application of updated inflation index.

Program Element: #6.42.07.A
Title: Advanced Attack Helicopter
DOD Mission Area: #211 - Close Combat
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 fly-away design-to-unit production cost, based upon an initial production buy of 472 aircraft. In April 1976, the planned procurement quantity was subsequently 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 26 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 System (TADS) and the Pilot Night Vision System (PNVS) be competitively developed with fly-off on the YAH. Development of the YAH-64 consists of two phases. The first phase was conducted as a fly-off 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 qualities and performance. Competitive development contracts for Phase 1 were awarded to Bell Helicopter Textron and to Hughes Helicopters. Government testing (fly-off) 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 is the competitive development of TADS/PNVS currently on contract with Martin-Marietta and Northrop Corporation. Selection of the winning contractor is currently scheduled for April 1980, and is considered an important Milestone in the AAH program. At the direction of the Office of the Secretary of Defense, the use of the WECOM-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-64 Program Manager has development responsibility for this ammunition. A Project Manager for the TADS/PNVS development and a Product Manager for 30mm Aircraft Gun Type Ammunition have been designated to assist the Advanced Attack Helicopter Program Manager in the development of the AAH system.

C. (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 an early aerial antitank capability with the TOW missile until the availability of the higher performance YAH-64, and is planned as a complement to the YAH-64 in a high-low mix. The AH-1S and AH-1T lack

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Title: Advanced Attack Helicopter
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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 Helicborne Missile - HELLFIRE is being developed under PE 6.43.10.A. The 30mm ADEN/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, and Northrop Corporation, Anaheim, CA, are the two competitive contractors for development of the Target Acquisition Designation System (TADS) and the Pilot Night Vision System (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 Airesearch, 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.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 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. TADS and PNVS proposals from industry were received by the Army in November 1976, and TADS/PNVS Contracts were awarded to Martin-Marietta and Northrop

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Corporation on 10 March 1977. During FY 1977, Hughes Helicopters initiated engineering design efforts to incorporate configuration changes identified by the Phase 1 Source 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 was initiated. In FY 1979, three prototype TADS/PNVS systems were delivered for test in the Hughes' Mission System Simulator and for installation in AAH flight vehicles at Yuma. Both Contractors' systems have been 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 fly-off 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 prior to OT to correct technical problems. In this restructuring, the production contract award was delayed one year, which also accommodated the increasing production leadtime.

2. (U) FY 1980 Program: *During the first quarter of FY80, highly successful day and night* launches of the HELLFIRE missile from the AAH were accomplished with the AAH TADS providing the laser designation (autonomous designation). The GTV will be operating extensively to formally qualify various dynamic components to support the reliability objectives. All five of the YAH-64's will be involved in various flight test programs. During the early part of FY80, the Army is conducting an analytical evaluation of an armed variant of the BLACKHAWK Helicopter for the attack helicopter mission with emphasis on its capabilities, cost, and schedule vis-a-vis the current program for the AH-64. This evaluation is at the direction of the Office of the Secretary of Defense (OSD). Flight evaluation of the competing TADS will be conducted January 1979 thru March 1980 on two YAH-64's. Flight test data will be provided to the Army Source Selection Evaluation Board (SSEB) to assist in determining a winner. After selection in April 1980, the successful TADS/PNVS Contractor will finalize his design, continue qualification testing, and support the AAH flight tests for the balance of FY80. The winning contractor's TADS/PNVS will be installed into three of the remaining aircraft with contractor testing continuing to mature the integration for operational testing in next fiscal year. The fifth aircraft will be instrumented for measuring flight loads, vibration, dynamic stability, and structural integrity and does not have mission equipment installed.

3. (U) FY 1981 Planned Program: Contractor and Government flight testing will continue on all five vehicles with emphasis on reliability, availability, and maintainability (RAM) culminating in a user assessment of RAM during the OT II in June thru August 1981. Long Lead Time Item (LLTI) contracts will be awarded during February 1981 in preparation for the Production Decision in December 1981.

Program Element: #6.42.07.A
DOD Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter
Budget Activity: #4 - Tactical Programs

4. (U) FY 1982 Planned Program: Data from OT II completed in August 1981 will be prepared for the use of ASARC/DSARC III 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. Flight qualification will be completed during October-November 1981, thus terminating this stage of engineering development of the Advanced Attack Helicopter.

5. (U) Program to Completion: Funding to cover engineering changes, expected to be forthcoming from Operational Testing, has been included in the AAH production estimate.

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Budget Activity: #4 - Tactical Program

J. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation:

a. (U) The AAH development 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 I aircraft together with the fabrication and test of 3 new prototype aircraft built to approx' 'e production items. Within the Phase 2 effort is a competitive development and selection of the Target Acquisition Desi¡ ion System (TADS) and Pilots Night Vision System (PNVS). Both independent and joint development tests are conducted by Contractor and Government test personnel. Significant past development program events are as follows:

(1) (U) Competing Advanced Attack Helicopter (AAH) contractors, Bell Hellicopter Textron and Hughes Helicopters, successfully completed Phase I development 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.

b. (U) During phase I Government competitive tests (GCT), which combined developmental and operational testing on the

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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 Development Test (DT) makes maximum use of contractor/Government integrated tests to eliminate duplication. Initial contractor DT in Phase 2 has further expanded the aircraft flight envelope and evaluated changes/modifications that had been proposed to the Phase 1 design. The first set of modifications (MOD 1) incorporated a changed empennage, improved automatic stabilization equipment, 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 somewhat 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 System (TADS), Pilot Night Vision System (PNVS), and HELLFIRE 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 with the redesigned stabilator was on 31 October 1979. Flight test data available at this submission indicates that the prototype stabilator is providing significant improvements to the technical problems it was designed to correct. All (5) prototypes are scheduled to receive the stabilator modification by May 1980.

Program Element: #6.42.07.A Title: Advanced Attack Helicopter
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c. (U) Prototypes used during Phase 2 of development include both early development aircraft, from Phase 1, and 3 new Phase 2 aircraft. The Phase 1 aircraft will go through a series of planned modifications so as to generally conform to the final specification. The Phase 2 aircraft, two of which are fully systemized, represent the final configuration or production aircraft. Producibility engineering is being applied to these latest fabricated prototypes and will result in some changes in production for improved producibility. No known basic changes are contemplated in the total system which would invalidate the development effort to date.

d. (U) Early in 1980, the total system aircraft will enter the final period of test and evaluation. Prior to this time, the four systems prototypes will be in several unique configurations primarily determined by the stabilizer configuration and the TADS/PNVS type. As of early May 1980 all systems aircraft will be in a conforming configuration. The final 15 months of the development 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 are operative:

(1) (U) Development Contractor:

(a) (U) Prototype Aircraft - Hughes Helicopters, Culver City, CA

(b) (U) TADS/PNVS - Martin-Marietta Co, Orlando, FL
Northrop Corporation, Anaheim, CA

(c) (U) 30mm Ammo - Hughes Helicopters

(d) (U) HELLFIRE 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: BG E. M. Browne, Program Manager--AAH, US Army Materiel Development and Readiness Command.

Program Element: #6.42.07.A
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(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

(d) (U) US Army Aeromedical Research Laboratories (USAARL), Ft Rucker, AL

(e) (U) US Army Communications and Electronics Research Command (USACECOM), 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: April 1980 - Target Acquisition Designation System (TADS) and Pilot Night Vision System (PNVS) Selection; February 1981-Long Leadtime Items; and November 1981 - Army and Defense Systems Acquisition Review Councils (ASARC/DSARC III).

h. (U) As previously stated, 5 flying prototypes will undergo testing. In addition one ground test vehicle is used to support the power train qualification.

Program Element: #6.42.07.A Title: Advanced Attack Helicopter
DOD Mission Area: #211 - Close Combat Budget Activity: #4 - Tactical Program

i. (U) A total of 62 HELLFIRE guided missile firings are planned during the AAH program. 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 development 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 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 environments of a climatic hangar. Environmental conditions such as vibration, shock, fatigue, and temperature are also an inherent part of the development 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-1S) was concurrently flown on all YAH-64 missions to establish comparative baseline information. The full weapons, visionics, 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 Developmental Test section.

b. OTEA is scheduled to conduct OT II, separate from development 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:

(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 (USAOTEA), Falls Church, VA.

f. (U) The Reliability, Availability, and Maintainability (RAM) assessment at Operational Testing (OT II) will be based on data available from Operational Testing (OT II) and all flight test data accumulated during Phase 2 testing. Army maintenance personnel will perform unit and intermediate maintenance support on all systems and subsystems except for Target Acquisition Designation Systems (TADS) and Pilot Night Vision System (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.

Program Element: #6.42.07.A
DOD Mission Area: #211 - Close Combat

Title: Advanced Attack Helicopter
Budget Activity: #4 - Tactical Program

RAM REQUIREMENTS

	OT II	Full-Rate Production
MMH/FH	14.4	13
System Reliability (MTBF - hours)	1.95	2.2
Mission Reliability (MTBF - hours)	17.0	18.5
TADS Reliability (MTBF - hours)	100	108
PNVS Reliability (MTBF - hours)	120	130

3. System Characteristics:

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)		
Lateral acceleration (g's)	.25-.35	.29
Endurance (hrs) - Primary Mission	1.83	1.83
- Alternate Mission	2.5-2.8	2.50
Expendable Ordnance @ PMGW		
HELLFIRE Missile (No.)	8-16	
30MM (rds)	320-500	
Target Recognition (km) Maximum - Day		
- Night		

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**
Target Designation (km) Maximum		
Day		
Night		

NOTES: * Performance required at primary mission gross weight, operating within specified mission profiles.
** From the Source Selection Evaluation Board (SSEB) final report; based on Government Development Test (DT) 1 YAH-64 data and adjusted to the approved armament configuration.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.12.A
DOD Mission Area: #211 - Close Combat

Title: COBRA/TOW
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	7337	970	9145	4560	To be determined	To be determined
D639	COBRA/TOW	7337	970	9145	4560	To be determined	To be determined

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Under this program, the Army is improving its Attack Helicopter, the COBRA/TOW, by conducting development efforts to provide a heliborne antitank capability and to improve the aircraft rocket subsystem, fire control, secondary armament capability, and night capability. The AH-1S, COBRA/TOW is a single-rotor, single-engine, two-seat, attack helicopter designed to perform as a stable, aerial weapon vehicle. The AH-1S will provide responsive direct aerial fires as an integral element of the ground combined arms team. This weapon system is required to contribute highly mobile, effective, and accurate firepower to the antiarmor capability in the field. Aircraft armament includes the TOW missile system, 20mm automatic gun, and 2.75" rockets. The AH-1S will complement the Army's primary attack helicopter, the AH-64.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: The requested funds will be primarily for initiation of the development of forward looking infrared (FLIR) capability in the COBRA/TOW telescope sight unit.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Weapons Fire Control		
Development Contract Award	Dec 1976	Dec 1976
Delivery of Prototype	May 1978	May 1978
Critical Issues In-Process Review	Nov 1978	Nov 1978
Initial Production Contract Award	Nov 1978	Nov 1978
DT Test Completed	Nov 1979	Nov 1979

Program Element: #6.42.12.A
Title: COBRA/TOW
DOD Mission Area: #211 - Close Combat
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Upgunning		
Development Contract Award	Jun 1976	Jun 1976
Delivery of Prototype Hardware	Sep 1977	Sep 1977
Informal In-Process Review	Jun 1977	Jun 1977
Initial Production Contract Award	Jul 1977	Jul 1977
Test Completed	Oct 1978	Oct 1978

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	7337	970	9145	4560	To be determined
Funds (as shown in FY 1980 submission)	10827	1000	To be determined	To be determined	To be determined

The reduction in FY 1979 reflects the decision to defer funding of the 30mm cannon program. The FY 1980 reduction is the result of a general reduction by Congress. FY 1981 figures reflect initiation of a multi-year engineering development program to incorporate a forward looking infrared (FLIR) capability into the COBRA/TOW telescopic sight unit.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Aircraft Procurement, Army:						
Funds (current requirements, Aircraft)	120300	29500	-	-	-	505100

Program Element: #6.42.12.A
DOD Mission Area: #211 - Close Combat

Title: COBRA/TOW
Budget Activity: #4 - Tactical Programs

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Funds (as shown in FY 1980 submission)	120300	30900	-	-	-	506500
Quantities (current requirements)	66	15	-	-	-	312
Quantities (as shown in FY 1980 submission)	66	15	-	-	-	312
Funds (current requirements-Modification of Aircraft)	195600	276400	121300	18300	To be determined	To be determined
Funds (as shown in FY 1980 submission)	Not Shown					
Quantities (current requirements)	317	160	64	-	-	-
Quantities (as shown in FY 1980 submission)	Not Shown					

The current FY 1980 aircraft procurement figure represents amount appropriated by Congress for 15 AH-1S's for the Army National Guard. That figure is $1.4 million less than Army's request as shown in the FY 1980 submission for 15 aircraft.

Program Element: #6.42.12.A Title: COBRA/TOW
DOD Mission Area: #211 - Close Combat 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 aerial Tube-launched Optically tracked Wire-guided (TOW) missile system. The development contract to accomplish this was awarded in March 1972. Eight AH-1G aircraft were modified with the aerial TOW system for the development and testing efforts that began in FY 1973. An AH-1G modified with the TOW system was designated AH-1Q. During operational testing of the AH-1Q, it was determined that it had certain performance limitations resulting 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 290 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 approved in FY 1975 thru FY 1979 to procure 297 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 consolidates all ongoing developmental COBRA improvement projects under this 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.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 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 completed and initial testing began

Program Element: #6.42.12.A
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in September 1978. The fire control subsystem developmental testing including operational issues was completed in November 1979.

2. (U) FY 1980 Program: Engineering Development and testing of the weapons fire control subsystem designed to upgun and modernize the AH-1S attack helicopter will be completed. Ground operational checks, aerial non-firing 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.

3. (U) FY 1981 Planned 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.

4. (U) FY 1982 Planned Program: Continue development of the FLIR augmented COBRA/TOW sight (FACTS). Begin developmental testing of FACTS.

5. (U) Program to Completion: Currently, it is anticipated that the FACTS development effort will be completed in FY 1983.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.13.A
DOD Mission Area: #261 - Airlift

Title: CH-47 Modernization
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	19123	22480	603	0	0	113775
	QUANTITIES	0	0				
DC37	CH-47 Modernization	19123	22480	603	0	0	113775

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The mission need for a medium lift helicopter is to provide logistical support of the battlefield. This support provides all weather, day/night air mobility for artillery weapons, engineer equipment, ammunition, bulk fuel, troops, general cargo, medical evacuation, and recovery of downed aircraft. The need is projected to continue beyond the year 2000. The age of the current fleet required that a modernization and/or procurement program be established. A modernization of the CH-47 fleet was determined to be the most cost effective approach. This program provides for incorporation of advances in design technology developed since introduction of CH-47 helicopters into Army inventory. The program is to modernize the current CH-47 fleet through development, test, and incorporation of seven new systems: rotor, drive, hydraulic, electrical, advanced flight control, cargo handling, and auxiliary power unit. Integration of these improvements through a modernization program will result in improved reliability, availability, maintainability, productivity, safety, and survivability, a reduction in vulnerability and providing a 20-year life extension after modernization.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Funds requested will provide in-house support for the completion of the Producibility Engineering and Planning (PEP) effort to assure effective producibility of aircraft. Major milestones are as follows:

Program Element: #6.42.13.A
DOD Mission Area: #261 - Airlift

Title: CH-47 Modernization
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Army Systems Acquisition Review Council (ASARC) II	August 1975	August 1975
Defense Systems Acquisition Review Council (DSARC) II	October 1975	October 1975
Modernization Research and Development (R&D) Contract Award	June 1976	June 1976
110-hour Blade Whirl	March 1978	March 1978
Transmission Dynamic Strain Survey	November 1978	November 1978
50-Hour Transmission Survey Run	December 1978	December 1978
First Flight	May 1979	May 1979
Preliminary Airworthiness Evaluation	November 1979 1/	October 1979
Long Lead Time Items Contract Award	January 1980 2/	October 1979
Development Testing (DT) II/Operational Testing (OT) II Start	December 1979 3/	November 1979
Development Testing (DT) II/Operational Testing (OT) II Complete	May 1980 3/	April 1980
Army Systems Acquisition Review Council (ASARC) III	August 1980	August 1980
Defense Systems Acquisition Review Council (DSARC) III	September 1980	September 1980
Production Contract Award	October 1980	October 1980
Production Delivery Begins	May 1982	May 1982
Initial Operational Capability (IOC)	February 1984	February 1984

1/ Current estimate reflects a change due to the test related accident of Prototype #002 in September 1979.
2/ Contract award rescheduled to allow completion of fact finding and evaluation of proposal.
3/ Changed to allow time for transfer of aircraft to testing sites.

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DOD Mission Area: #261 - Airlift

Title: CH-47 Modernization
Budget Activity: #4 - Tactical Programs

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	19123	22480	603	0	113775
Funds (as shown in FY 1980 submission)	19540	23146	564	0	114824

FY 1979 - $417 reprogramed to higher priority program.
FY 1980 - $666 was reduced by Congress.
FY 1981 - $33 added to the FY 1981 program to cover inflation per OMB Cir A-11, 25 May 1979.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Aircraft Procurement Army:						
Funds (current requirements)	0	28770	151314	171887	1618056	1970027
Funds (as shown in FY 1980 submission)	0	28770	146195	-	1490049	1665014
Quantities (current requirements)	Long Lead Items		9	19	333	361
Quantities (as shown in FY 1980 submission)	Long Lead Items		9	-	352	361

Total estimated cost this submission increased by a total of $305.0 million over the FY 1980 submission, broken out as follows:

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DOD Mission Area: #261 - Airlift

Title: CH-47 Modernization
Budget Activity: #4 - Tactical Programs

a. (U) $32.8 million in escalation resulting from reprofiling based on review of annual requirements. This change reduced the front end and increased out-years causing an escalation increase.

b. (U) $49.7 million for new requirements not included in the initial Baseline Cost Estimate for Trainers, Skill Performance Aids, Mockup, Prototype Update and Production Testing and an increase in Initial Spares due to implementation of Department of the Army/Office of the Secretary of Defense (DA/OSD) system for calculating initial provisioning spares referred to as the Provisioning Budget Forecasting Procedure (PBFP).

c. (U) $222.5 million increase in escalation resulting from a change of OSD/DA indices. The 1980 submission utilized July 1978 indices. This submission utilizes September 1979 indices.

FY 1981 shows a total increase of $5.119 million which includes a decrease due to reprofiling and increases due to new requirements including mock-ups, update of prototype aircraft, skill performance aids, and various trainers. It also includes an increase in escalation as a result of using OSD September 1979 indices.

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DOD Mission Area: #261 - Airlift

Title: CH-47 Modernization
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The CH-47 (Chinook) Medium Lift Helicopter (MLH) was developed in the late 1950's with the first CH-47s being procured in 1962. The Chinook provided invaluable battlefield mobility in Vietnam for tactical vehicles, artillery and engineering equipment, personnel and logistical support equipment. The modernization Chinook will continue in service to meet the Army medium lift requirement through the year 2000. The current Army inventory consists of 448 aircraft (162 CH-47A models, 77 B models and 209 C models). The CH-47A and B models fail to meet the Required Operational Capability (ROC) of 15,000 pound external payload for medium lift helicopters. Because of age and condition, all models have high operating costs and large maintenance requirements which result in a need for modernization. Life cycle cost estimates and economic analysis of the CH-47 fleet indicated that it was more cost effective to modernize CH-47s than to retire the Fleet and procure new helicopters. A ROC was approved in October 1974 (Revised October 1975) and a Special Study Group (SSG) was formed in December 1974 to prepare the program for Army Systems Acquisition Review Council (ASARC) II and Defense Systems Acquisition Review Council (DSARC) II. Based on the SSG findings, it was determined that modernization could best be accomplished by the incorporation of seven modernized subsystems. A Cost and Operational Effectiveness Analysis (COEA) was conducted which determined that the most cost effective approach would be to modernize a total of 361 existing aircraft. The objectives of this program are to integrate fiberglass rotor blades; a 7500 horsepower integrally lubricated transmission and drive system; modularized hydraulic system components; and accomplish the necessary engineering and design requirements to install a new electrical system, an improved auxiliary power unit, multiple cargo hooks and advanced flight control system in a prototype of each of the three models. The program goals are to improve reliability, availability, maintainability, productivity, and safety while reducing operating costs and standardizing the Medium Lift Helicopter (MLH) fleet to a single configuration, the CH-47D.

G. (U) RELATED ACTIVITIES: In FY 1975, advanced development work in drive and hydraulic systems related to CH-47 Modernization was conducted under Program Element 6.32.14.A, Project DB37. (CH-47 modernization)

H. (U) WORK PERFORMED BY: A contract for engineering development of the airframe was awarded on 4 June 1976 to the Boeing Vertol Company, Philadelphia, PA; and on 28 July 1976, a contract for engines to be furnished as GFM was awarded to AVCO Lycoming, Stratford, CT. The CH-47 Modernization Project Manager's Office, St. Louis, MO, is the responsible developing organization.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Defense Systems Acquisition Review Council (DSARC) II was held 16 October 1975. The DSARC approved transition into engineering development with a Research and Development (R&D) plan for three

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prototype aircraft and a program to modernize the CH-47 fleet at a rate of 3 per month for a total of 361. A contract for engineering development effort was awarded to Boeing Vertol in June 1976. In early June 1976, three CH-47 aircraft, one each A, B, and C were delivered to Boeing Vertol for initiation of the prototype effort. On 28 July 1976, a contract for engines to support the CH-47 Modernization Program was awarded to the engine contractor, AVCO Lycoming. The T55-L-712 engine qualification tests and component inspections have been accomplished, and engine qualified. Fiberglass Rotor Blade (FRB) development, testing, and qualification have been completed. The blades were flight tested and qualified for use on the CH-47C helicopter in October 1978. This early FRB qualification reduces risks, increases confidence in flight testing required in the CH-47 Modernization Program and allows gathering of valuable data through accumulation of flying hours prior to the first CH-47D production. FRBs were successfully flown on a CH-47C in a limited icing test in the January-February 1979 timeframe. Results indicate that these blades are less susceptible to icing than metal blades. Transmission and hydraulic bench tests began in 1978. The dynamic strain survey was completed in November 1978 and the 50-hour qualification bench test in December 1978. Forward and Aft transmission 150-hour endurance tests were accomplished in the December 78- March 79 timeframe. The engine/combiner transmission successfully completed a 200-hour qualification test in February 1979. all tests were highly successful and achieved desired results. The Auxiliary Power Unit (APU) has been designed and qualification testing completed. All three prototypes have completed modernization and first flights were accomplished on 11 May, 26 June and 11 August 1979, four months ahead of the Decision Coordination Paper (DCP) and contract schedule. Contractor test phase was initiated in May 1979. Government test phase will begin with Development II (DT II) in December 1979. The Producibility Engineering and Planning (PEP) contract to prepare for the production phase of the program was awarded in January 1979 to Boeing Vertol. A proposal was received in August 1979 from Boeing Vertol to procure a long lead items in support of the FY 81 procurement of nine aircraft. This proposal is currently under evaluation. Plans are to award the contract in Januay 1980.

2. (U) FY 1980 Program: Contractual development effort is scheduled for completion. Delivery of prototypes were made to the Government in the 1st and 2nd Qtr of this fiscal year. Preliminary Airworthiness Evaluation and Development Test/Operational Test II (DT/OT II) testing, required to assure validity of design, substantiate accomplishment of reliability, availability, maintainability (RAM) requirements and verify flight safety improvements, will be accomplished in the November 1979 to May 1980 timeframe. Preparations are being made for production decision by the Army Systems Acquisition Review Council/Defense Systems Acquisition Review Council (ASARC/DSARC) III scheduled for August and September 1980, respectively.

3. (U) FY 1981 Planned Program: Producibility Engineering and Planning (PEP) effort to assure effective producibility will be completed. Initial production contract will be awarded for nine aircraft.

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Title: CH-47 Modernization
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4. (U) FY 1982 Planned Program: None.

5. (U) Program to Completion: This program will be completed in FY 1981.

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Title: CH-47 Modernization
Budget Activity: #4 - Tactical Programs

J. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation: Development Test and Evaluation is being conducted by the contractor, Boeing Vertol Company, Philadelphia, PA; the US Army Aircraft Development Test Activity (ADTA), Ft Rucker, AL; and the US Army Aviation Engineering Flight Activity (AEFA), Edwards AFB, CA. Contractor testing utilizes all three prototypes and government testing will utilize two of the prototypes. The contractor schedule has been accelerated to permit the government portion of Development Testing (DT II) to begin in December 1979 versus January 1980 and end in March 1980. DT II will include ground and bench testing of new components and prototype qualification tests (PQT-C) on two of the prototype aircraft. Fiberglass rotor blade testing started in 1977 with the 110-hour whirl tower test milestone completed in March 1978. Flight tests and qualification of the fiberglass rotor blades for use on the CH-47C helicopter have been successfully completed. This early qualification on the CH-47C reduces risk and increases the confidence in flight testing required in the CH-47 modernization program. Transmission and hydraulic system bench tests began in 1978 with the transmission dynamic strain survey. The 50-hour qualification test was completed in December 1978. All endurance and overload testing has been completed on the forward, aft, combiner, and engine transmissions, thus completing the planned 950 hours of bench testing. Testing to demonstrate the auxiliary oil capability of the forward, aft, and combiner transmissions is scheduled for the January to March 1980 timeframe. During bench qualification of the auxiliary power unit (APU), a cold temperature starting problem was encountered. This problem was resolved in September 1978 by minor changes to the APU hydraulic start and fuel systems. These changes have been tested and qualified. First flights of the YCH-47D prototypes #001, #002, and #003 were accomplished on 11 May 1979, 26 June 1979, and 11 August 1979, respectively, four months ahead of Decision Coordinating Paper (DCP) and contract schedule. The contractor flight test phase was initiated with the 11 May 1979 first flight and is continuing. On 11 September 1979, YCH-47D prototype #002 was involved in an accident precipitated by a failure of the forward transmission cooling fan due to resonance. The fan impeller blade configuration was modified by decreasing the blade height which reduced the vibratory stress in the root fillet. The resonant frequency was confirmed by analysis, shake test and dynamic strain survey. The modified fan was run at the most severe resonant condition for over 50 times 10 to the 6th power cycles without failure. The modified fans were installed on all three prototype aircraft in October 1979. The accident will have no impact on program schedule. Repair of #002 was completed in time to accomplish the preliminary airworthiness evaluation (PAE) just prior to the scheduled Development Test II (DTII). Cost to repair #002 is within the program funding available. Government flight testing is scheduled to begin in November 1979 and continue thru spring of 1980 with aircraft essentially in the production configuration and will include PAE, icing, design verification, climatic hangar, and reliability, availability, and maintainability (RAM) growth tests. The PAE will evaluate aircraft flight characteristics to verify that the available flight envelope is safe and adequate for further government testing. The icing test is scheduled during the 2nd Qtr FY80 to provide data verifying the aircraft flight characteristics in icing conditions. Design verification testing, including aircraft performance, handling qualities, RAM characteristics, and interoperability requirements is scheduled to begin in November 1979 and continue thru the Spring of 1980 utilizing

two aircraft for a total of 280 flight hours. The climatic hangar tests conducted from August thru October 1980 include 30 hours of extreme environmental testing to demonstrate the capability of the modernized CH-47 to meet stated specifications. A RAM growth test program is planned subsequent to Developmental Test (DT)/Operational Test (OT) II from January thru September 1981. A production validation test (PVT) will be accomplished from May thru August 1982 starting with production delivery.

2. (U) Operational Test and Evaluation:

a. (U) Operational Test II (OT II) will be independently conducted at Fort Campbell, KY, by the US Army Operational Test and Evaluation Agency (OTEA). The test objectives include an assessment of the operational effectiveness of the modernized CH-47 (YCH-47D) to include improvements in reliability, availability, and maintainability (RAM) characteristics and logistical support. The test will address the adequacy of the proposed training for flight crews and maintenance personnel and the adequacy of doctrine and tactics. A total of 120 flight hours of OT II testing using the same two Development Test II (DT II) prototypes is scheduled to be conducted in the spring of 1980. Two CH-47C helicopters will fly the same type missions and total flight hours as the two prototypes to provide an additional basis for evaluation of total system improvements. Typical military user personnel will operate the aircraft and provide unit-level maintenance. Intermediate level maintenance will be provided by the contractor. The aircraft will be essentially the same as the production model. The test will be conducted under simulated tactical conditions with tactical missions performed under day, night, and simulated instrument flight conditions. Typical loads will be transported externally, internally, and mixed external and internal.

b. (U) The requirement for follow-on evaluation (FOE) tests will be determined by the Army Systems Acquisition Review Council/Defense Systems Acquisition Review Council (ASARC/DSARC) III scheduled for August/September 1980.

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Title: CH-47 Modernization
Budget Activity: #4 - Tactical Programs

3. (U) System Characteristics:

Operational/Technical Characteristics	Objectives	Demonstrated Performance
Maximum Gross Weight (lbs)	50,000	To be determined thru testing of prototype aircraft
Maximum Cruise Speed (Kts.) 1/ (Design Gross Weight)	155	
Payload (ROC Mission) 2/ (lbs)	15,775 3/	
Combat Radius (NM) 4/ (ROC Mission)	30	
Service Ceiling (ft) (Design Gross Weight, One Engine Inoperative)	10,000	
Hardware Systems Reliability (MTBF) 5/ (Hours)	3.0*	
Systems Operational Reliability (MTBF) (Hours)	1.4*	
Maintainability (MMH/FH) 6/	19.0*	

*Objective projected at maturity (100,000 fleet hours). Reliability values to be demonstrated prior to production decision ASARC/DSARC III are 1.52 and .76, respectively.

1/ Kts - Knots.
2/ Required Operational Capability (ROC) Mission: Minimum of 15,000 lbs external cargo at 4000 ft/95 degrees F, hover-out-of-ground effect with 200 FPM vertical rate of climb at maximum power, 30-minute fuel reserve, 30 NM radius of action.
3/ The ROC requirement is 15,000 pounds.
4/ NM - Nautical Miles.
5/ MTBF - Mean Time Between Failure.
6/ MMH/FH - Maintenance manhours per flight hour.

FY 1981 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	0	0	3049	6334	5645	15050
D147	UH-1 Modernization	0	0	3049	6334	5645	15050

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 aircraft by modernizing and extending the twenty-year service life of current UH-1H/V assets. To accomplish this, the aircraft will be returned to depot for modification to the service life extension configuration, and selected mission-required product improvements will be made. 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) BASIS FOR FY 1981 RDTE REQUEST: Due to the twenty-year service life expectancy of the UH-1H/V, large-scale retirements of the fleet will begin in 1983, and the aircraft will be totally depleted by 1996 unless steps are taken to extend its service life. The first step of this extension is the design, development, and qualification of the UH-1H/V composite main rotor which will begin with the award of a competitive contract in FY 1981.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Contract Award	1QFY81	Not Shown
First Flight	4QFY82	
Government Flight Test	1QFY83	

Program Element: #6.42.15.A
DOD Mission Area: #261 - Airlift

Title: UH-1 Modernization
Budget Activity: #4 - Tactical Programs

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

(U) Not applicable. FY 1980 Summary was not submitted.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Aircraft Procurement, Army						
Funds (current requirements)	0	0	0	0	161880	161880
Funds (as shown in FY 1980 submission)	Not Shown					
Quantities (current requirements)					5396	5396
Quantities (as shown in FY 1980 submission)	Not Shown					

Program Element: #6.42.15.A
DOD Mission Area: #261 - Airlift

Title: UH-1 Modernization
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The Army has requirements for 2698 UH-1H/V "Huey" helicopters together with 1107 UH-60A "BLACK HAWK" helicopters to provide for a high/low mix of utility aircraft to suppport a wide range of combat and combat support missions for the active Army. The UH-1H/V requirement also includes a continuing role as the primary utility helicopter for the Army Reserve Components. To meet these requirements, the UH-1 must undergo a service life extension which requires research and development work (RDTE) to optimize the performance capability, apply new technology, and avoid the expenses involved with the development or procurement of a replacement system. Significant cost savings are predicted by the 20-year service life extension of the UH-1H/V; these include $133M over 25 years through conversion to composite structure main rotor blades and $48M over 20 years in avoided maintenance costs because of reliability and maintainability improvements.

G. (U) RELATED ACTIVITIES: The Army has recently concluded a successful program for the design, development, and qualification of a composite main rotor blade for the AH-1 series helicopter. The first production contract was awarded in May 1977. Other composite blade programs include the CH-47D and the multitubular spar main rotor blade program conducted by US Army Aviation Research and Development Command Research and Technology Laboratory.

H. (U) WORK PERFORMED BY: US Army Aviation Research and Development Command, St Louis, MO, and a contractor to be selected by a source selection evaluation board.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Not Applicable.

2. (U) FY 1980 Program: The requests for proposal will be prepared and Source Selection Evaluation Board held for selection of the development contractor.

3. (U) FY 1981 Planned Program: The design and development of the composite main rotor blade will be initiated upon contract award to the selected contractor. This development activity will include blade design, tooling design and preliminary testing. Fabrication of preproduction blades will begin.

4. (U) FY 1982 Planned Program: Fabrication of the preproduction blades will be completed. Qualification testing will begin.

5. (U) Program to Completion: Qualification testing will be completed, and the composite main rotor blade approved for production.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.17.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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	5771	1198	0	14733	Continuing	Not Applicable
D275	Synthetic Flight Training Systems	5771	1198	0	14733	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF PROJECT: This program develops high fidelity operational flight, weapon, and mission helicopter simulators to support initial entry rotary wing training, transition training, and combat operational training. The goal is to produce a simulation of the combat environment, to include tactical flight, weapons engagement, and enemy interaction, in order to provide realistic and cost effective training. The simulations are used to complement the training accomplished in the actual helicopters in the maintenance of combat readiness.

C. (U) EXPLANATION OF CANCELLATION OR DEFERRAL: Deferral of FY81 funding due to requirements of higher priority programs.

FY 1981 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT QUANTITIES	743	950	2721	3665	Continuing	Not Applicable Not Applicable
D279	Airdrop Equipment Development	743	950	2721	3665	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 Services for airborne assault, clandestine, 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 PE directly supports the 18th Airborne Corps "D" Package, the vanguard of almost every contingency, civilian and military, and thus is vital to National Defense. Through data exchange agreements; standardization working groups; and Rationalization, Standardization, and Interoperability (RSI) programs, the PE fulfills essential airdrop mission needs of many allied countries.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Complete development and type classify Type V airdrop platform for use with all delivery aircraft, including C-130, C-141, C-5A, and C-X. Continue development of Two-Staged Personnel Parachute System with accompanying loads for airdrop at high speeds and low altitude. Continue efforts to develop a heavy airdrop system for outsize combat loads. Continue development of Maneuverable Reserve Parachute for Free-Fall Airdrop System. Continue development of 500-pound-capacity High Altitude Airdrop Resupply System for clandestine and special operations. Initiate task to provide airdrop engineering support for airtransportable and airdroppable Army materiel. Type classify High-Speed Container Airdrop System (CTU/2A). Initiate development of Drop-Zone Assembly Aids to enable quick assembly of combat units and their equipment-/supplies.

Program Element: #6.42.18.A
DOD Mission Area: #261 - Airlift

Title: Airdrop Equipment Development
Budget Activity: #4 - Tactical Programs

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	743	950	2721	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	652	950	2404	Continuing	Not Applicable

The FY 1979 difference reflects general adjustment to the program during execution and an increase in the scope of work planned. The FY 1980 is unchanged. FY 1981 increase is to cover the development of an Ultra-Heavy-Capacity Airdrop System in response to a high-priority requirement.

E. (U) OTHER APPROPRIATION FUNDS: Not Applicable. (NOTE: Airdrop items are stock fund procured and managed.)

Program Element: #6.42.18.A Title: Airdrop Equipment Development
DOD Missio: #261 - Airlift Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The work under this program element (PE) was formerly under PE 6.42.04.A, Air Mobility Support Equipment. The objectives of this ongoing work are to develop and field airdrop systems, components, and techniques which will increase the mission capabilities of airdrop operations, reduce operational costs, increase reliability of airdrop operations, 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 1981 are focused on: providing a single platform for the delivery of all heavy drop loads, high-level airdrop resupply capability, new methods for enhancing the link-up of men and materiel after airdrop, airdrop and airtransport engineering support to Army materiel developers; improving the personnel reserve parachute and extending capability to airdrop personnel at higher speeds and lower altitudes; and enhancing the capability to airdrop from high-performance aircraft and provide capability to airdrop heavy outsize combat materiel.

G. (U) RELATED ACTIVITIES: PE'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. Duplication is minimized by having the same Department of the Army representative manage the PEs and attend all related activities.

H. (U) WORK PERFORMED BY: Metric Systems, Inc., Ft. Walton Beach, FL; Pioneer Parachute Co., Manchester, CT; US Army Yuma Proving Ground, Yuma, AZ; US Army Natick Research and Development Command, Natick, MA.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Eleven new and improved items were fielded during the prior three years, including MC-3 Military Free-Fall Parachute System; static line deployed Steerable Personnel Parachute; Low-Altitude Cargo Parachute System; 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 120 items of priority munitions for airdrop. Sixty-five equipment and supply loads have been qualified to date for Low-Altitude Parachute Extraction System (LAPES) delivery. Completed design and evaluation of Ramp Bundle Airdrop System (WEDGE). Design tests of Type V Airdrop Platform prototypes by the contractor were completed, and the procurement of Development Test II/ Operational Test II (DT II/OT II) test quantities initiated. Initiated development of Free-Fall Maneuverable Reserve Parachute. Provided airdrop engineering and technical support to the development and test of the Air Force C-141B and the proposed Advanced Medium STOL Transport Aircraft.

2. (U) FY 1980 Program: Complete qualification of priority munitions for airdrop and LAPES delivery. Also, complete

Program Element: #6.42.18.A
DOD Mission Area: #261 - Airlift

Title: Airdrop Equipment Development
Budget Activity: #4 - Tactical Programs

certification of 18th Airborne Corps equipment for LAPES delivery. Type classify Ramp Bundle Airdrop System (WEDGE) for use with the C-130 aircraft. Conduct development and operational tests of Type V Airdrop Platform. Initiate engineering development of Staged Personnel Parachute System with Accompanying Bundle. Complete engineering design and development testing of Free-Fall Maneuverable Reserve Parachute. Initiate design of 500-lb-capacity High-Altitude Airdrop Resupply System and Ultra-Heavy-Capacity Airdrop System. Continue airdrop engineering and technical support to Air Force Developmental Aircraft programs.

3. (U) FY 1981 Planned Program: Complete development of Type V Airdrop Platform and type classify. Fabricate test quantities of Staged Personnel Airdrop System. Initiate operational tests of Free-Fall Maneuverable Reserve Parachute. Complete design and initiate development and operational testing of 500-lb-capacity High-Altitude Airdrop System. Continue development of Ultra-Heavy-capacity Airdrop System. Complete development of High-Speed Container Airdrop System (CTU/2A) and type classify. Initiate development of computer model to simulate loading of Army Materiel in Air Transport Aircraft. Initiate development of Drop Zone Assembly Aids; award contract for off-the-shelf hardware to obtain near-term improved capability for rapid assembly of troops after airdrop. Complete development of Computed Air Release Point data for airdrop of high velocity parachutes from C-130 and C-141 Air Force Aircraft. All necessary experimental work will be performed, and the proposed systems will be ready for full-scale engineering development.

4. (U) FY 1982 Planned Program: Initiate developmental testing (DT II) of Staged Personnel Parachute System. Complete development and type classify Maneuverable Reserve Parachute. Continue testing (DT/OT II) of Interim High Altitude Resupply System (500-pound capacity). Fabricate test quantities and initiate DT II of the Ultra-Heavy Capacity Air Drop System. Continue effort on computer code for Air Transport and Airdrop of Army Materiel in Air Force Aircraft. Initiate testing (DT/OT II) of Drop-Zone Assembly Aids. Develop and fabricate hardware for Airdrop Controlled Exit System (ACES). Initiate engineering development of Bundle Airdrop System (Universal), High-Speed Container Airdrop System (HSCADS) Universal, and Parachutist Weapons Jump Packs. All necessary work will be performed, and the proposed systems will be ready for full-scale development.

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

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.42.20.A
Title: Army Helicopter Improvement Program
DOD Mission Area: #255 - Tactical Surveillance
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0	0	5023	38000	To be determined	To be determined
	QUANTITIES						To be determined
D518	Army Helicopter Improvement Program (AHIP)	0	0	5023	38000	To be determined	To be determined
						To be determined	To be determined

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Ground commanders require a highly survivable helicopter to conduct reconnaissance, surveillance, security, target acquisition, and target designation functions in reduced visibility conditions and all levels of intensity of warfare. In performing these functions, the helicopter will operate in air cavalry, attack helicopter, and field artillery units. The objective of this program is to develop the most cost-effective system to meet this requirement. This development must be performed with recognition of the affordability issue attendant to the total modernization of the Army objective. The program will develop a near-term system capable of operation under reduced visibility conditions. Studies and testing clearly indicate Mast Mounted Sight (MMS) capability applied to an existing airframe would provide a more survivable near-term platform. As an integral part of the Army's combined arms team, the MMS helicopter will be the focal point for finding the enemy and directing a coordinated attack against his forces. In the antiarmor role, this system and the attack helicopters will operate in close harmony as hunter/killer teams. In support of field artillery the MMS helicopter will provide conventional artillery spotting and precision laser designation for the COPPERHEAD. As provisioned, the program is an evolutionary approach to achieve the most cost-effective battlefield capability for this role as the total Army moves forward.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: The FY 1981 program provides an essential link between MMS preliminary design efforts accomplished under Program Element 6.42.03.A (Project D281 Aerial Scout) and full-scale engineering development of the MMS helicopter modification, to be initiated early in FY82 in order to achieve earliest possible initial operational capability (IOC). Requested funds will be used to define and develop MMS critical components and perform systems integration analysis, as well as for necessary requests for proposal and source selection activities.

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 1980 Submission
Concept Formulation Package Complete*	Oct 79	Jul 79
Special Army Systems Acquisition Review Council/Office of the Secretary of Defense Program Review*	Nov 79/Dec 79	Not Shown
Selection of Existing Airframe for Modification*	Apr 80	Not Shown
Request for Proposal (RFP) Release for MMS*	Apr 80	Not Shown
MMS Preliminary Design & Component Definition Award*	Aug 80	
RFP Release on Airframe Modification	Apr 81	Not Shown
Engineering Development Contract Award	Nov 81	Not Shown
Initial Operational Capability (IOC)	Jul 85	Not Shown

*Performed under Project D281, PE 6.42.03.A.

The program milestones have been structured to delineate the program to develop an MMS helicopter with required target acquisition/designation capability.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	0	0	5023	To be determined	To be determined
Funds (as shown in FY 1980 submission)	Not Applicable				

Program Element: #6.42.20.A
DOD Mission Area: #255 - Tactical Surveillance

Title: Army Helicopter Improvement Program
Budget Activity: #4 - Tactical Programs

No FY 1980 Congressional Descriptive Summary was submitted for this program.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Aircraft Procurement, Army						
Funds (current requirements)	0	0	0	0	To be determined	To be determined
Funds (as shown in FY 1980 submission)	Not Applicable					
Quantities (current requirements)	0	0	0	0	720	720
Quantities (as shown in FY 1980 submission)						

No FY 1980 Congressional Descriptive Summary was submitted for this program. It is estimated that the first procurement funds for this program will be required in FY 1983.

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. This 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 fund 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 is 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 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 was cancelled by the Office of the Secretary of Defense (OSD). The decision authorized development of a mast-mounted sight (MMS) on either an OH-58 or UH-1 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.

G. (U) RELATED ACTIVITIES: Previous aerial scout program concept and program formulation efforts were conducted under program elements 6.32.05.A, and 6.42.03.A, Aerial Scout. A portion of PE 6.42.03.A FY 1980 funding will be used to support initial phases of MMS development. Weapon systems being developed under elements 6.46.21.A and 6.43.10.A, Heliborne Missile - HELLFIRE, and program element, 6.46.21.D, COPPERHEAD, when required, may use the terminal homing guidance provided by mast-mounted laser designator on the MMS helicopter.

Program Element: #6.42.20.A
DOD Mission Area: #255 - Tactical Surveillance

Title: Army Helicopter Improvement Program
Budget Activity: #4 - Tactical Programs

II. (U) WORK PERFORMED BY: Contractors will be determined when source selection has been completed for the Mast Mounted Sight (MMS) and airframe modification work. In-house developing organization: US Army Aviation Research and Development Command, St Louis, MO.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Covered under PE 6.42.03.A, Projects D281 and D304; encompassed overall concept formulation and requirements documentation, feasibility studies, and trade-off analyses (including NATO/RSI potential), and cost and operational efffectiveness analysis (COEA).

2. (U) FY 1980 Program: Covered by PE 6.42.03.A, Project D281; includes Army and OSD decision reviews, initiation of MMS preliminary design/critical component definition, selection of existing airframe, and overall risk reduction/systems integration analysis activities preparatory to initiation of MMS helicopter development under this project.

3. (U) FY 1981 Planned Program: Initiate MMS critical component development, complete systems integration/risk reduction analyses for the modification approach, prepare and release request for proposal for airframe modification with MMS, evaluate contractor proposals, and conduct source selection.

4. (U) FY 1982 Planned Program: Conduct Army/OSD decision reviews to result in award of Engineering Development contract November 1981. FY82 effort will encompass engineering design, fabrication, and testing required to prepare for the first flight of the aircraft modified with prototype MMS.

5. (U) Program to Completion: Engineering development will be completed, encompassing contractor flight testing, qualification, prototype delivery, and Army development testing/operational testing. Force deployability tests will be scheduled and completed. Component production and airframe modificatioon contracts will be awarded, leading to aircraft delivery and initial operational capability in FY 1985.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.06.A
Title: STINGER
DOD Mission Area: #213 - Ground Air Defense
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	24582	17577	9945	0	0	204071
	QUANTITIES						208
D646	STINGER	24582	17577	9945	0	0	204071

B. (U) 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), is now in engineering development.

C. BASIS FOR FY 1981 RDTE REQUEST: The programmed full scale development of the advanced seeker (POST) will be in the fourth and final year. Pre-flight and post-flight computer studies and the final performance assessment will be completed. Fabrication of the Tracking Head Trainer and hardware for support of the various test activities will be completed. Preparation of the Technical Data Package (TDP) and performance of Producibility Engineering Planning (PEP) activities will be completed. Reliability Demonstration and the Development Testing/Operational Testing II (DT/OT II) tests will be conducted. Engineering Development (ED) will be completed and a production decision for POST will be made.

Program Element: #6.43.06.A Title: STINGER
DOD Mission Area: #213 - Ground Air Defense Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Initiation of ED of the POST Seeker	June 1977	June 1977
Completion of ED of POST Seeker	June 1981	June 1981
Seeker available in Europe		

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	24582	17577	9945	0	204071
Funds (as shown in FY 1980 submission)	24582	17577	5384	0	200213

An additional $4M was added to FY81 to complete development of STINGER-POST guidance section. The additional funding is necessary because of delays incurred in the original schedule. Also, $0.56M was added because of new inflation indices.

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

Program Element: #6.43.06.A
DOD Mission Area: #213 - Ground Air Defense

Title: STINGER
Budget Activity: #4 - Tactical Programs

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Missile Procurement, Army						
Funds (current requirements)	104868	81000	70800	168600	908700	1368000
Funds (as shown in FY 1980 submission)	104900	81000	84800	137600	603600	1045900
Quantities (current requirements)	2250	2400	1356	1974	22215	30453
Quantities (as shown in FY 1980 submission)	2250	2400	2400	2450	20695	30453

Reason for Change: The $322.1 million increase in total procurement results from: (1) $116.8 million to cover an estimated total program cost revision based on FY 79 contract experience; (2) $101.4 million in economic changes resulting from application of new Department of Defense inflation guidance; and (3) $103.9 million reflecting a production lead time increase, a STINGER-POST development schedule delay, and a procurement strategy change whereby dual source production continues an additional year. The FY79 contract negotiations revealed that the original cost estimates were understated regarding the effects of inflation. This FY79 experience is reflected by the upward revision of unit cost estimates and, for affordability considerations, a downward revision in the number of missiles being procured in FY81-83. FY81 quantities were further reduced based on a probable delay in STINGER-POST initial production. Corresponding adjustments have been made in the outyears to preserve total program quantities.

Program Element: #6.43.06.A
DOD Mission Area: #213 - Ground Air Defense

Title: STINGER
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The currently fielded REDEYE Guided Missile System exhibits
in view of the current and postulated threat posed by enemy support and interdiction j 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 up to with no more than a due to all known infrared countermeasures. 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 additional missiles in theater stocks. The STINGER-POST advanced seeker (POST) has demonstrated the feasibility of a two color (infrared and ultraviolet) design which has a significantly enhance 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. The air-to-air STINGER program (PE 6.33.07) is also being managed by the STINGER project office.

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).

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

Program Element: #6.43.06.A Title: STINGER
DOD Mission Area: #213 - Ground Air Defense Budget Activity: #4 - Tactical Programs

1. FY 1979 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 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 197T, 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 Test-Government (PQT-G) to evaluate system performance independently against requirements. There were 35 flights conducted in Prototype Qualification Test-Government (PQT-G) under varying environmental conditions. The US Army Operational Test and Evaluation Agency (OTEA) also tested the system (Operational Test II) with both non-firing 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. 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 has been initiated. Design trade-off studies and a preliminary performance assessment have been completed. Fabrication, and ground and laboratory testing of prototype hardware will continue as will Producibility Engineering Planning (PEP) activities. Target purchases were made in preparation for the FY 1980 flight test program. The development program culminates in FY 1981 with the completion of the 29-round flight test program and upon completion of the TDP.

2. (U) FY 1980 Program: POST Engineering Development will continue with similar engineering tasks as those in FY 1979 with increased emphasis on PEP efforts but with reduced expenditures for target support. Detailed computer kinematic and

tolerance studies will be completed. Pre- and post-flight computer analyses will be initiated in support of 13 guided test vehicle (GTV) firings. Extensive ground and laboratory testing to proof the design will be performed prior to and in conjunction with the GTV phase of the firing effort. Design of Tracking Head Trainers (THT) will be initiated and completed, and fabrication started.

3. (U) FY 1981 Planned Program: Completion of Engineering Development of POST will be accomplished in FY 1981. System simulation activities will include: (1) completion of computer simulation validation and pre- and post-flight analyses; and (2) initiation and completion of the computer final performance assessment. All development activities will be completed at the end of the flight test effort and upon the delivery of the Technical Data Package (TDP). Tests, test support, and PEP will also be completed.

4. (U) FY 1982 Planned Program: None.

5. (U) Program to Completion: None.

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 were 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 cause 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 tail fin 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 24 successes, 6 failures, and 2 no-test. Five of the failures were the result of the target exceeding the missile kinematic capability and one was the result of a miswired battery coolant unit. 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 24 successes, 8 failures, and 3 no tests. Four of the failures were due to poor quality control in the detector filter, one for dual "hot spots," one near miss on a 0° aspect, and one for failure of the wings to erect. Corrective action was taken on all deficiencies. 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 FY81. 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.

(U) Testing by the contractor, Pamona Division of General Dynamics Corporaton, 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, scheduled to begin in December 1979, 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 1981.

(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 FY80. Six of the GTV's will be preconditioned at extreme temperatures. Prototype Qualification Tests (PQT) by the government, consisting of 16 rounds, will begin early in 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 by the contractors on the GV configuration are scheduled for January 1980 at China Lake, CA. Fly-by tracking tests of the GV were completed in September 1978. The CCMV version is scheduled for testing in mid-January 1980 at Ft. Bliss, TX. Electromagnetic radiation tests are scheduled for July 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.

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 successes and 6 failures. Four of the failures 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 of the REDEYE Weapon System, which was used as the baseline. The conclusions that supported a production decision with the hardware configuration tested are:

(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 early CY 1981. The OT&E flight test objectives for POST (operation in an infrared countermeasures environment) will be incorporated into the DT&E program. A separate operational field/tracking exercise will be conducted by the OTEA at Ft. Bliss, TX and Nellis AFB, NV, beginning in March 1981. The field exercise will be conducted to assess the prelaunch or gunner-influenced performance of the system. While the external appearance and gunner mechanical operations are not changed from the basic STINGER system, this STINGER-POST tracking exercise will evaluate gunner training and operational aspects of the system. Six Tracking Head Trainers and a moving target simulator will be available for the operational tests. OT&E testing will be completed mid-CY 1981. A production decision will be made in August 1981.

3. System Characteristics:

Operational/Technical Characteristics 1/	Objectives	Demonstrated Performance
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/		
Infrared Countermeasures (Performance Degradation %) 9/ 10/		
Weapon Reliability		
IFF Maximum Instantaneous		

Program Element: #6.43.06.A Title: STINGER
DOD Mission Area: #213 - Ground Air Defense Budget Activity: #4 - Tactical Programs

Operational/Technical Characteristics 1/	Objectives	Demonstrated Performance
Search Sector (Degrees) 13/	±6	±5
Ready-to-fire weapon weight Including Onboard IFF antenna (lbs)	35	33.9 (34.3)*

* Number in parentheses reflects current estimate (CE) for POST program.
** Based on PQT-G/OT II/PPT test results.

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 (Pdet). For the purposes of ED, the performance of the gunner will not degrade this probability. Includes non-IRCM maneuvering and nonmaneuverving 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_s) in a countermeasures environment compared to the approved program E_, 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.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.07.A
DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)
Budget Activity: #4 - 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	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	228392	128718	51624	28699	42867	1902072
D212	Patriot (SAM-D)	227492	125718	29132	0	0	1804114
D213	Patriot (ECCM Enhancement)	-	-	19606	24780	27177	71563
D291	Patriot (NATO)	900	3000	2886	3919	15690	26395

B. 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 kill probability capable of operation in an Electronic Counter Measures (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 U.S. which established a NATO Patriot Steering Committee (PSC) and a full time management study group for the period Oct 78-Oct 80 to study the acquisition of Patriot by these nations. Patriot Electronic Counter Counter Measures (ECCM) Enhancement (Project Number D213) has been initiated upon recommendations of the Defense Science Board to _____ threat.

C. (U) BASIS FOR FY 1981 RDTE REQUEST:

Program Element: #6.43.07.A
DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)
Budget Activity: #4 - Tactical Programs

(U) Project D212 - Firing Units (FU) 3, 4, and 5 will be retrofitted to accommodate the requirements of the Antenna Mast Set (AMS), the counter Antiradiation Missile (ARM) program and Maintenance Enhancement Program (MEP). The Communications Relay Set (CRS) will be developed and tested and the final development of the Electrical Power Plant completed. The Initial Operational Capability (IOC) battalion training will be initiated using FU 4 and 5. The third Initial Production Facilities (IPF) contract will be executed to procure the special tooling and test equipment necessary to meet the production rates of Patriot.

Project D213 - Initial definition and design effort will begin for the following tasks:

(U) Project D291 - Continuation of ongoing technical/management requirements to support NATO acquisition efforts.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
First Modular Digital Airborne Guidance System (MDAGS) Flight	Oct 78	Oct 78
Delivery of FU #3 to White Sands Missile Range (WSMR)	Dec 78	Dec 78
Delivery of FU #4 to WSMR	Feb 79	Jan 79
Contractor Flight Tests Completed and Start of development/operational Testing (DT/OT)	Nov 79 1/	Jul 79
Completion of DT/OT Testing	Jun 80 2/	Mar 80

1/ The final contractor flights are scheduled for January 1980; the OT II began 19 Nov 79 and the delay was due to delays in software integration which were corrected.
2/ OT II will be completed in March 1980; DT will be completed in June 1980 due to delay in the start of DT until February Test data from OT will be used by DT where applicable.

Program Element: #6.43.07.A
DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)
Budget Activity: #4 - Tactical Programs

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current submission)	228392	128718	51624	71566	1902072
Funds (as shown in FY 1980 submission)	228392	128718	31668	1900	1812450

The additional funds required to completion and for total cost increased due to: extension of Patriot (NATO) D291 effort through FY86; initiation of the Patriot (ECCM Enhancement) D213 effort directed by Defense Science Board which will be accomplished during FY81, FY82 and FY83. The overall increase in D212, D213, and D291 to the obligation authority provides for inflation for the FY81 Budget Submission.

E. (U) OTHER APPROPRIATION FUNDS: ($ IN THOUSANDS)

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Costs
Missile Procurement, Army						
Funds (current requirement)	67300[1/]	395950[2/]	469600[3/]	575200[3/]	2584300[3/]	4092350[3/]
Funds (as shown in FY 1980) submission)	67321	425950	419788	-	2781341	3694400
Quantities (current requirement)						
Fire Control Sections	0	5	12[3/]	18	68	103
Missiles	0	155	183	391	3544	4267
Quantities (as shown in FY 1980 submission)						
Fire Control Section	0	5	15	-	83	103
Missiles	0	155	184	-	3934	4273

Program Element: #6.43.07.A
DOD Mission Area: #213 - Ground Air Defense

Title: Patriot (SAM-D)
Budget Activity: #4 - Tactical Programs

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Costs
Military Construction, Army Funds (current requirement)	0	3800 4/	0	42000 4/	0 4/	0 4/
Funds (as shown in FY 1980 submission)	0	0	0	-	11400	11400

1/ $21K deleted by OSD action.
2/ $30M deleted by Congressional action.
3/ Difference in current program budget request for FY 1981 and previous submission is the result of escalation, adjustments to achieve producable quantities of government furnished equipment (GFE), program reduction in FY 1981 procurement and procurement of training devices deformed from FY 1980 pursuant to FY 1980 budget direcction.
4/ Increase due to addition of Missile Construction Army (MCA) funds required for US Army Europe (USAREUR) deployment and FY80 expenditures approved at Ft Bliss and omitted in FY80 CDS. Additonal to complete funds required but not yet identified.

Program Element: #6.43.07.A
Title: Patriot (SAM-D)
DOD Mission Area: #213 - Ground Air Defense
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. IBM Corporation of Huntsville, AL, is the System Engineering Cost Reduction Assistance Contractor (SECRAC). 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 1979 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 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 Anti-missile Capability Study was approved in December 1972 which recommended: deletion of the nuclear warhead, programing 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 System 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 test program from 2 December 1976 to 31 December 1979 has completed 35 missile firings. A special ASARC approved the current accelerated program on 17 February 1977. FU 4 and FU 5 are being used at WSMR for training, support, and DT/OT Tests during FY80. One DT II firing has been completed utilizing FU 2. The contract period of performance has been extended to March 1981 to include producibility engineering and planning (PEP), the Counter-Anti radition 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 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.

2. (U) FY 1980 Program: Twenty-four Modular Airborne Guidance Section (MDAGS) missiles are scheduled to be flight tested

to complete Development Test/Operational Test II (DT/OT II). The environmental qualification program is scheduled for completion. Design, prototype hardware production and simulation activities in the area of Counter-ARM continued. PEP activities conclude with the completion of the manufacturing data package and completion of the design and documentation of the special tooling and test equipment. The second IPF contract will be executed to buy the special tooling and special test equipment to complete the production line set up for initial production of the Patriot tactical hardware at less than full-scale production rate. The first production buy of Patriot tactical hardware will be executed after a favorable Defense Systems Acquisition Review Council (DSARC) III decision.

3. (U) FY 1981 Planned Program: Fire Units 3, 4, and 5 will be retrofitted to accommodate the requirements of the Antenna Mast Set (AMS) effort, Counter-ARM program, and Maintenance Enhancement Program (MEP). The Communications Relay Set (CRS) development concludes and Maintenance Enhancement Program (MEP) prototype designs and initial tests will be accomplished. The Initial Operational Capability (IOC) battalion training will be initiated using FU 4 and 5. The third IPF contract will be executed to procure the special tooling and special test equipment necessary to meet programmed production rates for Patriot. The second production contract for Patriot tactical hardware will be executed. The definition and design efforts on Electronic Counter Counter Measures (ECCM) Enhancement Program will be initiated. NATO acquisition efforts will continue.

4. FY 1982 Planned Program: The ECCM Enhancement program (D213) initiates design efforts for [redacted]. The continuation multiyear tasks for NATO activities will continue. Follow-on activities will consist of engineering and test efforts previously underway such as: Counter-Arm testing; initial ECCM enhancement testing; completion of CRS/AMS engineering; conduct of the Production Confirmatory test; conduct of Follow-on Evaluations by the Operational Test and Evaluation Agency (OTEA). A third production contract will be executed. The first and second battalion units will be trained prior to IOC in CY 1982.

5. (U) 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.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D212 Title: Patriot (SAM-D)
Program Element: #6.43.07.A Title: Patriot (SAM-D)
DOD Mission Area: #213 - Ground Air Defense 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. IBM Corporation of Huntsville, AL, is the System Engineering Cost Reduction Assistance Contractor (SECRAC). 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.

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D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 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 approved the current accelerated program on 17 Feb 77. The test program from 2 Dec 76 to 31 Dec 79 has completed thirty-five missile firings. FU 4 and FU 5 are being used at White Sands Missile Range (WSMR for training and support and development/operational tests (DT/OT) during FY80. One DT firing has been completed utilizing FU 2. 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

Project: #D212 Title: Patriot (SAM-D)
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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.

2. (U) FY 1980 Program: Twenty-four Modular Digital Airborne Guidance Section (MDAGS) missiles are scheduled to be flight tested to complete Development Test II/Operational Test II (DT/OT II). The environmental qualification program is scheduled for completion. Design, prototype hardware development and simulation activities in the area of Counter-ARM will continue. PEP activities conclude with the completion of the manufacturing data package and completion of the design and documentation of the special tooling and special test equipment. The second IPF contract will be executed to buy the special tooling and special test equipment to complete the production line set up for initial production of the Patriot tactical hardware at less than full-scale production rate. The first production buy of Patriot tactical hardware will be executed after the Defense Systems Acquisition Review Council (DSARC) III decision.

3. (U) FY 1981 Planned Program: Fire Units (FU) 3, 4, and 5 will be retrofitted to accommodate the requirements of the Antenna Mast Group (AMS), counterARM program and Maintenance Enhancement Program (MEP). The Communications Relay Set (CRS) will be developed and tested and the final development of the Electrical Power Plant completed. The Initial Operational Capability (IOC) battalion training will be initiated using FU-4 and 5. The third IPF contract will be executed to procure the special tooling and special test equipment necessary to meet the programmed production rates for Patriot. The second production contract for Patriot tactical hardware will be executed.

4. (U) FY 1982 Planned Program: Follow-on activities will consist of engineering and test efforts previously underway such as: counter ARM testing; completion of CRS/AMS testings; initial ECCM Enhancement testing; conduct of the Production Confirmatory Test; conduct of the Follow-on Evaluations by the Operational Test and Evaluation Agency (OTEA). A third production contract will be executed. The first and second battalion units will be trained prior to IOC in CY 1982.

5. (U) Program to Completion: Production contracts will be executed until the currently programmed number of fire units are completed.

Project: #D212 — Title: Patriot (SAM-D)
Program Element: #6.43.07.A — Title: Patriot (SAM-D)
DOD Mission Area: #213 - Ground Air Defense — Budget Activity: #4 - Tactical Programs

6. (U) Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
First Modular Digital Airborne Guidance System (MDAGS) Flight	Oct 78	Oct 78
Delivery of FU-3 to White Sands Missile Range (WSMR)	Dec 78	Dec 78
Delivery of FU-5 to WSMR	Feb 79	Jan 79
Contractc Flight Tests Completed and Start of Development Test/ Operational Test (DT/OT)	Nov 79[1/]	Jul 79
Completion of DT/OT Testing	Jun 80[2/]	Mar 80

1/ The final contractor flights are scheduled for January 1980. The OT began 19 Nov 79 due to delays in software integration which were corrected.

2/ OT II will be completed in March 1980; DT will be completed in June 1980 due to the delay in the start of DT until March 1980. Test data from OT will be used by DT where applicable.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	227492	125718	29132[1/]	0	0	1804114[1/]
Funds (as shown in FY 1980 submission)	227492	125718	26668	Not Shown	0	1801650

Project: #D212
Program Element: #6.43.07.A
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Title: Patriot (SAM-D)
Title: Patriot (SAM-D)
Budget Activity: #4 - Tactical Programs

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Estimated Cost
Quantities (current requirements)		Not Applicable				
Quantities (as shown in FY 1980 submission)		Not Applicable				
Other Appropriations:						
						Total
Missile Procurement, Army:						
Funds (current requirements)	67300 2/	395950 3/	469600 4/	575200 4/	2584300 4/	4092350 4/
Funds (as shown in FY 1980 submission)	67321	425950	419788	Not Shown	2859341	3806600
Quantities (current requirements)						
Fire Control Section (FCS)	0	5	12 5/	18	68	103
Missiles 0	155	183	184	3897	4267	
Quantities (as shown in FY 1980 submission)						
Fire Control Sections (FCS)	0	0	15	Not Shown	83	103
Missiles	0	155	184	Not Shown	3934	4273
Military Construction, Army(MCA)						
Funds (current requirements)	0	3800 6/	0	42000 6/	0 6/	0 6/
Funds (as shown in FY 1980 submission)	0	0	0	11400	0	11400

1/ Increased due to inflation.
2/ Reduced by OSD action.
3/ Reduced by congressional budget actions.
4/ Difference from current program budget request for FY 1981 and previous submission.

Project: #D212 Title: Patriot (SAM-D)
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5/ The difference is the result of escalation, adjustments to achieve producable quantities of government furnished equipment (GFE), program reduction in FY 1981 procurement and training devices procurement deferred from FY 1980 pursuant to FY 1980 Congressional budget direction.
6/ Increased due to Military Construction Appropriation (MCA) required for US Army Europe (USAREUR) deployments and FY80 expenditures at Ft. Bliss, TX, omitted in FY80 CDS. Additional to complete funds required but not yet identified.

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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-risk 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) Five 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 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 are 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 will provide input for a production decision.

c. (U) The engineering development (ED) test program was organized into contractor and goverment testing called 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 has been divided into three phase : the first phase was the initial proof-of-principle firings; the second was between Feb 76-Nov 77; and the third continued until January 1980. The contractor was to fire 55 rounds during these phases. To date, 49 firings have occurred, four were cancelled due to guidance changes and two remain. The government program was originally configured to fire 70 missiles. Thirty firings were reduced by the elimination of OT III, and fifteen were reduced in 1977 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. A total of 76 missiles will be fired in ED by the contractor and government. A summary of all firings to date is at subparagraph i 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 system integration. 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-Principal demonstration were met with the first six Patriot guided missile flights against target aircraft. The target conditions included

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. 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

environments were used. Target conditions included:

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 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 by OSD 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 thirty firings 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 placing the system into the field led to this decision.

(3) (U) Phase III contractor tests are continuing through January 1980. They consist 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 are incorporated into the program to assess critical man-machine interfaces. Development Test and Operational Test evaluators will also share test data for use during their independent evaluations.

d. (U) The OT/DT events will utilize prototype FU's 3, 4 and 5 for the conduct of both tests. FU 3 will be 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 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. It also is being redesigned and will be manufactured by the prime contractor. The electronic equivalents of the CRS and AMS will be available for testing in DT/OT II. The CRS, AMS, and EPP will undergo development testing and production confirmatory tests (PCT) in 1980-82. One Electronic Power Plant is available for OT/DT and one for mobility 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 of the CRS, AMS, and Electrical Power Plant (EPP) until the PCT and Follow-on Evaluations (FOE). The MSP to be tested in OT II will provide data on how well the Patriot system meets its RAM requirements. A maintenance enhancement program (MEP) is being developed to significantly (75% to 99%) improve the capability of maintenance personnel to isolate and repair malfunctions. The Department of the Army will conduct a System Support Evaluation (SSE) in early 1981 to test the results of MEP.

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 are expected to demonstrate satisfactory growth toward specified Mean Time Between Failure (MTBF) values during the government Prototype Qualification Tests. An MTBF of hours and Inherent Availability of are to be demonstrated in DT/OT. Reliability growth to date of the Patriot Radar, Engagement Control Station (ECS) and Command and Coordination Set (CCS) has been satisfactory. The launcher reliability growth has been slightly 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

meeting its current requirement at this point in its development. There have been 14 firings since the change to the modular digital airborne guidance system (MDAGS) with 24 more scheduled in OT/DT.

f. (U) Environmental qualification tests will be conducted as a coordinated government-contractor test program to determine the effects of natural and induced environments. Climatic testing will be conducted at Eglin AFB, FL, and at the contractor plant facilities. Mobility, transportability, electromagnetic interference and chemical tests will be conducted at Aberdeen Proving Ground, MD, during 2d and the 3d quarter FY80. High altitude, electromagnetic radiation, compromising emanations, electromagnetic compatibility, and radar transmitter spectrum measurements will be conducted at WSMR in the 3d/4th quarter FY80.

g. (U) The development contractor for the Patriot system is Raytheon Company, Bedford, MA, with Martin Marietta of Orlando, FL, as the primary subcontracter for the missile. IBM of Huntsville, AL, is the System Engineering Cost Reduction Assistance Contractor (SECRAC) who supports the test program by assisting in test data reduction. MG Oliver D. Street is the Patriot Project Manager. The development test is being conducted by the US Army Test & Evaluation Command (TECOM), and the operational test is being conducted by the US Army Operational Test & Evaluation Agency (OTEA).

h. (U) Test Schedule Summary:

Test	Dates	Equipment	Equipment Type
OT	Nov 79-Mar 80	FU's 4 & 5, CCS	Engineer development(ED) equipment (see para 1b) CRS, AMS, EPP not production-like equipment
PQT-C(DT)	Mar-Jun 80	same as OT	same as OT
Mobility/ Environmental	Mar-Oct 80	FU4	ED equipment (see para 1b)
System Support Evaluation (SSE)	Nov 80-Jan 81	FU 5 modified	ED equipment (see para 1b)

Project: #D212 Title: Patriot (SAM-D)
Program Element: #6.43.07.A Title: Patriot (SAM-D)
DOD Mission Area: #213 - Ground Air Defense Budget Activity: #4 - Tactical Programs

Test	Dates	Equipment	Equipment Type
Production Confirmatory Test (PCT)	Jan-Apr 82	FY80 production	production equipment
Follow-On Evaluation (FOE)	May and Sep 82	FY80 production	production equipment

1. PATRIOT Flight Test Results to Date.

Flt No.	Date	Engagement Objective	FU	Mission Results	Reliability Scoring
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		
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		

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Flt No.	Date	Engagement Objective	FU	Mission Results	Reliability Scoring
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	8 Feb 78		2		
25	23 Feb 78		2		
26	27 Mar 78		2		
27	24 Apr 78		2		
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		
MF-1	28 Sep 78		2		
MF-2	12 Oct 78		2		
MF-3	17 Nov 78		2		
MF-4	19 Jan 79		2		
MF-5	24 Feb 79		2		
MF-6	6 Mar 79		3		
MF-7	27 Apr 79		3		
MF-8	2 May 79		3		
MF-9	17 May 79		3		

Project: #D212 Title: Patriot (SAM-D)
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Flt No.	Date	Engagement Objective	FU	Mission Results	Reliability Scoring
PQT-G2	22 Aug 79		2		
MF-10	28 Aug 79		3		
MF-11	8 Nov 79		3		
MF-12	14 Nov 79		2		
MF-13	1 Dec 79		3		

* 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

2. (U) Operational Test and Evaluation:

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) during 1982. OTEA will actively participate in a System Support Evaluation (SSE) in the 2nd quarter FY81. Ground equipment used for OT II will be the same as that used for Development Test (DT) II. Nine of twenty-five Government test missiles are designated to be fired under the control of OTEA. An independent evaluation report will be provided by OTEA prior to a production decision. OT II will be conducted at White Sands Missile Range and Ft Bliss, TX, on prototype equipment manned by soldiers from an active duty 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 is a ten-month, two-phase test with a Patriot Battalion minus (consisting of two firing units, a command and coordination set (CSS), and associated government equipment) which will conduct 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 began on 19 Nov 79 and is a sixty-day exercise. Phase II was delayed from 31 Aug to 19 Nov 79 by software integration problems. These

problems were reviewed at Dept of the Army and corrections made prior to the start of OT. Efforts are continuing to complete system software in order to provide for the completion of certain OT tests during DT testing. Subtest 1 is a Tactical Effectiveness Evaluation (TEE) conducted under scenarios realistically depicting the threat environment to assess operator/machine capabilities. During Subtest 2, the Patriot units will deploy, operate, and conduct movements under realistic operational field conditions to include chemical environments. This subtest was temporarily suspended by OTEA on 10 December 1979 until 8 January 1980. 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 is a series of four live fire exercises with two fire units launching nine missiles during multiple simultaneous engagements (three firings of two missiles and one firing of three missiles). All evaluations during OT II will be conducted in an ECM environment using Standoff Jammers (SOJ) and/or Self-Screening Jammers (SSJ). Chaff will be included during selected tests. The Patriot CCS will be interfaced with an Air Defense Group Command and Control System, the AN/TSQ-73, when the battalion is operating in the centralized or decentralized methods of control for both live fire and nonfire exercises.

c. (U) OT II soldier training was a 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, will be used to obtain information on the adequacy of training. OTEA monitored the training phase.

d. (U) The equipment utilized for OT II will be preproduction prototype configuration Fire Units 4 and 5 except for the CRS, AMS, and EPP. 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 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 last sixty days of Unit Training of the 1st Battalion to be deployed. The second part is programmed to occur five months after the initial operational capability (IOC) use the IOC battalion for a thirty-day evaluation.

3. System Characteristics: The essential system requirements at the confidential level are provided below.

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Operational/Technical Characteristics	Objectives
Range (km) - Max	
Min	
Altitude (km) - Max	
Min	
Target - Max Velocity (m/s)	
Target Manever (g)	
in formation	
Availability - Inherent	
Missile	
MTBF (hrs)	
Reaction Time (Auto) (Sec)	
PSSK	
Reload Time (Minutes)	

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D213 Title: PATRIOT Electronic Counter-Countermeasure (ECCM) 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. The current threat

These improvements will
Both hardware and software enhancements will be made to achieve the improved performance. Hardware improvements are:

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. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Not Applicable

2. (U) FY 1980 Program: Not Applicable

3. (U) FY 1981 Planned Program: FY 1981 is dedicated to conceptual design, initial definition of performance trade offs,

Project: #D213 Title: PATRIOT Electronic Counter-Countermeasure (ECCM) Enhancement
Program Element: #6.43.07.A Title: PATRIOT (SAM-D)
DOD Mission Area: #213 - Ground Air Defense Budget Activity: #4 - Tactical Programs

and initial design efforts. The emphasis will be to provide specific hardware requirements, software development and initial evaluations. The requirements will be determined by use of currently accepted simulation models, theoretical studies and breadboard tests on current Engineer Development equipment at White Sands Missile Range (WSMR). Software development will be emphasized to insure coding/integration is accomplished for validation. Initial evaluations will be made to demonstrate concepts, integrate hardware/software changes and refine requirements. All necessary development work will be performed and the proposed enhancement will be prepared for production engineering.

4. (U) FY 1982 Planned Program: The continuation of the enhancement program in 1982 will allow completion of performance requirements for two improvements and the integration and testing of other improvements. Simulations will be accomplished to anticipate new hardware capabilities. Documentation of proposed hardware and software will be accomplished. Initial development of fuze and warhead improvements begin.

5. (U) Program to Completion: ECCM enhancements will be integrated into systems level tests and evaluations. Production release occurs and improvements are incorporated into production in 1985.

6. (U) Major Milestones: Not Applicable to this project.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	0	0	19606	24780	27177	71563
Funds (as shown in FY 1980 submission)	Not Applicable					
Quantities (current requirements)	0	0	0	0	103	103
Quantities (as shown in FY 1980 submission)	Not Applicable					

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Title: PATRIOT Electronic Counter-Countermeasure (ECCM) Enhancement
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Other Appropriations: Improvements are to be folded into currently programmed production contracts when system design finalized and tested.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.09.A
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Title: ROLAND
Budget Activity: #4 - Tactical Program

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	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	27765	11299	12638	0	0	299049
	QUANTITY - Fire Units						4
	QUANTITY - Missiles						90
D647	ROLAND	27765	11299	12638	0	0	299049

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the transfer of the design of the French/German ROLAND II All-Weather Short-Range Air Defense (SHORAD) missile system to the US. 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 system to defend vital targets in Corps areas against low-flying, high-performance aircraft.

C. BASIS FOR FY 1981 RDTE REQUEST: $7.6 million in FY81 is needed to complete design and fabrication of a prototype US ROLAND multistation classroom trainer. This effort is a continuation of one initiated in FY80. $5.0 million is required to develop a prototype maintenance training simulator for use in training organizational and direct support maintenance personnel.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Defense Systems Acquisition Review Council I/II	FEB 74	FEB 74
Source Selection Evaluation	JAN 75	JAN 75

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Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Joint US/European Test (Completed)	NOV 78	NOV 78
Defense Systems Acquisition Review Council III	MAY 79	MAY 79
Low Rate Production	OCT 79[1/]	MAY 79
Initial Operational Capability(IOC) (Training Btry)	N/A[2/]	
Initial Operational Capability(IOC) (Tactical Unit in Europe)		N/A[2/]

1/ Change is a result of delaying the release of FY79 procurement funds for award of FY79 production contract until resolution of the ROLAND FY80 procurement funds issue by the Congressional joint authorization conference.

2/ Change due to the deletion of the training battery and two tactical battalions from the approved program.

3/ IOC of first tactical unit deployed to Europe was not shown in FY80 submission; the current date represents a slip of one year in last year's schedule (4 months because of delay in award of FY79 production contract and 8 months due to continuing low-rate production for a third year in FY81).

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

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	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	27765	11299	12638	0	299049
Funds (as shown in FY 1980 submission)	22663	11299	6999	0	288400

Additional funding of $5.1 million was reprogrammed by the Army in FY79 to cover the impact of a labor strike at Boeing Aerospace Company; $0.6 million of the increase in FY81 is due to application of new Department of Defense inflation indexes; the remaining $5.0 million reflects the requirement for a prototype maintenance training simulator.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Missile Procurement, Army:						
Funds (current requirements)	167600	296900[1/]	412000	551000	124000	1607200[2/]
Funds (as shown in FY 1980 submission)	167600	296900	520600	555900	424600	2021300
Quantities - Fire Units:						
(current requirements)	3	18[1/]	23	51	0	95
(as shown in FY 1980 submission)	3	18	54	-	105	180[3/]
Quantities - Missiles:						
(current requirements)	75	410[1/]	600	1230	824	3139
(as shown in FY 1980 submission)	75	410	970	-	4731	6186[3/]

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Notes:

1/ Award of the FY 1979 production contract was delayed more than four months because FY 1979 procurement funds could not be released until the issue of FY80 procurement funds for US ROLAND was resolved by the Congressional joint authorization conference. The impact of this delay in fiscal years 79 and 80 amounts to $10.4 million, which will be handled through reprogramming, reducing hardware quantities, or by reducing the scope of engineering services in FY 1980.

2/ Includes peculiar support equipment and initial spares for a two-battalion (95 fire units) nondivisional air defense program.

3/ Current total Army Authorization Objective (AAO), less Technology Transfer, Fabrication and Test (TTF&T) quantities.

FY 1981 funding and quantity differences between the FY 1980 and 1981 submissions are due to a decision, which was driven primarily by affordability, to continue low-rate production for a third year. The funding and quantity reductions in the outyears and totals reflect a two-battalion (95 fire units) program instead of the four-battalion program (180 fire units) presented in the FY 1980 submission. The Army still has a valid requirement for four nondivisional US ROLAND battalions; however, affordability constraints necessitated the reductions presented in this submission.

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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 airbases and other rear area critical assets. The US ROLAND will replace the presently deployed European nondivisional CHAPPARAL/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 XM975 tracked vehicle. The US system can engage low-flying targets at ranges out to ¡km and altitudes up to ¡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 1979 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 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 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 modification proposed by Hughes Aircraft Company was negotiated in August 1976, and a special ASARC was held 16 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 Facilitization (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. Obligation of the FY 1979 procurement funds for production was delayed until October 1979 pending resolution of the ROLAND FY 1980 procurement funds issue by the Congressional joint authorization conference. The first low-rate production contract (FY 1979) was signed 30 October 1979.

2. FY 1980 Program: Analyze data and conduct activities incident to the close-out of the technology transfer; continue design/test effort to incorporate modifications into the track radar; continue design effort on the FMTS to provide support capability for the Organizational Maintenance Test Set (OMTS) Surveillance Radar Test Set; initiate design effort to upgrade software for the OMTS System Test Set; initiate design/test effort on the modification and on the track radar to correct its problem; initiate development/prototype fabrication of multistation classroom trainer; continue low-rate production effort.

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3. FY 1981 Planned Program: Complete development of the multistation classroom trainer; initiate development of a prototype maintenance training simulator; continue low-rate production effort; conduct reliability demonstration test; DSARC IIIb will be held during FY 1981 to review system reliability and improvement prior to approval of full-rate production.

4. (U) FY 1982 Planned Program: Initiate confirmatory tests in December 1981; begin full-production effort.

5. Program to Completion: Complete confirmatory tests in April 1983; continue production, aimed at deploying the first tactical unit to Europe in

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Budget Activity: #4 - Tactical Programs

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 future 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-December 1980 for the purpose of evaluating modifications to correct deficiencies found in TTF&T testing. These tests will be conducted by the developer. The second is a combined reliability demonstration test that will be conducted during October-December 1980 to evaluate system reliability growth as a result of improved components. This test, which includes a realistic and vigorous field test, will be 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 April 1983. 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.
- Verify US missile safety.
- Accept tactical missiles.

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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 deficiences 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.

- A modification has been designed in coordination with the Europeans which incorporates The complete modification will be subjected to system testing in the special evaluation test program scheduled for July-December 1980.

- The Europeans have taken the lead to incorporate a Similarly, the US has taken the lead on the track radar's Hardware with these modifications will be available for testing during the special evaluation test timeframe.

- A joint US/European modification will be tested during fiscal year 1981, November 1980 to June 1981.

(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 improvement program has been underway for a year. Prototypes have been designed and are undergoing qualification testing. The production design will be subjected to a reliability demonstration test to be conducted in an operational environment in October-December 1980.

The hardware to be tested in the three future 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 modifications. The reliability demonstration test will use an upgraded TTF&T fire unit which will incorporate the production configuration of the seven items discussed above. 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 all three test programs.

(U) The development contractor on US ROLAND is the Hughes Aircraft Company, with the Boeing Aerospace Company as the major subcontractor. Hughes and Boeing will provide test support during the remaining tests. All ROLAND tests will be conducted with the Army program manager, BG Joseph O. Lax. 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 reliability demonstration test and 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.

Test	Facility	Type of Personnel
Special Evaluation	White Sands Missile Range, NM	Government and contractor civilians
Reliability D stration	Fort Lewis, WA	US Army troops, 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

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Test	Facility	Type of Personnel
	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.

. Special Evaluation Test	Start July 1980 Complete December 1980
. Reliability Demonstration	Start October 1980 Complete December 1980
. Confirmatory Tests	
.. Developer Testing	
... Logistics Evaluation	Start December 1981 Complete August 1982
... Hardware Verification	Start January 1982 Complete April 1983
.. Operational Testing	Start October 1982 Complete February 1983

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(U) The number of units scheduled to undergo testing follows.

- Special Evaluation Test - One fire unit and five to nine missiles for firing.
- Reliability Demonstration - One fire unit and one organizational maintenance test set.
- 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.

Objective	Successful	Unsuccessful	No Test
Establish System Baseline			
Maneuvering Target			
Countermeasures			
Formation Targets			
Environmental			
Helicopter			
Arctic			
Total	41	18	5

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. Retest requirements during TTF&T established the need for the special evaluation test and the reliability demonstration 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 environment.	Same
Reliability Demonstration	Combination of factory and development tests conducted at White Sands Missile Range and an operational test at White Sands and Vandenberg AFB, CA.	Operational type test to be conducted at Fort Lewis, WA.

Reliability, availability, and maintainability (RAM) testing is a primary ingredient in future testing. The major objective of the reliability demonstration (October-December 1980) is to determine system reliability improvement in terms of average mean time between failure (MTBF). The average MTBF is to be demonstrated through 500 accumulated hours of system testing. A goal of hours fire unit average MTBF has been set for this test. A Technology, Transfer, Fabrication, and Test (TTF&T) fire unit will be upgraded with production configuration hardware for those items which exhibited unacceptable failure rates in TTF&T. The testing will be conducted using Army troops primarily.

The confirmatory tests (December 1981-April 1983) 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 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:

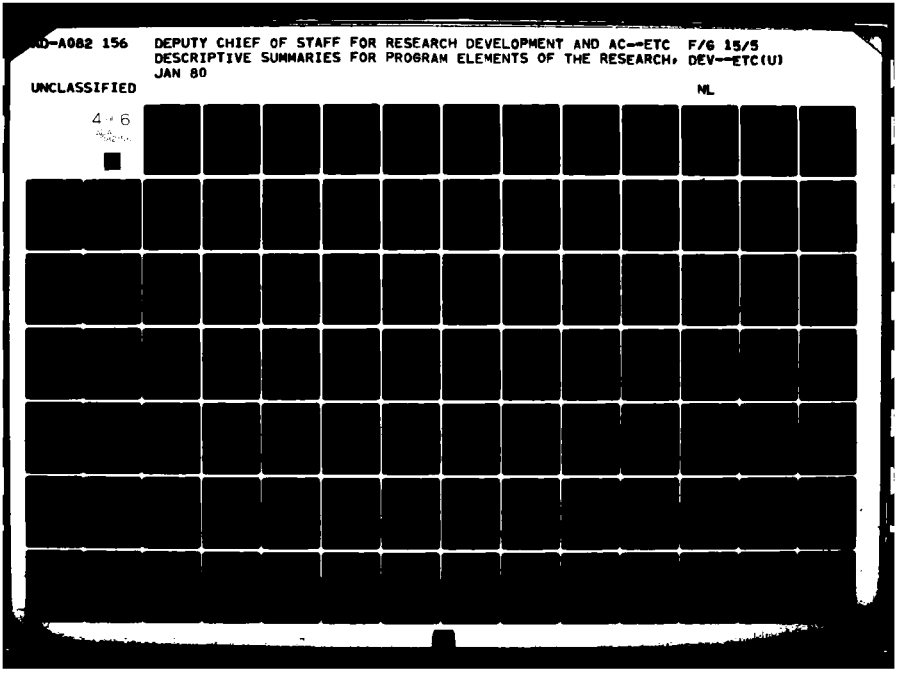
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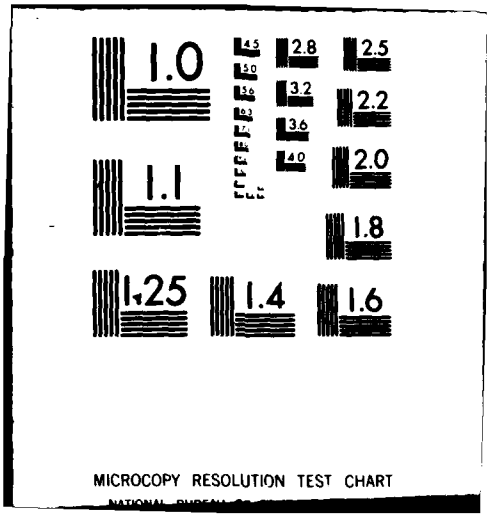
(1) assess the capability of the system to engage and destroy threat targets in an operational environment including adverse weather and enemy countermeasures, (2) assess the survivability of the US ROLAND in a hostile environment, (3) assess system personnel requirements, (4) assess the effectiveness 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 October 1982-February 1983 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.

(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


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MICROCOPY RESOLUTION TEST CHART

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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 demonstration (previously discussed in paragraph J.1.) scheduled for October-December 1980 will provide 500 hours of test time to give an indication of 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 October 1982-February 1983 during confirmatory testing as pointed out previously. As stated before, the test-fix-test philosophy corrected other deficiencies, retested the fixes, 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. Prior to award of the first full-production contract, the reliability demonstration test will be completed to insure that full-production reliability goals can be met.

Program Element: #6.43.09.A
DOD Mission Area: #213 - Ground Air Defense

Title: ROLAND
Budget Activity: #4 - Tactical Programs

3. System Characteristics:

Operational/Technical Characteristics	Objectives	Demonstrated Performance[1/]
. Forward Intercept Range		
Maximum (KM)	[ ]	[ ]
Minimum (M)		
. Intercept Altitude		
Maximum (KM)		
Minimum (M)		
. System Reaction Time (Sec)		
. Reload Time (Sec)		
. System Operational Availability (A_o)		
. System Operational Effectiveness (E_{ao})		
Benign (nonelectronic countermeasures (ECM)), nonmaneuvering, single target		
Benign (non-ECM), maneuvering, single target		
Benign (non-ECM), multiple target formation		
ECM environment, nonmaneuvering, single target		

Program Element: #6.43.09.A
DOD Mission Area: #213 - Ground Air Defense

Title: ROLAND
Budget Activity: #4 - Tactical Programs

Operational/Technical Characteristics	Objectives	Demonstrated Performance[1/]
ECM environment, multiple target formation		
• Antiradiation missile (ARM) Survivability		
• Missile Reliability		
• Inherent Availability (A_I)		
• Target Speed Maximum (MPS) Minimum (MPS)		
• Engagement Target Maneuvers (g's)		

FOOTNOTES:

1/ Demonstrated during developmental/operational testing (DT/OT II).
2/ To be retested during confirmatory testing.
3/ 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 [redacted]
5/ 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/ To be recalculated based on results obtained from the special evaluation test (July-December 1980), the reliability demonstration test (October-December 1980), and confirmatory testing (December 1981-April 1983).
7/ Based on computer simulation and analysis, not on a demonstration test.
8/ Based on tracking tests; the firing maximum target speed was [redacted] MPS which was constrained by the speed of the drone available and not system capability.

Program Element: #6.43.09.A
DOD Mission Area: #213 - Ground Air Defense

Title: ROLAND
Budget Activity: #4 - Tactical Programs

9/ Demonstrated in European Joint testing with European system; the maximum demonstrated by the US ROLAND system was [redacted] g's.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.10.A
DOD Mission Area: #211 - Close Combat

Title: Heliborne Missile - HELLFIRE
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	66358	61000	54844	21289	0	309978
	QUANTITIES						229
D069	UH-60 Feasibility Demonstration	0	3000	5420	0	0	8420
D074	Heliborne Missile - HELLFIRE	66358	58000	49424	21289		301558

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: HELLFIRE is a heliborne antiarmor 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 semiactive laser terminal homing guidance and will be designed to accept various other guidance packages. The missile system will be employed from Advanced Attack Helicopters (YAH-64's) against heavily armored vehicle at longer stand-off 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. In review of the FY80 budget, Congress added $3.0 million to Program Element 6.43.10 to demonstrate the feasibility of using the UH-60A as a firing platform for HELLFIRE missiles.

C. BASIS FOR FY 1981 RDTE REQUEST: The HELLFIRE Modular Missile System prime contractor will continue engineering development activities to complete testing, finalize the Technical Data Package, and support YAH-64 helicopter operational tests. Army efforts will also include preparation for and conduct of Defense System Acquisition Review Council (DSARC) III for the start of production. The flight test program for demonstration of HELLFIRE launches from the UH-60A helicopter will be completed.

Program Element: #6.43.10.A
DOD Mission Area: #211 - Close Combat

Title: Heliborne Missile - HELLFIRE
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Army System 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	Oct 79
Initial Production Contract Award	Nov 81	Oct 80
Missile & Launcher Availability	Jul 83	Sep 82
Initial Operational Capability (IOC) on Advanced Attack Helicopter (AAH)		

The changes in milestone dates from FY 1980 to FY 1981 submission are a result of adjusting the HELLFIRE schedule to be in synchronization with the revised AAH schedule.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

Program Element: #6.43.10.A
DOD Mission Area: #211 - Close Combat

Title: Heliborne Missile - HELLFIRE
Budget Activity: #4 - Tactical Programs

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	66358	61000	54844	21289	309978
Funds (as shown in FY 1980 submission)	65058	58000	38616	18708	286869

The increase in FY 1979 funds was to support a new requirement in battlefield obscuration testing. The increase in FY 1980 funds was added by Congress to demonstrate launching HELLFIRE from UH-60. The increase in FY 1981 funds is $5936 for application of new inflation indices, $4897 for delay in production program to synchronize with Advanced Attack Helicopter production, and $5395 to complete demonstration of launching HELLFIRE from UH-60. The increase in additional to completion of $2581 is for application of new inflation indices.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Missile Procurement, Army						
Funds (current requirements)			20800	126000	529986	676786
Funds (as shown in FY 1980 submission)			27677		499682	527359
Quantities (current requirements)				2760	21840	24600
Quantities (as shown in FY 1980 submission)			600		24000	24600

The increase in procurement funding is $12013 for additional training hardware requirements and depot capital equipment, $55529 from a new cost estimate of missile and launcher production items and engineering services, $94057 for application of new

Program Element: #6.43.10.A
DOD Mission Area: #211 - Close Combat

Title: Heliborne Missile - HELLFIRE
Budget Activity: #4 - Tactical Programs

inflation indices, and $7498 for additional requirements for initial production facilities; and a decrease of $19670 for a reduction in spare requirements. The changes in procurement quantities are a result of a new production schedule to be in synchronization with the Advanced Attack Helicopter with initial production facilities and long-lead items funded in FY 1981.

Program Element: #6.43.10.A
DOD Mission Area: #211 - Close Combat

Title: Heliborne Missile - HELLFIRE
Budget Activity: #4 - Tactical Programs

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 antiarmor 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 95 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. In review of the FY80 budget, Congress added $3.0 million to Program Element 6.43.10 to demonstrate the feasibility of using the UH-60A helicopter as a firing platform for HELLFIRE missiles. The statement of work and schedule requires funds in FY 1981 to complete the demonstration.

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 (PE) 6.23.03.A, Missile Technology, and the Advanced Development effort was conducted under PE 6.33.10.A, Heliborne Missile - HELLFIRE. Work on the infrared seeker, will be done under PE 6.43.16.A, Fire-and-Forget Seeker, HELLFIRE, currently programed for funding in FY 1981. The US Air Force portion of the tri-service development was funded under PE 6.46.08.F, Close Air Support Weapon Systems. The Air Force has elected not to employ the Tri-Service Laser Seeker on the Maverick missile. The Advanced Attack Helicopter is funded under PE 6.42.07.A. The UH-60 helicopter is currently in production.

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. Sikorsky Aircraft Division, Stratford, CT, will accomplish UH-60 development tasks. PM BLACKHAWK will execute the feasibility demonstration of launching HELLFIRE from UH-60.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1979 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 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 3d 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 197T supported the Cost and Operational Effectiveness Analysis (COEA), Army Systems Acquisition review Council/Defense System Acquisition Review Council (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.

2. (U) FY 1980 Program: Government and contractor testing is intensified in FY 1980. Engineering Design Flight Tests (EDT), component and system Prototype Qualification Tests conducted by the contractor (PQT-C) will be completed, and environmental storage tests will start. Fifty-five tactical prototype missiles will be flight tested in the EDT and PQT flight test programs including the initial live warhead launches. During first quarter of FY80, highly successful day and night launches were made from the YAH-64 with laser designation from its Target Acquisition Designation System. Operational Tests (OT II) will be conducted by the Operational Test and Evaluation Agency (OTEA) and will be supported by the system prime contractor. The AH-1 (COBRA) will be used as the testbed aircraft and thirty-three tactical prototype missiles will be flight tested in operational tests. Preparation will be made in FY 1981 for the production decision and for award of the Initial Production Facilities (IPF) contract in FY 1981. For the feasibility demonstration of launching HELLFIRE from UH-60 design and fabrication of hard points and wing stores and integration of launchers and fire control system will be accomplished.

3. (U) FY 1981 Planned Program: The FY 1981 RDTE program will be oriented toward completion of Engineering Development testing, correction of technical problems, and preparation for the start of procurement. 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 (OT II). 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. The milestone III reviews will be held for a production decision, and a contract for Initial Production Facilities (IPF) and procurement of long-lead items will be awarded to the system prime and seeker contractors. For the feasibility demonstration, flight tests will be conducted to evaluate the airframe modifications and HELLFIRE launches will be completed.

Program Element: #6.43.10.A
DOD Mission Area: #211 - Close Combat

Title: Heliborne Missile - HELLFIRE
Budget Activity: #4 - Tactical Programs

4. (U) FY 1982 Planned Program: Most of the Engineering Development effort will be completed, Production Validation Tests (PVT) will be conducted for missiles, launchers and laser seekers. Environmental storage tests will be completed, and six missiles that have been subjected to storage will be fired.

5. Program to Completion: 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 YAH-64 helicopter in

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D069 Title: UH-60 Feasibility Demonstration
Program Element: #6.43.10.A Title: Heliborne Missile - HELLFIRE
DOD Mission Area: #211 - Close Combat Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: In review of the FY80 budget, Congress added $3.0 million to Program Element 6.43.10 to demonstrate the feasibility of using the UH-60A as a firing platform for HELLFIRE missiles. The statement of work and schedule require funds for completion of the program in FY81. The overall objectives of the program are to:

1. (U) Relocate, design, and test hard points and wing stores on the UH-60A suitable for carrying 8 HELLFIRE missiles on each side of the UH-60A.

2. (U) Conduct flight tests to insure aerodynamic and structural compatibility of wing stores and launchers to the UH-60A.

3. (U) Integrate HELLFIRE fire control systems and electronics into the UH-60A. 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 structural loads of aerodynamic stability.

4. (U) Conduct a preliminary airworthiness evaluation by military pilots and a developmental test by US Army Test and Evaluation Command monitored by US Army Operational Test and Evaluation Agency to determine technical and to evaluate operational feasibility.

5. (U) Define UH-60/HELLFIRE interface documentation to insure complete compatibility of the systems.

(U) The FY80 effort will be to design, fabricate, and ground test the UH-60A hard points and to integrate the HELLFIRE launchers and fire control system. The FY81 effort will include an aerial structural demonstration, handling qualities demonstration, blast pressure survey, and firing missiles from the airborne platform. An airworthiness evaluation and developmental testing will be completed by military pilots and engineers.

B. (U) RELATED ACTIVITIES: None.

C. (U) WORK PERFORMED BY: Sikorsky Aircraft Division, Stratford, CT, for airframe design and modification; Rockwell International, Columbus, OH, for missile integration. Program manager, BLACKHAWK, will have Army responsibility for program execution.

Project: #D069 — Title: UH-60 Feasibility Demoonstration
Program Element: #6.43.10.A — Title: Heliborne Missile - HELLFIRE
DOD Mission Area: #211 - Close Combat — Budget Activity: #4 - Tactical Programs

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Not applicable.

2. (U) FY 1980 Program: Design, fabrication, and ground testing of UH-60A hard points and wing stores. Limited design update of missile electronics. Integration of HELLFIRE launchers and fire control system.

3. (U) FY 1981 Planned Program: Aerial structural demonstration and handling qualities demonstration. Blast pressure survey defining effects of missile blast on UH-60A empennage. Free flight and guided flight of heliborne missiles from the UH-60A. Preliminary airworthiness evaluation. Limited developmental testing conducted by TECOM and monitored by OTEA.

4. (U) FY 1982 Planned Program: None.

5. (U) Program to Completion: Not applicable.

6. (U) Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
1st Missile Firing	3rd Quarter FY81	None
Demonstration Completion	4th Quarter FY81	
Final Report	1st Quarter FY82	

Project: #D069
Program Element: #6.43.10.A
DOD Mission Area: #211 - Close Combat

Title: UH-60 Feasibility Demoonstration
Title: Heliborne Missile - HELLFIRE
Budget Activity: #4 - Tactical Programs

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	0	3000	5420	0	0	8420
Funds (as shown in FY 1980 submission)	Not shown					
Quantities (current requirements)	None					
Quantities (as shown in FY 1980 submission)	Not shown					

Other Appropriations: None

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D074 Title: Heliborne Missile - HELLFIRE
Program Element: #6.43.10.A Title: Heliborne Missile - HELLFIRE
DOD Mission Area: #413 - Close Combat Budget Activity: #4 - Tactical Programs

A. 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. 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 antiarmor 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 95 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.

B. (U) RELATED ACTIVITIES: The HELLFIRE missile system is related to Air Force, Navy, and other Army systems which utilize similar technology. Coordination 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 (PE) 6.23.03.A, Missile Technology, and the Advanced Development effort was conducted under PE 6.33.10.A, Heliborne Missile - HELLFIRE. Work on the infrared seeker will be done under PE 6.43.16.A, Fire-and-Forget Seeker, HELLFIRE, currently programed for funding in FY 1981. The US Air force portion of the tri-service development was funded under PE 6.46.08.F, Close Air Support Weapon Systems. The Air Force has elected not to employ the Tri-Service Laser Seeker on the Maverick missile. The Advanced Attack Helicopter is funded under PE 6.42.07.A.

C. (U) WORK PERFORMED BY: Contractors are Rockwell International Corporation, Columbus, OH, and Martin-Marietta Corporation, Orlando, FL. The Army program manager (PM) is PM, HELLFIRE at Redstone Arsenal, Alabama.

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

1. FY 1979 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 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 3d 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 197T supported the Cost and Operational Effectiveness Analysis (COEA), Army Systems

Acquisition Review Council/Defense System Acquisition Review Council (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.

2. (U) FY 1980 Program: Government and contractor testing is intensified in FY 1980. Engineering Design Flight Tests (EDT), component and system Prototype Qualification Tests conducted by the contractor (PQT-C) will be completed, and environmental storage tests will start. Fifty-five tactical prototype missiles will be flight tested in the EDT and PQT flight test programs including the initial live warhead launches. Operational Tests (OT II) will be conducted by the Operational Test and Evaluation Agency (OTEA) and will be supported by the system prime contractor. The AH-1 (COBRA) will be used as the testbed aircraft and thirty-three tactical prototype missiles will be flight tested in operational tests. Preparation will be made in FY 1981 for the production decision and for award of the Initial Production Facilities (IPF) contract in FY 1981.

3. (U) FY 1981 Planned Program: The FY 1981 RDTE program will be oriented toward completion of Engineering Development testing, correction of technical problems, and preparation for the start of procurement. 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 (OT II). 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. The ASARC/DSARC III reviews will be held for a production decision, and a contract for Initial Production Facilities (IPF) and procurement of long-lead items will be awarded to the system prime and seeker contractors.

4. (U) FY 1982 Planned Program: Most of the Engineering Development effort will be completed, Production Validation Tests (PVT) will be conducted for missiles, launchers and laser seekers. Environmental storage tests will be completed, and six missiles that have been subjected to storage will be fired.

Project: #D074 Title: Heliborne Missile - HELLFIRE
Program Element: #6.43.10.A Title: Heliborne Missile - HELLFIRE
DOD Mission Area: #211 - Close Combat Budget Activity: #4 - Tactical Programs

5. Program to Completion: 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 YAH-64 helicopter in

6. Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Army System 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	Oct 79
Initial Production Contract Award	Nov 81	Oct 80
Missile & Launcher Availability	Jul 83	Sep 82
Initial Operational Capability (IOC) on Advanced Attack Helicopter (AAH)		

The changes in milestone dates from FY 1980 to FY 1981 submission are a result of adjusting the HELLFIRE schedule to be in synchronization with the revised AAH schedule.

Project: #D074 Title: Heliborne Missile - HELLFIRE
Program Element: #6.43.10.A Title: Heliborne Missile - HELLFIRE
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7. (U) Resources ($ in thousands):

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	66358	58000	49424	21289	0	301558
Funds (as shown in FY 1980 submission)	65058	58000	38616	0	18708	286869
Quantities (current requirements)						229
Quantities (as shown in FY 1980 submission)						229

The increase in FY 1979 funds was to support a new requirement in battlefield obscuration testing. The increase in FY 1981 funds is $5911 for application of new inflation indices and $4897 for delay in production program to synchronize with Advanced Attack Helicopter production. The increase in FY 1982 funds of $2581 is for application of new inflation indices.

Other Appropriations:

Missile Procurement, Army				
Funds (Current Requirements)	20800	126000	529986	676786
Funds (as shown in FY 80 submission)	27677		499682	527359
Quantities (Current Requirements)		2760	21840	24600
Quantities (as shown in FY80 submission)	600		24000	24600

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The increase in procurement funding is $12013 for additional training hardware requirements and depot capital equipment, $55529 from a new cost estimate of missile and launcher production items and engineering services, and $94057 for application of new inflation indices, and $7498 for additional requirements for initial production facilities; and a decrease of $19670 for a reduction in space requirements. The changes in procurement quantities are a result of a new production schedule to be in synchronization with the Advanced Attack Helicopter with initial production facilities and long-lead items funded in FY 1981.

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E. (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 test bed 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 test bed 7" missile, of the wide field-of-view laser seeker and the Army laser seeker were conducted at U.S. 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-I). 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 progress 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 achieved. Development tests are planned to be conducted so that important systems characteristics will be tested and deficiencies corrected prior to Army Systems Acquisition Review Council (ASARC III). Four modified AH-1G helicopters, two basic and two equipped with the Airborne Target Acquisition and Fire Control System (ATAFCS), will be utilized as "test bed" aircraft to qualify the HELLFIRE Modular Missile System (HMMS). 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. Preprogrammed 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. There are no Defense Systems Acquisition Review Council-directed tests or demonstrations.

b. Thirteen HELLFIRE telemetry missiles have been fired in the current Engineering Development Program. Test conditions and results are tabulated below:

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Firing	Direct/Indirect	Range (Missile-to-Target)	Designator	Results
1	Direct, Lock-on-Before Launch (LOBL)		Remote @ 1.5 Km	Hit
2	Direct, LOBL		Remote @ 1.5 Km	Hit
3	Direct, LOBL		Remote @ 2.7 Km	Hit
4	Direct, LOBL		Remote @ 2.7 Km	Hit
5	Direct, LOBL		Remote @ 1.5 Km	Failure-Gyro interconnect circuit board anomaly, resolved
6	Direct, LOBL		Remote @ .6 Km	Hit
7	Direct, LOBL		Remote @ .6 Km	Hit
8	Indirect, Low Trajectory		Remote @ 1.9 Km	Hit
9	Indirect, High Trajectory		Remote @ 2.7 Km	Hit
10	Direct, LOBL		Remote @ 3.6 Km	Hit
11	Direct, LOBL		Remote @ 1.6 Km	Hit
12	Direct, LOBL		Remote @ 1.6 Km	Hit
13	Direct, LOBL		Remote @ 3.6 Km	Failure-Actuator potentiometer anomaly, resolved

Three firing attempts were aborted prior to launch due to a missile battery anomaly. This battery problem has been resolved.

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.

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(1) (U) Development Contractor: Rockwell International Corporation
Missile Systems Division
4300 East Fifth Avenue
Columbus, Ohio 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 Grounds, MD 21005

(4) (U) Independent Operational Test Agency: US Army Operational Test and Evaluation Agency (OTEA)
5600 Columbia Pike
Falls Church, VA 22041

(5) (U) OTEA will conduct the Operational Testing (OT II) Test Program.

f. (U) Major Test Facilities.

(1) (U) US Army Missile Command, Redstone Arsenal, AL - Contractor and government personnel will conduct the missile flight, captive flight, component qualification, system qualification, and electro-magnetic radiation tests.

(2) (U) Eglin AFB, Florida - Contractor and government personnel will conduct missile flight tests.

(3) (U) Yuma Proving Grounds, Arizona - Contractor and government personnel will conduct YAH-64/HELLFIRE integration tests to include missile flight tests.

(4) (U) Hunter Liggett Military Reservation, California - Government personnel will conduct and participate in the operational testing.

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g. (U) Overall test program schedule.

(1) (U) Missile flight tests, Oct 78 - May 80.

(2) (U) Component Qualification Tests, Dec 78 - Feb 80.

(3) (U) System Qualification Tests, Jan 80 - May 80.

(4) (U) Environmental Storage Tests (PQT-G), Aug 80 - Jul 82.

h. (U) Tabulation of developmental firings in HELLFIRE and Advanced Attack Helicopter programs.

	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
Programmed Rounds	-	4	4	4
Guided Missiles	ED	74	13	11
Advanced Attack Helicopter Engineering Development				
Ballistic Rounds	-	6	6	6
Guided Missile	ED	50	7	6

i. (U) The HELLFIRE Modular Missile System has not been previously tested by another DOD component.

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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 tradeoffs 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 than the hardware for operational tests and production.

l. (U) Tests will be conducted to determine if system end 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 is scheduled to start in the 2nd quarter of FY80.

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) Operational Test (OT II) will be conducted in the third quarter, FY80, with Tactical Prototype hardware to validate the operational capability of HELLFIRE using the COBRA helicopter as the test bed vehicle. Data will be obtained in an operational environment to assess the operational effectiveness to include command and control, hit performance, human factors, and safety. Information will be obtained on the reliability, availability, and maintainability (RAM) of the system during this test. This test will be conducted by the US Army Operational Test and Evaluation Agency (OTEA) in FY 1980 at Hunter Liggett Military Reservation, CA.

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(3) (U) Some of the operational test objectives will be examined during development testing by using operational pilots during the conduct of developmental tests.

b. (U) Summary of Test Results. Testing to satisfy the OT I requirements is described in subparagraph a above - No HELLFIRE missiles have been fired in operational tests to date.

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 and is compatible with the armament stations of both the YAH-64 and AH-1 (COBRA). A gas storage system is provided for cooling IR detectors for follow-on seekers.

(2) (U) Both the HELLFIRE missile and launcher being tested in the Engineering Development Program have no significant differences to the planned production hardware configuration.

d. (U) All subsystems and support equipment will be 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 II) will be conducted at Hunter Liggett Military Reservation. Tests will be conducted by government personnel with participation by contractor personnel.

g. (U) Overall test program schedule - Operational Testing (OT II) will be conducted in the May to July 1980 timeframe.

h. (U) Service firings to be conducted during OT II in the HELLFIRE and Advanced Attack Helicopter (AAH) programs.

(1) (U) The thirty-three guided flights in the HELLFIRE program will consist of:

12 direct fire, autonomous designation
16 direct fire, remote designation
5 indirect fire

(2) (U) There are twelve guided flights planned in the AAH OT II tests.

i. (U) Initial operational test and evaluation will be conducted prior to the major production contract award.

j. (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.

k. (U) Operational tests have not yet been conducted with the current HELLFIRE missile.

l. A missile reliability point estimate of _ is demonstrated on Engineering Development firing attempts to date. A reliability point estimate of is demonstrated when three aborted flights are excluded. The Materiel Need (MN) requirement band is 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 are scored for reliability. The development program also includes a formal maintainability demonstration utilizing trained military personnel.

3. System Characteristics:

Operational/Technical Characteristics	Objectives	Demonstrated Performance
Range		
Direct Fire	Kilometers	Kilometers
Indirect Fire	Kilometers	Kilometers
Time of Flight		
Kilometers	Seconds	Seconds

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Operational/Technical Characteristics	Objectives	Demonstrated Performance
Kilometers	[ ] Seconds	[ ] Seconds
Probability of Hit (Given Reliability)		
Stationary Targets		
Moving Targets		Not demonstrated
Missile Weight, Max	95 pounds	97.5 pounds

FY 1981 RDTE 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0*	144800	145985	150032	130127	666536
	QUANTITIES						34
D599	PERSHING II	0*	144800	145985	150032	130127	666536

* Does not include $18.0M received from AF PE 6.33.17.F (Theater Ballistic Missile Program).

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 airburst/surface-burst and earth penetrator warheads; 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 is planned to begin in 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 of national urgency to fill the land-based ballistic missile 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 Pack (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.

Program Element: #6.43.11.A
DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Title: PERSHING II
Budget Activity: #4 - Tactical Programs

C. BASIS FOR FY 1981 RDTE REQUEST: Procurement of prototype material, initiated in FY 1980, will continue through FY 1981 and fabrication of prototype ground support equipment will be initiated. Fabrication on the prototype reentry vehicles and propulsion sections will continue and testing on these items will be initiated. Fabrication of the ground test missiles will be completed during FY 1981 and fabrication of the flight missiles will be initiated. The wind tunnel test program and propulsion section development test will be completed and Pre-Flight Rating Test on the propulsion sections and captive flight test to evaluate hardware and reference imagery will be initiated. Final preparation for the Development Testing/Operational Testing (DT/OT) II flight test program will be initiated.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission	
		Baseline	Optional
Start Development Test I	Nov 77	Nov 77	Nov 77
Complete Development Test I	May 78	May 78	May 78
Defense Systems Acquisition Review Council II	Dec 78	Dec 78	Dec 78
Award Engineering Development Contracts	Feb 79	Jan 79	Jan 79
Start Development/Operational Test II			
Long Lead Procurement			
Complete Development/Operational Test II			
Defense Systems Acquisition Review Council (DSARC) III			
Start Full Scale Production			
Production (Buy 2)			
Initial Operational Capability			
Production (Buy 3)			
Production Deliveries Complete			

(U) Since last year's summary, the decision was made to pursue the accelerated program option and proper procurement funding was added to the FY 1982 budget to accommodate this acceleration. The current milestones differ from the optional milestones shown in last year's summary for the start and completion of Development/Operational Test II because of a change in the way of accomplishing the accelerated option. The milestones shown in last year's summary were based on a 16-month initial Operational

Capability acceleration 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 in the production decision by 16 months. The entire acceleration is, therefore, accomplished by overlapping the development and production program. The current milestone for completion of production deliveries differs from last year's summary because it was decided to keep the initial production rate at a minimum 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.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (Current Requirements)	0	144800	145985	278152	666536
Funds (as shown in FY 1980 submission)	42000*	144800	137000	209007	562452

* FY 1979 Supplemental request was disapproved by Congress 11 July 1979. Additional funds were included in program element 6.33.17.F, Theater Ballistic Missile Program, $18000.

The change from FY 1980 submission in FY 1981 reflects the failure to receive the requested FY 1979 supplemental funding which necessitated redistributing the funds over the program. The FY 1981 submission reflects a 4-month longer Engineering Development program than the FY 1980 submission due to the failure to receive the supplement request. Adjustments for a more realistic projection were also made.

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

Program Element: #6.43.11.A
DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare

Title: PERSHING II
Budget Activity: #4 - Tactical Programs

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Missile Procurement, Army:						
Funds (current requirements)	0	0	0			
Funds (as shown in FY 1980 submission)						
Quantities (current requirements)						
Quantities (as shown in FY 1980 submission)						

Change from FY 1980 submission reflects increased Missile Procurement, Army (MIPA) cost resulting from use of more realistic inflation projections. MIPA funding was moved forward to FY 1982 to accommodate the accelerated Initial Operational Capability.

Program Element: #6.43.11.A Title: PERSHING II
DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare 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 an 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, an airburst/surface burst; and an earth penetrator. This directed extended range decision represents a substantial increase in the range over the currently fielded PERSHING 1a (P1a) version. A contract was awarded to the PERSHING prime contractor in February 1979 for enginering development of the PERSHING II program. 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 P1a 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 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 Pack (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 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, in addition to its airburst/surface burst, provides a unique capability to attack hardpoint targets with an earth penetrator warhead. The system has a rapid retargeting capability that makes it response to both the SACEUR and the Theater Army Commander. Initial Operational Capability (IOC) is planned for 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; and Hercules, Inc., Salt Lake City, UT.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

Program Element: #6.43.11.A Title: PERSHING II
DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare Budget Activity: #4 - Tactical Programs

1. FY 1979 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 meter 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.

2. (U) FY 1980 Program: During FY 1980 fixed wing captive flight test will be conducted to evaluate the correlator hardware. Prototype air vehicle and Ground Support Equipment (GSE) material procurement will be initiated and reentry vehicle prototype fabrication will start. The wind tunnel program initiated in FY 1979 will continue and the development test on the propulsion sections will be initiated. Procurement of tooling material will occur and fabrication of production tooling will be initiated. Major design effort will be 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.

3. (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 Pre-Flight Rating Test will be initiated. The wind tunnel test program will be completed during this fiscal year and fixed wing captive test to evaluate hardware and reference imagery will be initiated. Numerous system, subsystem and environmental testing will be conducted during this period. During FY 1981, reference scene preparation will be completed for the ED missile flight targets.

Program Element: #6.43.11.A Title: PERSHING II
DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare Budget Activity: #4 - Tactical Programs

4. 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. for the production phase will be conducted early in FY 1982 and following DSARC III, the will be made.

5. Program to Completion: 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 and the Initial Operational Capability (IOC) will occur in providing US troop units in Europe and the Continental United States with a modernized system designed to meet the threat.

Program Element: #6.43.11.A Title: PERSHING II
DOD Mission Area: #242 - Theater-Wide Theater Nuclear Warfare Budget Activity: #4 - Tactical Programs

J. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation:

a. During the engineering development phase of the PERSHING II Development Program, extensive testing will be 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 span a period of approximately 19 months. No design difficulties have been identified as a result of the testing. In order to simulate the missile re-entry environment (with the exception of velocity), the PERSHING II re-entry vehicle pod is attached to the wing of an FJ4B aircraft and flown at targets. Tests are conducted to verify that the terminal guidance system can achieve the required accuracy and verify that the reference scenes are adequate for correlation. These tests will be conducted at White Sands Missile Range, NM, the Watertown, NY, area, and the Huntsville, AL, area. Tests will be conducted in two phases. The first phase is currently underway with planned completion in February 1980. The second phase will start in July 1981 on the prototype re-entry vehicle and continue through February 1983. The prime mission for the second phase will be to evaluate the prototype hardware and verify the reference scenes that will be used in the missile flight program. System environmental testing will be initiated in January 1982 and will continue through May 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 September 1981. 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 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 and earth penetrator warhead 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, system test and fixed-wing captive test were conducted in preparation for five Advanced Development (AD) missile flights. The planned sixth flight was cancelled because of the success demonstrated through flight five. The missile flights were conducted at White Sands Missile Range, NM, using an earth penetrator warhead as the payload. All flights were tested at a range of 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
. Deliver RV to Acquisition Basket	*	*	1/	*	*
. Demonstrate RV Maneuver Capability	*	*		*	*
. Demonstrate Required PII System Accuracy		*		*	*
. Demonstrate EP Structural Integrity During Penetration	*	*		*	*
. 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 on production tooling. This same tooling will 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 tested during this program includes the missile (re-entry vehicle, 1st and 2d 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 agency for PERSHING II will be the Army Materiel System Analysis (AMSAA) and Army Operational Test & Evaluation Agency (OTEA). OTEA will perform both ground and flight tests as described in paragraph 2 below.

e. (U) All OTEA, 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:

Test	Facility
Fixed Wing Captive Test	White Sands Missile Range (WSMR), NM Huntsville, AL Watertown, NY
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.

f. All testing from component testing to captive flight tests is conducted in preparation for the 28-missile DT/OT II flight test program. The major tests with planned spans are shown below:

Wind tunnel	Jan 79 - Jul 79 (Phase I)	Oct 79 - May 81 (Phase II)
Captive test	Oct 89 - Feb 80 (Phase I)	Jul 81 - Feb 83 (Phase II)
System marriage test	Sep 81 - Aug 83	
Structural test	Oct 81 - Mar 82	
Environmental test	Jan 82 - May 83	
DT II (14 msl flights)		
Operational ground test	Feb 83 - Apr 83	
OT II (14 msl flights)		

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. Ten erector launchers, five Platoon Control Centrals, five reference scene generation facilities and four system component test stations are also planned for tests during the ED phase.

h. The currently planned missile firings for the DT II flight program scheduled for are as follows:

Flight No	Range *
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.

1. (U) Reliability assessments will be conducted using the data obtained from all testing conducted during the ED program. This assessment will start with the Phase 1 captive test results and continue throughout the 28 missile flights. Construction of the reliability growth area for PERSHING II is currently in process with the goal of obtaining the required reliability following the development missile firings. Maintainability is a parameter that is constantly considered in any design decision on PERSHING II. A maintainability demonstration and evaluation is planned from April 1982 to December 1982. 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 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, rain, sand, dust, 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 include 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. The currently planned missile firings for the OT II flight program scheduled for' are as follows:

Flight No	Range*
15-24	long
25-28	short

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 will result 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 involving a production of the missiles of the missile total buy. 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.

g. (U) PERSHING II is an evolutionary improvement to the currently fielded Pla system. Therefore, PERSHING II is not unlike PERSHING la and a great deal of operational information is available.

3. Systems Characteristics: Selected operational and technical characteristics are as follows:

Operational/Technical Characteristics	Objective	Demonstrated Performance
Maintainability (mean time to repair)		To be determined
Range Requirements		To be determined
Accuracy		- 1/

1/ Capability demonstrated in captive and missile flight tests during Advanced Development.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.13.A
Title: GRASS BLADE
DOD Mission Area: #213 - Ground Air Defense
Budget Activity: #4 - 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	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	29100	30215	35784	13324	0	137645
	QUANTITIES						CLASSIFIED
D112	GRASS BLADE	29100	30215	35784	13324	0	137645

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 1981 RDTE REQUEST: Continue RDTE effort.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	29100	30215	35784	13324	137645
Funds (as shown in FY 1980 submission)	27200	30215	9700	0	96337

Details on funding increases are available upon request in accordance with paragraph B above.

Program Element: #6.43.13.A
DOD Mission Area: #213 - Ground Air Defense

Title: GRASS BLADE
Budget Activity: #4 - Tactical Programs

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Missile Procurement, Army:						
Funds (current requirements)	0	0	11100	100200	292900	404200
Funds (as shown in FY 1980 submission)	0	0	69800	Not shown	176400	246200

Details on procurement increases are available upon request in accordance with paragraph B above.

Program Element: #6.43.13.A
DOD Mission Area: #213 - Ground Air Defense

Title: GRASS BLADE
Budget Activity: #4 - Tactical Programs

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.

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 above.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.14.A
DOD Mission Area: #212 - Fire Support

Title: General Support Rocket System
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	70795	69225	64191	39652	11874	310431
	QUANTITIES						To Be Determined
D564	Area Fire Support Rocket	70795	69225	64191	39652	11874	310431

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This multiple launch rocket system (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 can also perform interdiction-type missions. Its ability to deliver large volumes of firepower in a short time against critical, time sensitive targets fills a gap that presently cannot be filled except by the use of tactical nuclear weapons. The system will have the growth potential to deliver other type warheads such as scatterable mines, terminal homing, smoke, etc. The system is commonly referred to as the General Support Rocket System (GSRS).

C. BASIS FOR FY 1981 RDTE REQUEST: Continuation of the Maturation Phase which is being conducted concurrently with low Rate Production. Completion of the Maturation Development Testing.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Start Development Test (DT)	Nov 79	Nov 79
Start Operational Test (OT)	Dec 79	Dec 79
Complete DT/OT	Feb 80	Feb 80

Program Element: #6.43.14.A
DOD Mission Area: #212 - Fire Support

Title: General Support Rocket System
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Army System Acquisition Review Council (ASARC) III	Apr 80	Mar 80
Defense System Acquisition Review Council (DSARC) III	May 80	Apr 80
Maturation/Production Contract Award	May 80	May 80
Complete Production Qualification Test (PQT)	Sep 82	Sep 82
ASARC IIIa	Oct 82	Oct 82
DSARC IIIa	Nov. 82	Nov. 82
Initial Operational Capability (IOC)	—	—

The ASARC III and DSARC III were slipped one month to allow more time to analyze the test results.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	70795	69225	64191	51526	310431
Funds (as shown in FY 1980 submission)	62800	69250	47300	47256	281300

The total estimated cost increased because the automatic test equipment was added to this program element, the cost of the carrier development increased, and the inflation index was changed. These changes are reflected in each of the years shown. FY80 decreased slightly due to a general Congressional reduction.

Program Element: #6.43.14.A
DOD Mission Area: #212 - Fire Support

Title: General Support Rocket System
Budget Activity: #4 - Tactical Programs

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Estimated Cost
Missile Procurement, Army						
Funds (current requirements)	0	61900	114200	150200	3169100	3495400
Initial Spares	0	400	2800	3600	6000	12800
Funds (as shown in FY 1980 submission)	0	61900	82400	-	2999805	3144105
Initial Spares	0	400	600	-		2100
Quantities (current requirements)	0	1374	2340	2496	356622	362832
Quantities (as shown in FY 1980 submission)	0	1764	3000		387615	392379
Other Procurement, Army						
Funds (current requirements)	0	0	16500	23000	82200	121700
Funds (as shown in FY 1980 submission)	0	0	0	0	0	0
Quantities (current requirements)	0	0	72	100	347	519
Quantities (as shown in FY 1980 submission)						Not Applicable

The increase in the FY 1981 program reflects the additional funds required to start procurement of the automatic test equipment in FY 1981 rather than in FY 1982, the change in the inflation index, the increased cost of carrier, and the adjustment to account for the transfer of the resupply vehicle and trailer to Other Procurement, Army. The total estimated cost has changed because of the new inflation index and the deletion of the resupply vehicle and trailer from the Missile Procurement, Army. These changes are reflected in the FY82 estimate and the additional cost to completion.

Program Element: #6.43.14.A
DOD Mission Area: #212 - Fire Support

Title: General Support Rocket System
Budget Activity: #4 - Tactical Programs

Other Procurement, Army (OPA) now reflects the requirement for the GSRS Resupply Vehicle and Trailer. This was included in the GSRS Program Element in the FY 1980 budget.

Program Element: #6.43.14.A
DOD Mission Area: #212 - Fire Support

Title: General Support Rocket System
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: This multiple launch rocket system (MLRS) is the result of a continuing effort begun in FY 1971. It has been commonly referred to as the General Support Rocket System (GSRS). 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 (TRADOC) Joint Working Group (JWG) was established in February 1974 to assess the use of a general support rocket system for counterbattery and suppression of enemy air defense. The JWG conducted a preliminary technical and cost assessment of a multiple launch rocket system. 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 the 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, disruptive fires to counter movement, control and support of opposing forces, efficient attack of deep targets, and responsive direct support fires. One of the weapons which could make a major contribution to improvement of the artillery system was the General Support Rocket System (GSRS). These efforts led to the basis for the Letter of Agreement (LOA) between the Training and Doctrine Command (TRADOC) and the Materiel Development and Readiness Command (DARCOM) to develop a concept and conduct a technology demonstration of the GSRS. This LOA was approved by the Department of the Army in September 1975. In December 1975, a Special Study Group (SSG) was organized to conduct an in-depth investigation of the GSRS concepts, study possible alternative systems and recommend an approach to fulfill the system need. System alternatives included conceptual studies (small caliber rocket, medium caliber rocket and a large directional controlled rocket), developmental programs (application of the Navy's ZUNI rocket motor, the German-US-Italian system RS-80, and the French SYRA), and existing systems (i.e., the German Light Artillery Rocket System). The study was completed in November 1976. The conclusion reached was the addition of General Support Rocket System to the artillery force was 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 GSRS with a dual purpose improved conventional munitions (DPICM) warhead. This decision was substantiated by LEGAL MIX V, completed in December 1977, which concluded the introduction of GSRS into both the light and heavy divisions provides the preferred artillery mix in support of the division.

G. (U) RELATED ACTIVITIES: This program element is a continuation of efforts previously funded under Program Element 6.33.03.A, Surface-to-Surface Missile Rocket System, Project D564, Area Fire Support Rocket System. Development of the Terminally Guided Warhead (TGW) for the GSRS continues under Program Element 6.33.03.A, title, Project D216 title. Both of these efforts are managed by the Program Manager for the GSRS. Procurement of the Resupply Vehicle for GSRS has been incorporated under the Heavy Expanded Mobility Tactical Truck (HEMTT).

Program Element: #6.43.14.A
DOD Mission Area: #212 - Fire Support

Title: General Support Rocket System
Budget Activity: #4 - Tactical Programs

H. (U) WORK PERFORMED BY: The US Army Missile Command, Redstone Arsenal, AL, has the overall responsibility for development of the GSRS. In Fiscal Year 1976, contracts for concept definition studies were awarded to: Boeing Aerospace Company, Seattle, Washington, Emerson Electric, St. Louis, Missouri, Martin-Marietta Corporation, Orlando, Florida, Northrop Corporation, Anaheim, California, and Vought Corporation, Dallas, Texas.

On 16 September 1977, the Army signed competitive development contracts with the Vought Corporation and Boeing Aerospace Company. The Army also has contracts with FMC Corporation, San Jose, California for development of the self-propelled carrier vehicle. The warhead fuze was developed by the US Army Electronics Research and Development Command at their Harry Diamond Laboratories, Adelphi, Maryland. This will be produced by KDI Corporation, Cincinnati, Ohio. The dual purpose improved conventional munition (DPICM) was developed by the US Army Armaments Research and Development Command, Dover, New Jersey.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1979 and Prior Accomplishments: The Defense Systems Acquisition Review Council (DSARC) I took place in January 1977. In February 1977, the Secretary of Defense authorized the Army to proceed with development of the GSRS. At the same time, however, he also directed the Army to study ways to accelerate the acquisition process, attempt to get NATO participation in the program, 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. Carrier development was initiated in June 1977. Competitive system development contracts were signed in September 1977. Contractor Engineering Design Tests began in December 1977. The program was restructured in January 1978 to enable the system to deliver the German developed AT II Scatterable Mine Warhead to a range of kilometers The Validation Phase was increased from 29 to 32 months and the RDTE cost increased about 20 million dollars. The Maturation Phase was shortened to prevent any slip in the Initial Operational Capability (IOC). Seven self-propelled carrier vehicles were delivered during 1978-79. Each of the competing system contractors have converted three of these into self-propelled launcher loaders (SPLL) by adding their launcher-loader module and fire control system. The Memorandum of Understanding calling for a standardized multiple launch rocket system (MLRS) was signed with Germany, France and the United Kingdom on 14 July 1979. Rocket assembly and manufacture began at the Camden, Arkansas facility. Contractor Advance Development Verification Tests began in September 1979 and were completed in November 1979. Government Advance Development Verification Tests began in November 1979. All test programs have been satisfactory.

Program Element: #6.43.14.A
DOD Mission Area: #212 - Fire Support

Title: General Support Rocket System
Budget Activity: #4 - Tactical Programs

2. (U) FY 1980 Planned Program: Complete Government Advance Development Verification Tests and Operational Tests as well as production planning efforts. Both contractors will be evaluated based on the results of the Advance Development Verification Tests, Operational Tests and cost proposals. If the system is sufficiently mature, the winner will be awarded a contract for the Maturation Phase and Low Rate Production. The research and development effort includes the design update, hardware fabrication and completion of engineering and environmental testing started in the Validation Phase. Development of the automatic test equipment and training devices will be initiated in FY 1980.

3. (U) FY 1981 Planned Program: Continue with the Maturation Phase and Low Rate Production. Specific tasks to be undertaken during Maturation include: develop the full production Technical Data Package; incorporate final Design to Unit Production Cost (DTUPC) trades; continue production engineering planning (PEP) effort devoted to high rate economical production of the rocket and to lower rate production for training and test equipment; correct Validation Phase deficiencies; qualify hardware for natural and induced environments; develop training devices; finalize publications and training materials; finalize logistics and maintenance package; develop automatic test equipment; develop software necessary to integrate GSRS with TACFIRE/Battery Computer System. Most of the effort associated with these tasks will take place in FY 1981. An extensive test program, starting with the Maturation Development Testing, will begin. Hardware used during this phase of testing will be procured with RDTE funds. The Self-Propelled Launcher Loaders (SPLL) used during the Validation Phase will be refurbished as part of the maturation effort.

4. (U) FY 1982 Planned Program. Continue Maturation Phase. Low Rate Production deliveries begin in FY 1982 to support Production Qualification Testing (PQT). Conduct PQT and Operational Test III. Complete PEP effort. Start update of Technical Data Package (TDP). Qualify training devices. Test automatic test equipment. Complete logistic package. Validate the ballistic algorithms.

5. (U) Program to Completion. Complete Maturation Phase in first Quarter 1983. Finalize test reports. Evaluate and accept the technical data package (TDP). Release the TDP for procurement from a second source. Conduct Army Systems Acquisition Review Council/Defense Systems Acquisition Review Council IIIa. Award full scale production contract.

Program Element: #6.43.14.A
DOD Mission Area: #212 - Fire Support

Title: General Support Rocket System (GSRS)
Budget Activity: #4 - Tactical Programs

J. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation:

a. (U) Test Phases.

(1) (U) Validation Phase. Because of the accelerated schedule, the testing conducted during the GSRS Validation Phase is more extensive than that normally accomplished during a more traditional Demonstration and Validation Phase. The GSRS test program was designed to accommodate the low rate production decision. The Validation Phase will demonstrate that all technical risks have been identified, that solutions are achievable, and provide documented proof of the GSRS military utility and operational suitability. Analysis will be conducted to provide confidence that all required reliability, availability and maintainability characteristics can be achieved. Testing will consist of two phases: Engineering Design Tests (EDT) and Advance Development Verification Tests (ADVT).

(a) (U) Engineering Design Tests (EDT). These tests provided reliability and safety margin data, determined natural and induced environmental effects, established performance levels, selected and qualified components, conducted selected severe qualification and hazard classification tests, conducted launch hazard analysis, and identified technical risks and achievable solutions. Contractor Engineering Design Tests (EDT-C) examined the feasibility of the GSRS 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. 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 test facilities and expertise required. This also allowed the government to acquire an intimate knowledge of the hardware. Data from EDT-G is made available to respective contractors and the independent evaluators.

(b) (U) Advanced Development Verification Tests (ADVT). These tests provide human factors and ground support equipment performance data in a simulated arctic and desert environment; identify system emissions, effluents, and wastes; and perform system demonstration flights. Contractors Advance Development Verification Tests (ADVT-C) verified that the design approach was capable of evolving into a ruggedized weapon system that can achieve necessary reliability and performance goals during the Maturation Phase. ADVT-C included performance testing of subsystems and systems plus flight tests. Selected items were exercised during exposure to high and low temperature extremes. The test program insured that the system is capable of passing further Government testing such as Government Advance Development Verification Test (ADVT-G) and Operational Test (OT)

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1. The ADVT-C is a comparison of the prototype systems developed by the two competing contractors. The Government is testing selected subsystems and systems considered critical to individual design. ADVT-C provides the final quantitative data points and includes ground and flight tests. During this portion of the testing, the Battery Control System will not be available. All data will be manually entered into the GSRS Fire Control System. Personnel required are four LANCE crewmen (MOS 15D) and four field artillery crewmen (MOS 15D).

(2) (U) Maturation Phase. During this phase of the program, testing will be conducted for all components/subsystems which were not fully tested or qualified during the Validation Phase. Development testing shall 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 utilize independent or mixed contractor/government test crews as test conditions warrant. The contractor will conduct independent analyses of test data and provide reports to the government. The government will also conduct an independent evaluation of the test results for Army System Acquisition Review Council (ASARC) and Defense System Acquisition Review Council (DSARC) IIIa. Testing will consist of two phases: Maturation Development Tests (MDT) and Production Qualification Testing (PQT).

(a) (U) Maturation Development Tests (MDT). This test program will start with component evaluation and progress through total system demonstration. This test program will demonstrate that the system's performance meets the requirements. The following types of tests will be included:

1 (U) Component/subsystem/system performance tests.
2 (U) Rocket flight tests (including environmental tests).
3 (U) Safety tests.
4 (U) Countermeasures tests.
5 (U) Electromagnetic radiation tests.
6 (U) Nuclear hardness tests.
7 (U) Human factors tests.
8 (U) Maintainability demonstration tests.
9 (U) Transportability tests.
10 (U) Mobility and endurance tests.
11 (U) Component/subsystem qualification tests.

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12 (U) Computer software tests.
13 (U) Inadvertent launch tests.
14 (U) Command, control, and communications tests.

(b) (U) Production Qualification Tests (PQT). PQT will be conducted utilizing low-rate production hardware and will be divided into three (3) categories: Environmental Qualification Tests, Rocket Performance 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. Deficiencies discovered during these tests will be corrected by the contractor and retested appropriately. The Self-Propelled Launcher Loader (SPLL) 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 GSRS will perform as required over the requirred operational extremes. The Launch Pod Container (LPC) and rockets will be subjected to environmental sequential testing then utilized for flight tests. Both the launch Pod Container (LPC) 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 (LPC) reliability and accuracy versus range. End items utilized in this test will be the low-rate production hardware. Flight tests will be conducted at White Sands Missile Range (WSMR) utilizing contractor, government, or mixed launch crews. Launch procedures utilized will simulate tactical employment of GSRS.

3 (U) Command, Control and Communication Tests. This test program will use Battery Computer System (BCS), one Platoon Leader's Digital Message Device (PLDMD), and three Self-Propelled Launcher Loaders (SPLL) to demonstrate that the GSRS battery is a totally integrated system and capable of performing its intended purpose.

b. (U) Test Summaries.

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(1) (U) Rocket Flight Tests.

TEST	LOCATION	SCHEDULE	TOTAL PLAN	ACCOMPLISHED-TO-DATE
Engineering Design Tests - Contractor (EDT-C)	White Sands Missile Range	Dec 77 - Dec 79	115	115
Advance Development Verifiction Test - Contractor (ADVT-C)	White Sands Missile Range	Sep 79 - Nov 79	36	36
Advance Development Verification Test - Government (ADVT-G)	White Sands Missile Range	Nov 79 - Feb 80	48	0
Operational Test (OT)	Ft Sill/White Sands Missile Range	Jan 80 - Feb 80	24	0
			223	151

(2) (U) Self-Propelled Launcher Loader (SPLL) Tests.

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TEST	LOCATION	SCHEDULE	STATUS
EDT-G Mobility & Endurance	Aberdeen Proving Ground, MD	Jul 79 - Sep 79	Test complete - Two Launchers (One/ Contractor) accomplished 3848 total test kilometers. No major problems were encountered.
ADVT-C Environmental	Eglin AFB, FL	Jul 79 - Nov 79	Test completed with one launcher. No major problems were encountered. Test in progress with second launcher.

(3) (U) Summary: Development Testing is progressing 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 portion of testing the total system was demonstrated. Firings include 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 Advance Development Verification Tests. All scored tests are conducted in accordance with the government approved test plan. Results are used to calculate demonstrated performance, reliability and accuracy. Test results to date indicate technical performance requirements are achievable with both system designs. The Launch Pod Container (LPC), rocket and Self Propelled Launcher Loader (SPLL) have confirmed the system is safe for operational testing. Single and ripple firings with a crew in the cab have been successfully demonstrated. The Self Propelled Launcher Loader (SPLL) has performed well as a launch platform. Over 100 rockets have been fired from the SPLL with no adverse effects on the vehicle. Vehicle performance was good during the facility vehicle testing and the Mobility and Endurance Test. Problems were encountered with the Fire Control System. They appear to be related to SPLL vibration at the specific fire control computer location. Other minor problems with cable routing, connectors and broken wires were identified for corrective action. These problems will be resolved during Maturation. The SPLL performed relatively well in the simulated arctic, desert and tropic environment with only minor problems noted at low temperature. No problems were encountered during the loading tests of the SPLL into the C141 aircraft. Preliminary results are favorable that the Launch Pod Container (LPC) can perform the three intended roles of transportation, storage and launch container. Laboratory environmental tests identified problems with environmental seals and improvements have been incorporated. C141 aircraft loading of the LPC has been successfully demonstrated. Rail transportation is approximately 90% complete and no significant problems have been noted. Problems were encountered with the XM-445 fuze during the

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non-scored flight tests. These developmental problems were corrected by strengthening components in the fuze itself and modifying the fuze/fire control interface. The fuze has been 100% successful during the scored firings. All validation phase testing will be complete by mid-February 1980.

c. (U) Description of Equipment Being Tested.

(1) (U) The GSRS is a surface-to-surface, free-flight rocket launcher system with the capability to launch up to 12 rockets in a ripple-free mode. The GSRS is comprised of three major components: the self-propelled launcher loader (SPLL), the launch pod containers (LPC), and the rocket.

(2) (U) The SPLL consists of the carrier, the fire control system (FCS), and the launcher loader module (LLM).

(a) (U) The carrier is a tracked vehicle derived from the XM2 Infantry Fighting Vehicle (IFV).

(b) (U) The fire direction center for the GSRS will be the Battery Computer System (BCS), which will communicate with the GSRS FCS via encoder radio link. The GSRS Fire Control System contains a microprocessor that is capable of computing fire mission data.

(c) (U) The Launcher Loader Module provides an armored housing for two Launch Pod Container.

(3) (U) The Launch Pod Container serves as a shipping container, a storage container, and a launch pad for six rockets. In a tactical environment the Launch Pod Container will be expended after the rockets are fired.

(4) (U) The GSRS rocket is a spin-stabilized, free-flight rocket. The warhead fuze (XM445) 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 (Modified M-42).

d. (U) The GSRS Validation Phase (VP) testing is being conducted under the Single Integrated Development Test Concept (SIDTC). Boeing Aerospace Company, Seattle, WA, and Vought Corporation, Dallas, TX, are competing for the prime contract. Results obtained during testing will be evaluated by Army Materiel Systems Analysis Activity (AMSAA), US Army Operational Test and Evaluation Agency (OTEA), and the Project Manager, COL Carl Steimle, of the Army Missile Command, Redstone Arsenal, AL.

e. (U) Test Program Schedule.

Engine Design Tests - Contractor (EDT-C)	Dec 77-Dec 79
Advance Development Verification Test-Contractor (ADVT-C)	Sep 79-Nov 79
Advance Development Verification Test - Government (ADVT-G)	Nov 79-Feb 80
Operational Test 1 (OT 1)	Jan 80-Feb 80
Milestone III	May 80
Maturation Development Tet (MDT)	Sep 80-Dec 81
Production Qualification Test (PQT)	Jan 82-Sep 82
Operational Test III (OT III)	May 82-Sep 82

f. (U) For all subsystems and components, the contractors are required to produce a design whose Reliability, Availability and Maintenance (RAM) characteristics are consistent with meeting performance effectiveness requirements at lowest possible life-cycle costs. One important output of the Validation Phase will be the establishment of firm RAM system requirements which will be converted to appropriate goals and threshold values.

g. (U) Units being tested during Validation Phase testing will be the same for both development and operational testing. Units tested during Production Qualification Testing will be manufactured on the production line.

2. (U) Operational Test and Evaluation: The General Support Rocket System (GSRS) Operational Test (OT) will be an integral part of a combined Development Test/Operational Test (DT/OT). The OT portion of the test will consist of six weeks of operational testing scheduled to begin in FY 1980. The equipment being tested is the same as that described in paragraph 2c above. Two firing sections, each manning a GSRS candidate system, will conduct a series of firing and nonfiring operational exericises in a tactical environment. OT will concentrate on man-machine interfaces in obtaining information on the military potential of GSRS. OT will be conducted in three phases. Phase I will take place at Ft Sill, OK, and will consist of three weeks devoted to training and pilot testing. Phase II, also conducted at Ft Sill, will consist of two weeks of nonfiring exercises in a realistic tactical environment. Phase III will be a combined Development Test/Operational Test live fire exercise lasting one week. It will be conducted at White Sands Missile Range (WSMR), NM, during which 12 rockets will be fired from each of the candidate systems. OT will obtain data to assess operational effectiveness; provide information on reliability, availability, and maintainability (RAM); provide information on operational survivability of the GSRS as a result of signature, mobility, emplacement, and displacement; and provide information on human factors, safety, training, doctrine, organization,

tactics, and the adequacy of the proposed logistical concepts to support GSRS to the extent that existing hardware and support package will permit. Data collected and associated analyses will be provided to the Army Systems Acquisition Review Council (ASARC) III as part of the information required for a decision concerning entry into the concurrent Maturation and Production Phases. Additional operational testing will be conducted during the Maturation Phase. This testing will assess performance with those system components not available during Validation Phase (Battery Control System, on-board positioning locating, system, resupply vehicle) and to resolve any remaining, operational test issues.

a. (U) Boeing Aerospace Company and Vought Corporation are competing for the Maturation contract. Testing results will be evaluated by the Army Materiel Systems Analysis Agency, the Operational Test. and Evaluation Agency, (OTEA) and the Project Manager, COL Steimle. OTEA will conduct the operational testing.

b. (U) Test facilities used during operational testing include Ft Sill, OK, and White Sands Missile Range. Two launcher sections, Fire Direction Center section, Target Acquisition Platoon, Maintenance Section, Ammo Section, Survey Section, and DS/GS Maintenance Section will participate in the operational testing. The test schedule is included in paragraph 2e above.

c. (U) Operational Testing I will be used in establishing firm RAM system requirements to be approved at DSARC III.

d. (U) Operational Test I will be completed prior to the major production contract award.

3. System Characteristics:

Operational/Technical Characteristics		Objectives	Demonstrated Performance
Maximum Range			
Minimum Range			
Reaction Time:	Fire 1st round		
	Fire Launcher Load		
	Displace		
	Reload		

Footnote 1/

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Title: General Support Rocket System (GSRS)
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Operational/Technical Characteristics	Objectives	Demonstrated Performance
Accuracy		Footnote 2/
Reliability: Rocket		Footnote 2/
Launcher		Footnote 2/
Achieved Availability		Footnote 2/
Maintainability (Mean-Time-To-Repair):		
Organizational	1.0 hr	Footnote 2/
Direct Support/General Support	4.0 hr	Footnote 2/

1/ To be demonstrated during Development Test (DT) I/Operational Test (OT) I.
2/ Initial data to be gathered during DT I/OT I; demonstration of performance will continue through maturation and system fielding.

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Program Element: #6.43.16.A
DOD Mission Area: #211 - Close Combat

Title: Fire-and-Forget Seeker HELLFIRE
Budget Activity: #4 - 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	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	0	0	25010	57130	184439	266579
	QUANTITIES						74
D076	Focal Plane Array Detector	0	0	2059	2925	0	4984
D078	Fire-and-Forget Seeker, HELLFIRE	0	0	18418	44075	150570	213063
D100	Seeker & System Integration	0	0	4533	10130	33869	48532

B. BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The objective of the fire-and-forget seeker program is to develop an infrared imaging seeker for use with the HELLFIRE Modular Missile System (HMMS). HELLFIRE is being developed as the primary antiarmor weapon system for the Advanced Attack Helicopter (AAH) and other helicopters. The HMMS and the laser seeker are currently in Full-Scale Development with production deliveries scheduled to begin in FY 1983. Fire-and-Forget HELLFIRE will allow the AAH to immediately remask after the missile is launched which will significantly reduce AAH exposure time and thus enhance survivability. Fire-and-Forget HELLFIRE will also add an improved capability for operation in battlefield obscuration and adverse weather conditions. The fire-and-forget seeker will complement the laser seeker, and the two seekers in concert will be highly resistant to enemy countermeasures and will meet the armored threat of the timeframe.

C. BASIS FOR FY 1981 RDTE REQUEST: In the 2d Quarter FY 1981, after competitive procurement and proposal evaluation, a single contract will be awarded to initiate Full-Scale Development of the seeker. Multiple contracts will be awarded in early FY 1981 to intensify focal plane array detector technology development. Additional contractual effort for system integration activities will be initiated with the HELLFIRE system prime contractor.

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Major Milestones	Current Milestone Dates		Milestone Dates Shown in FY 1980 Submission
	Current Generation Detector Option	Focal Plane Array Detector Option	
Army Systems Acquisition Review Council/Defense Systems Acquisition Review Council (ASARC/DSARC) II	Jan 80	Jan 80	Oct 79
Full-Scale Development Contract Award	Mar 81	Mar 81	Mar 80
Operational Test II Complete	Aug 84	Aug 85	Nov 82
ASARC/DSARC III	Oct 84	Oct 85	Feb 83
Initial Operational Capability			

The major difference in current milestone dates from those shown in the FY 1980 Congressional Descriptive Summary is a 1-year delay due to Congressional action which deleted FY 1980 funds for the fire-and-forget seeker program. Other differences in the milestone dates are due to completion of a more thorough program plan.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	0	0	25010	241569	266579
Funds (as shown in FY 1980 submission)	0	15000	35100	89300	139400

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The request to initiate this program in FY 1980 *was not supported* by Congress and the program has been adjusted for a FY81 start. Differences in estimated costs between the FY 1981 and FY 1980 Congressional Descriptive Summaries are due to additional tests planned related to battlefield obscuration, countermeasures, and storage ($15515); completion of a more thorough program plan and a detailed baseline cost estimate for accomplishment of the plan ($38259); adjustments for inflation due to a planned program initiation in FY 1981 versus FY 1980 ($24873); and inclusion of aircraft integration costs ($48532).

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Missile Procurement, Army						
Funds (current requirements)	0	0	0	0	1159300	1159300
Funds (as shown in FY 1980 submission)	0	0	0	0	0	0
Quantities (current requirements)					18468	18468
Quantities (as shown in FY 1980 submission)	0	0	0	0	0	0

In the FY 1980 Congressional Descriptive Summary, the procurement program had not been established.

Program Element: #6.43.16.A
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Title: Fire-and-Forget Seeker HELLFIRE
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The objective of the fire-and-forget seeker program is to develop an infrared imaging seeker for use with the HELLFIRE Modular Missile System (HMMS). The seeker will use thermal contrast between the target and background for tracking. HELLFIRE is being developed as the primary antiarmor weapon system for the Advanced Attack Helicopter (AAH) and other helicopters. The HMMS and the laser seeker are currently in Full-Scale Development with production deliveries scheduled to begin in FY 1983. Once the helicopter launches a Fire-and-Forget HELLFIRE missile, it may immediately remask or engage another target. Survivability of the helicopter will be significantly enhanced due to less exposure time to enemy attack. Fire-and-Forget HELLFIRE will also provide an improved capability for use in battlefield obscuration and adverse weather conditions. Generally the same countermeasures cannot be used against both laser and infrared imaging seekers, and a much enhanced antitank capability is available to the helicopter. Fire-and-Forget HELLFIRE will be effective against targets out to' and penetrate a minimum of of semi-infinite armor with the capability to defeat potential enemy tanks of the timeframe. Exploratory Development of infrared imaging seekers by the Army began in 1972 with competitive contracts awarded to Texas Instruments (TI) and Hughes Aircraft Company (HAC). In 1975, modified contracts required TI to develop a seeker using the TOW night sight technology and components and HAC to incorporate commonality where possible with the MAVERICK 12-inch seeker. A two-year contract was awarded to TI in June 1977 to demonstrate manufacturing methods and technology. The shared technology with the Common Module Night Sight program and the Air Force imaging infrared MAVERICK program support the maturity of this generation of imaging infrared technology to enter Full-Scale Development. The design of this seeker will be such that it can accommodate either a current generation or focal plane array detector. Although performance with a current generation detector is adequate, a focal array detector has potential for providing an improvement in sensitivity which will provide greater seeker lock-on ranges and improved performance in reduced visibility environments. Focal plane array detector development will be intensified and monitored for application in the fire-and-forget seeker. A decision will be made in late FY 1982 on which detector to use in the seeker. If the focal plane array detector is selected, RDTE funding for FY83-86 would increase by $44.5 million and procurement costs by $73.2 million.

G. (U) RELATED ACTIVITIES: The HELLFIRE Modular Missile System is related to Air Force, Navy, and other Army systems which utilize similar technology. Coordination is effected through technology coordination groups, frequent liaison visits, exchange of components and subsystems, and exchange of analyses, simulation, and hardware test results. The exploratory prototype program for the infrared imaging seeker using current technology has been conducted under Program Element (PE) 6.23.03.A, Missile Technology. The basic research and exploratory development programs for focal plane array detectors are being supported by the Army Night Vision Laboratories in PE 6.27.09, Night Vision Investigations/Far Infrared, and by the Defense Advanced Research Projects Agency with a variety of individual contracts. Work on the HELLFIRE Modular Missile System with the laser seeker has progressed from 6.23.03.A, Missile Technology; 6.33.10.A, Heliborne Missile - HELLFIRE; to 6.43.10.A, Heliborne

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Budget Activity: #4 - Tactical Programs

Missile-HELLFIRE. The US Air Force portion of the Tri-Service Laser Seeker development is funded under PE 6.46.08.F, Close Air Support Weapon System. The Air Force has elected not to employ the Tri-Service Laser Seeker on the MAVERICK Missile. The Air Force imaging infrared seeker for MAVERICK is funded under PE 6.46.08.F. Proposals for development of the Army Fire-and-Forget Seeker will be solicited from the contractor for the Air Force imaging infrared MAVERICK and a technical, development, and production cost and management evaluation will be conducted in competition with proposals from other contractors. The award will be made on the basis of the best overall value to the Government. The Advanced Attack Helicopter is funded under PE 6.42.07.A.

H. (U) WORK PERFORMED BY: A single contractor for development of the infrared imaging seeker and 2 to 3 contractors for focal plane array detector technology development will be selected in FY 1981 by evaluation of competitive proposals. Rockwell International Corporation of Columbus, OH, and Anaheim, CA, is the prime contractor for the HELLFIRE Modular Missile System. Project manager (PM) for the Army is PM, HELLFIRE, Redstone Arsenal, AL.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Exploratory development in current generation technology continued from 1972 to 1977 with Texas Instruments (TI) and Hughes Aircraft Company participating. A Manufacturing Methods and Technology (MM&T) contract to TI began in 1977 to establish production techniques for imaging infrared seekers. The contract was completed in FY 1979 with the delivery of ten seeker heads demonstrating improved production techniques. Numerous contracts in exploratory development for focal plane array technology have been started. These efforts have explored material development, signal processing, and operational aspects of different wavelength bands.

2. (U) FY 1980 Program: Brassboard hardware of seekers employing focal plane array detectors will be tested, and efforts will be expanded in material development and investigation of different wavelength bands. The Defense Advanced Research Projects Agency is funding these efforts through the US Army Missile Command.

3. (U) FY 1981 Planned Program: Full-Scale Development (FSD) will be initiated to design and fabricate prototype infrared imaging seekers and to perform supporting analyses, simulations, and tests. Procurement of HELLFIRE missiles, launchers, and other hardware required for system integration will begin. Authorization of Full-Scale Development is essential even though all prescribed conditions have not been met. The infrared imaging seeker has not been in the Advanced Development phases, but the technology is sufficiently mature to progress into Full-Scale Development with little risk. Programs with similar technology are the Common Module Night Sight and the MAVERICK imaging infrared programs in FSD. The fielding of the

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Title: Fire-and-Forget Seeker HELLFIRE
Budget Activity: #4 - Tactical Programs

"fire-and-forget" capability is a high-priority program for the Army, and the small risk and early availability, along with commensurate research and development dollar savings, urge entry into Full-Scale Development in FY 1981. Focal plane array technology development will continue, and additional contracts in Project b076 will be used to insure a sufficient amount of effort by different contractors to provide a viable competitive situation.

4. (U) FY 1982 Planned Program: Full-Scale Development of the seeker will continue with integration with the HELLFIRE missile. Hardware deliveries of seekers, missiles, launchers, and other hardware will begin during the 4th quarter. A decision will be made to complete the development program using either a current generation detector or a focal plane array detector.

5. (U) Program to Completion: Seeker qualification test and hardware-in-the-loop simulations will evolve into system qualification tests. Guided flight tests will begin during 4th quarter FY 1983 and continue for 12 months. Operational tests will start 4th quarter FY 1984 with a production decision in the 1st quarter FY 1985. Production deliveries will then begin during 2nd quarter FY 1986. If the FY 1982 decision is to use the focal plane array detector in the seeker, the program will be extended approximately one year to allow for qualification of the seeker with this detector.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D078 Title: Fire-and-Forget Seeker, HELLFIRE
Program Element: #6.43.16.A Title: Fire-and-Forget HELLFIRE
DOD Mission Area: #211 - Close Combat Budget Activity: #4 - Tactical Programs

A. DETAILED BACKGROUND AND DESCRIPTION: The objective of the fire-and-forget seeker program is to develop an infrared imaging seeker for use with the HELLFIRE Modular Missile System (HMMS). The seeker will use thermal contrast between the target and background for tracking. HELLFIRE is being developed as the primary antiarmor weapon system for the Advanced Attack Helicopter (AAH) and other helicopters. The HMMS and the laser seeker are currently in Full-Scale Development with production deliveries scheduled to begin in FY 1983. Once the helicopter launches a Fire-and-Forget HELLFIRE missile, it may immediately remask or engage another target. Survivability of the helicopter will be significantly enhanced due to less exposure time to enemy attack. Fire-and-Forget HELLFIRE will also provide an improved capability for use in battlefield obscuration and adverse weather conditions. Generally the same countermeasures cannot be used against both laser and infrared imaging seekers, and a much enhanced antitank capability is available to the helicopter. Fire-and-Forget HELLFIRE will be effective against targets out to and penetrate a minimum of of semi-infinite armor with the capability to defeat potential enemy tanks of the timeframe. Exploratory Development of infrared imaging seekers by the Army began in 1972 with competitive contracts awarded to Texas Instruments (TI) and Hughes Aircraft Company (HAC). In 1975, modified contracts required TI to develop a seeker using the TOW night sight technology and components and HAC to incorporate commonality where possible with the MAVERICK 12-inch seeker. A two-year contract was awarded to TI in June 1977 to demonstrate manufacturing methods and technology. The shared technology with the Common Module Night Sight program and the Air Force imaging infrared MAVERICK program support the maturity of this generation of imaging infrared technology to enter Full-Scale Development. The design of this seeker will be such that it can accommodate either a current generation or focal plane array detector. Although performance with a current generation detector is adequate, a focal array detector has potential for providing an improvement in sensitivity which will provide greater seeker lock-on ranges and improved performance in reduced visibility environments. Focal plane array detector development will be intensified and monitored for application in the fire-and-forget seeker. A decision will be made in late FY 1982 on which detector to use in the seeker. If the focal plane array detector is selected, RDTE funding for FY83-86 would increase by $44.5 million and procurement costs by $73.2 million.

B. (U) RELATED ACTIVITIES: The HELLFIRE Modular Missile System is related to Air Force, Navy, and other Army systems which utilize similar technology. Coordination is effected through technology coordination groups, frequent liaison visits, exchange of components and subsystems, and exchange of analyses, simulation, and hardware test results. The exploratory prototype program for the infrared imaging seeker using current technology has been conducted under Program Element (PE) 6.23.03.A, Missile

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Technology. The basic research and exploratory development programs for focal plane array detectors are being supported by the Army Night Vision Laboratories in PE 6.27.09, Night Vision Investigations/Far Infrared, and by the Defense Advanced Research Projects Agency with a variety of individual contracts. Work on the HELLFIRE Modular Missile System with the laser seeker has progressed from 6.23.03.A, Missile Technology; 6.33.10.A, Heliborne Missile - HELLFIRE; to 6.43.10.A, Heliborne Missile-HELLFIRE. The US Air Force portion of the Tri-Service Laser Seeker development is funded under PE 6.46.08.F, Close Air Support Weapon System. The Air Force has elected not to employ the Tri-Service Laser Seeker on the MAVERICK Missile. The Air Force imaging infrared seeker for MAVERICK is funded under PE 6.46.08.F. Proposals for development of the Army Fire-and-Forget Seeker will be solicited from the contractor for the Air Force imaging infrared MAVERICK and a technical, development, and production cost and management evaluation will be conducted in competition with proposals from other contractors. The award will be made on the basis of the best overall value to the Government. The Advanced Attack Helicopter is funded under PE 6.42.07.A.

C. (U) WORK PERFORMED BY: A single contractor for development of the infrared imaging seeker and 2 to 3 contractors for focal plane array detector technology development will be selected in FY 1981 by evaluation of competitive proposals. Rockwell International Corporation of Columbus, OH, and Anaheim, CA, is the prime contractor for the HELLFIRE Modular Missile System. Project manager (PM) for the Army is PM, HELLFIRE, Redstone Arsenal, AL.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Exploratory development in current generation technology continued from 1972 to 1977 with Texas Instruments (TI) and Hughes Aircraft Company participating. A Manufacturing Methods and Technology (MM&T) contract to TI began in 1977 to establish production techniques for imaging infrared seekers. The contract was completed in FY 1979 with the delivery of ten seeker heads demonstrating improved production techniques. Numerous contracts in exploratory development for focal plane array technology have been started. These efforts have explored material development, signal processing, and operational aspects of different wavelength bands.

2. (U) FY 1980 Program: Brassboard hardware of seekers employing focal plane array detectors will be tested, and efforts will be expanded in material development and investigation of different wavelength bands. The Defense Advanced Research Projects Agency is funding these efforts through the US Army Missile Command.

3. (U) FY 1981 Planned Program: Full-Scale Development (FSD) will be initiated to design and fabricate prototype infrared imaging seekers and to perform supporting analyses, simulations, and tests. Procurement of HELLFIRE missiles, launchers,

and other hardware required for system integration will begin. Authorization of Full-Scale Development is essential even though all prescribed conditions have not been met. The infrared imaging seeker has not been in the Advanced Development phases, but the technology is sufficiently mature to progress into Full-Scale Development with little risk. Programs with similar technology are the Common Module Night Sight and the MAVERICK imaging infrared programs in FSD. The fielding of the "fire-and-forget" capability is a high-priority program for the Army, and the small risk and early availability, along with commensurate research and development dollar savings, support initiation of Full-Scale Development in FY 1981. Focal plane array technology development will continue, and additional contracts in Project D076 will be used to insure a sufficient amount of effort by different contractors to provide a viable competitive situation.

4. (U) FY 1982 Planned Program: Full-Scale Development of the seeker will continue with integration with the HELLFIRE missile. Hardware deliveries of seekers, missiles, launchers, and other hardware will begin during the 4th quarter. A decision will be made to complete the development program using either a current generation detector or a focal plane array detector.

5. (U) Program to Completion: Seeker qualification test and hardware-in-the-loop simulations will evolve into system qualification tests. Guided flight tests will begin during 4th quarter FY 1983 and continue for 12 months. Operational tests will start 4th quarter FY 1984 with a production decision in the 1st quarter FY 1985. Production deliveries will then begin during 2nd quarter FY 1986. If the FY 1982 decision is to use the focal plane array detector in the seeker, the program will be extended approximately one year to allow for qualification of the seeker with this detector.

6. Major Milestones:

Major Milestones	Current Milestone Dates		Milestone Dates Shown in FY 1980 Submission
	Current Generation Detector Option	Focal Plane Array Detector Option	
Army Systems Acquisition Review Council/Defense Systems Acquisition Review Council (ASARC/DSARC) II	Jan 80	Jan 80	Oct 79

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Major Milestones	Current Milestone Dates		Milestone Dates Shown in FY 1980 Submission
	Current Generation Detector Option	Focal Plane Array Detector Option	
Full-Scale Development Contract Award	Mar 81	Mar 81	Mar 80
Operational Test II Complete	Aug 84	Aug 85	Nov 82
Operational Test II Complete	Aug 84	Oct 85	Feb 83
ASARC/DSARC III	Oct 84	Oct 85	Feb 83
Initial Operational Capability			

The major difference in current milestone dates from those shown in the FY 1980 Congressional Descriptive Summary is a 1-year delay due to Congressional action which deleted FY 1980 funds for the fire-and-forget seeker program. Other differences in the milestone dates are due to completion of a more complete program plan.

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

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	0	0	18418	194645	213063
Funds (as shown in FY 1980 submission)	0	13500	33100	89300	135900

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	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
Quantities (current requirements)					74
Quantities (as shown in FY 1980 submission)					62

The request to initiate this program in FY 1980 was not supported by Congress and the program has been adjusted for a FY81 start. Difference in estimated costs between the *FY 1981* and *FY 1980 Congressional* Descriptive Summaries are due to additional tests related to battlefield obscuration, countermeasures, and storage ($15515); completion of a more complete program plan and a detailed baseline cost *estimate for accomplishment* of the plan ($38259); and adjustments for inflation due to a planned program initiation in FY 1981 versus FY 1980 ($23389). The twelve additional seekers in current requirements compared to the FY *1980 estimate support* the additional tests.

Other Appropriations:

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Missile Procurement, Army						
Funds (current requirements)	0	0	0	0	1159300	1159300
Funds (as shown in FY 1980 submission)	0	0	0	0	0	0
Quantities (current requirements)					18468	18468
Quantities (as shown in FY 1980 submission)	0	0	0	0	0	0

In the FY 1980 Congressional Descriptive Summary, the procurement program had not been established.

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J. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation:

a. (U) Test Phases:

(1) (U) Exploratory development of imaging infrared seekers began in 1972 with competitive contracts awarded to Texas Instruments (TI) and Hughes Aircraft Company (HAC). In 1975, modified contracts required TI to develop a seeker using the TOW night sight technology and components and the HAC version to be a small scale derivative of the MAVERICK 12-inch seeker. Both seekers demonstrated essentially the same performance in captive flight tests conducted by the US Army Missile Research and Development Command in 1976. These tests demonstrated seeker lock-on ranges, aim-point distribution, and tracking against tanks. The results of 159 runs indicate that the technology will meet the Army requirements. A two-year contract to demonstrate manufacturing methods and technology was awarded to TI in June 1977 with ten seeker heads to be delivered. The first phase of this contract established production techniques with the second stage demonstrating the validity of these concepts by fabricating the ten seekers. This hardware also uses the infrared common module detectors employed in the previous development contract and the TOW, DRAGON, and night vision sights. Due to similarity of the technology used in the Army infrared imaging seeker (IRIS) and the Air force imaging infrared (IIR) MAVERICK, IIR MAVERICK development and operational tests also contribute to the maturity of the technology of the Army IRIS. In particular, the IIR MAVERICK Joint Operational Test and Evaluation (JOT&E) conducted at Ft. Polk, LA, in February 1977 and the IIR MAVERICK European Winter Tests conducted in February 1978 demonstrated that the seeker technology can be successfully employed in the presence of substantial thermal clutter and in European weather conditions.

(2) (U) The Full-Scale Development (FSD) program planned for initiation in FY81 will include seeker level tests, seeker/missile integration tests and missile/aircraft integration tests. Tests involving countermeasures (CM) will include participation by the Office of Missile Electronic Warfare, White Sands Missile Range, New Mexico. Seeker tests will commence with component selection and evaluation and progress through seeker tests and qualification. Seeker qualification will utilize hardware functionally equivalent to the production models.

Seeker/missile integration tests will consist of Engineering Design Tests (EDT) and Prototype Qualification Tests (PQT). The test program will make maximum utilization of data obtained during the laser HELLFIRE test program and seeker level tests. The

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test program will demonstrate integration of the infrared imaging seeker with the HELLFIRE missile and the ability of the resultant Fire-and-Forget HELLFIRE system to survive and function in its antiarmor role during and/or after exposure, as applicable, to critical natural and induced environments. To minimize test hardware requirements, an extensive series of simulation and captive flight tests will be conducted to obtain seeker performance, countermeasures, and battlefield obscuration test data. Missile free flight tests will include high explosive antitank (HEAT) and telemetry missiles and will test hardware performance and reliability under all operating conditions, including countermeasures. Missiles which have been exposed to low, ambient, and high-temperature environmental test sequences will be included in the free flight tests. Environments will include: climatic, nuclear, countermeasures, and battlefield obscurants. Fire-and-Forget HELLFIRE missile performance, maintainability, and built-in-test capabilities will also be tested after storage in arctic, tropic, and desert conditions. Missile/aircraft integration tests will include captive flight and missile free flight tests using the AH-1 COBRA, as a test bed aircraft, and the AH-64 helicopter. Significant tests milestones in the Full-Scale Development program are as follows:

	Current Generation Detector	Time Delay Integration Focal Plane Array Detector
Seeker Level Tests		
Prototype Evaluation Complete	Jan 83	Jan 84
Pre-flight Environmental Tests Complete	Jul 83	Jul 84
Seeker Qualification Complete	Jan 84	Jan 85
Missile System Tests		
Initial System Integration Complete	Jul 83	Aug 84
System Qualification Complete	May 84	May 85
Free Flight Tests Complete	Jun 84	Jun 85

b. Test Results Achieved To Date:

Captive flight tests were performed by US Army Missile Research and Development Command in 1976 from a helicopter against tanks. Moving targets of various kinds were deployed in a large number of 159 runs for the purpose of attempting to simulate tactical targets and to vary the target and background conditions. Additionally, methods to suppress the infrared signature of the target were used in thirty-six tests. Lock-on ranges during these tests averaged during, both day and night conditions. This meets Army requirements.

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(U) Air Force tests of MAVERICK with the imaging infrared seeker demonstrated that technology exists to successfully employ these seekers in the presence of substantial thermal clutter and in European weather conditions.

(U) Based on Army and Air Force tests, potentially degrading countermeasures and thermal clutter conditions have been postulated and solutions to minimize the problems have been identified. Requirements for these solutions will be incorporated in the seeker development program. Verification by testing will commence with delivery of first hardware in October 1982.

c. (U) Equipment to be Tested:

The equipment to be tested is an infrared imaging seeker. The seeker will be integrated with the HELLFIRE Modular Missile System and tested, and the missile with the seeker will be integrated with the AH-64 helicopter and tested. All hardware will be functionally equivalent to the production models. All subsystem/support equipment required for tests is expected to be available.

d. (U) Development/Testing Organizations:

(U) The project manager for development of the fire-and-forget seeker and integration of the seeker with the HELLFIRE missile is the HELLFIRE/laser designator (LD) project manager. The project manager for integration of Fire-and-Forget HELLFIRE with the AH-64 helicopter is the AAH project manager. Contractors involved are as follows:

(1) (U) Seeker - A single contractor is to be selected by evaluation of competitive proposals.

(2) (U) Integration with HELLFIRE missile - Rockwell International Corporation, Missile Systems Division, Columbus, OH.

(3) (U) Integration of HELLFIRE missile with AH-64 helicopter - Hughes Helicopters, Culver City, CA.

Development tests will be managed by the HELLFIRE/LD project manager. The Office of Missile Electronic Warfare, White Sands Missile Range, NM, will perform an independent assessment of the countermeasures (CM) susceptibility of the system and the Office of the Test Director, White Sands Missile Range, NM, will perform CM field tests of the system. The Army Materiel Systems Analysis Activity, Aberdeen Proving Ground, MD, will perform an independent evaluation of the system's performance.

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e. (U) Major Test Facilities/Ranges/Personnel:

Test	Facilities/Range	Primary Personnel
Development Tests	Redstone Arsenal, AL	Contractor
	Eglin AFB, FL	Contractor
	White Sands Missile Range, NM	Contractor
	Yuma Proving Ground, AZ	US Army Forces Command
	Ft. Greely, AK	US Army Forces Command
	Ft. Clayton, Canal Zone	Contractor

f. (U) Units Scheduled for Test:

TEST	MISSILES			
Engineering Design Test (EDT)	Flight	Special	Training	Dummy
Captive Flight			4	8
Free Flight	30			
Electro-magnetic radiation/nuclear		2		
AH-6 4 Integration	4		8	8
Prototype Qualification Test (PQT)				
System Qualification	12		6	
Environmental Storage	6		6	
TOTALS	52	2	24	16

If Full-Scale Development (FSD) is completed with seekers employing a current generation detector, 155 seekers are required. If FSD is completed with seekers employing a focal plane array detector, 178 seekers are required. A total of 52 missiles is to be fired as part of development tests. Forty-six will be fired by contractors and 6 will be fired by the US Army Forces Command. Twenty missiles will be fired as a part of Operational Test II by the US Army Operational Test and Evaluation Agency

(OTEA) Detailed test objectives, success/failure criteria and other test requirements will be established during the developmental program.

g. (U) Previous Testing:

(U) The fire-and-forget seeker will be developed as a part of a planned Full-Scale Development, and it has not been previously tested by another DOD component. A seeker utilizing similar technology, the Air Force MAVERICK, was tested as described in 1.a.(2).

h. Reliability/Availability/Maintainability (RAM) and Operational Logistics Support:

The Fire-and-Forget HELLFIRE missile system mission reliability requirement is minimum acceptable value and best operational capability, respectively. The inherent availability requirement is The HELLFIRE missile is being designed in accordance with the "certified round" maintenance concept and will require depot maintenance only. The fire-and-forget seeker will also be designed to be compatible with the "certified round" concept. RAM requirements will be verified by test, demonstration, and analysis using data from development and operational missile flight tests and system qualification tests. US Army OTEA personnel will perform Operational Test II. Hardware in developmental tests, in operational tests and for production is expected to be very similar and functionally equivalent.

2. (U) Operational Test and Evaluation:

a. (U) Test Phases and Results:

(1) Captive flight tests were performed by the US Army Missile Research and Development Command in 1976 from a helicopter against tanks. A total of 159 runs many against various kinds of moving targets, was conducted for the purpose of attempting to simulate tactical targets and to vary the target and background conditions. Additionally, methods to suppress the infrared signature were used in thirty-six tests. Lock-on ranges during these tests averaged during both day and night conditions. This meets Army requirements.

(2) (U) The Imaging Infrared MAVERICK Joint Operational Test and Evaluation (JOT&E) conducted at Ft. Polk, LA, in February 1977 and the IIR (IIR) MAVERICK European Winter Tests conducted in February 1978 demonstrated that infrared imaging seeker technology can be successfully employed in the presence of substantial thermal clutter and in European weather

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conditions. Operational insights were also provided on target acquisition and potentially degrading seeker break-lock conditions were identified and solutions for the break-lock conditions have been defined. Requirements for these solution will be incorporated in the seeker development program.

(3) (U) Operational Test II is presently projected for July-August 1984, if the seeker utilizes the current generation detector, and July-August 1985, if the seeker utilizes the focal plane array detector. The agency to perform the test will be the US Army Operational Test and Evaluation Agency, Falls Church, VA. The Advanced Attack Helicopter (AH-64) will be the weapons platform to validate the operational capability of the HELLFIRE Modular Missile System with the imaging infrared seeker. Operational performance, safety characteristics, reliability, availability, and maintainability will be assessed during these tests.

b. (U) Equipment to be Tested:

(U) The equipment to be tested is the HELLFIRE Modular Missile System employing the fire-and-forget seeker and the HELLFIRE launcher. The missile and launcher will be integrated and tested using the AH-64 helicopter as the launch platform in Operational Test II. All hardware will be functionally equivalent to the production models. All subsystem/support equipment required for tests is expected to be available.

c. (U) Development/Testing Organizations:

(U) The project manager for development of the fire-and-forget seeker and integration of the seeker with the HELLFIRE missile is the HELLFIRE/laser designator project manager. The project manager for integration of Fire-and-Forget HELLFIRE with the AH-64 helicopter is the AAH project manager. Contractors involved are as follows:

(1) (U) Seeker - A single contractor is to be selected by evaluation of competitive proposals.

(2) (U) Integration with HELLFIRE missile - Rockwell International Corporation, Missile Systems Division, Columbus, OH.

(3) (U) Integration of HELLFIRE missile with AH-64 helicopter - Hughes Helicopters, Culver City, CA.

Operational tests will be conducted by the US Army Operational Test and Evaluation Agency, Falls Church, VA. The Office of

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Missile Electronic Warfare, White Sands Missile Range, NM, will perform an independent assessment of the countermeasures (CM) susceptibility of the system and the Office of the Test Director, White Sands Missile Range, NM, will perform CM field tests of the system. The Army Materiel Systems Analysis Agency, Aberdeen Proving Ground, MD, will perform an independent evaluation of the system's performance.

d. (U) Major Test Facilities/Ranges/Personnel:

(U) Operational Test II is planned to be conducted at either Yuma Proving Ground, AZ, or Ft. Hunter-Liggett, CA, using US Army Forces Command personnel with support by government and contractor personnel.

e. (U) Test Program Schedule:

(U) Operational Test II (OT II) is presently projected for July-August 1984 if the seeker utilizes the current generation detector, and July-August 1985, if the seeker utilizes the focal plane array detector. The US Army Forces Command will fire twenty missiles in OT II.

f. (U) Reliability/Availability/Maintainability (RAM) and Operational Logistics Support:

(U) The Fire-and-Forget HELLFIRE missile system mission reliability requirement is 0.86 to 0.95, minimum acceptable value and best operational capability, respectively. The inherent availability requirement is 0.95. The HELLFIRE missile is being designed in accordance with the "certified round" maintenance concept and will require depot maintenance only. The fire-and-forget seeker will also be designed to be compatible with the "certified round" concept. RAM requirements will be verified by test, demonstration, and analysis using data from development and operational missile flight tests and system qualification tests. A reliability growth curve has been established for verification of achievement of the reliability requirements as missile firings are conducted. US Army Forces Command personnel will perform Operational Test II. Hardware to be tested will be functionally equivalent to the production models.

g. (U) Operational Test and Evaluation Prior to Production Contract Award:

(U) Operational test and evaluation to be conducted prior to the program budget year production contract award is described in 2.a. above.

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h. (U) Initial Operational Test and Evaluation:

(U) Initial operational test and evaluation will be conducted prior to the program budget year major production contract award.

i. (U) Past and Recent Operational Test Results:

(U) Operational testing and results are summarized in 2.(a)(1) and (2) above. Solutions for the break-lock conditions discussed in 2.(1)(2) will be verified by tests commencing with delivery of the first Full-Scale Development hardware in Oct 1982.

j. (U) Reliability/Availability/Maintainability (RAM) Requirements/Results:

The Fire-and-Forget HELLFIRE missile system Missile Reliability requirement is [redacted] minimum acceptable value and best operational capability, respectively. The inherent availability requirement is [redacted] The HELLFIRE missile is being designed in accordance with the "certified round" concept and will require maintenance only. The fire-and-forget seeker will be designed to be compatible with the "certified round" concept. RAM requirements will be verified by test, demonstration, and analysis using data from development and operational missile flight tests and system qualification tests. A reliability growth curve has been established for verification of achievement of the reliability requirements as missile firings are conducted. The RAM/Operational Suitability verification will culminate with Operational Test II as described in 2.a.(3). Test results achieved to date are summarized in 2.a.(1) and (2) above. During the development tests described in 1.a(1), the two seekers demonstrated a mission reliability of [redacted] versus a requirement of [redacted] allocated from the missile system mission reliability requirement of [redacted]

3. System Characteristics:

Operational/Technical Characteristics	Objectives	Demonstrated Performance
Range		
Time of Flight [redacted]		

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Operational/Technical Characteristics	Objectives	Demonstrated Performance
Probability of Hit	1/	
Missile Reliability	-	
Missile Length (max)	1.778 mm	
Missile Diameter (max)	178.3 mm	
Missile Weight (max)	43 kg	

1/ Characteristics are to be demonstrated during the Full-Scale Development Program planned for initiation in FY81.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.43.18.A
Title: Division Air Defense (DIVAD) Gun
DOD Mission Area: #213 - Ground Air Defense
Budget Activity: #4 - Tactical Program

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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	75717	25478	64693	20684	0	205788
	QUANTITIES						4
D648	Division Air Defense	75717	25478	64693	20684	0	205788

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides necessary development prototyping, and evaluation effort to define and develop a new weapon to meet Army requirements for low-altitude air defense in the forward maneuver area during the mid-1980 time period. Current air defense systems in the field cannot provide the forward maneuver units of Army divisions the necessary protection.

C. BASIS FOR FY 1981 RDTE REQUEST: Funds will permit the continuation of the accelerated development program to provide a radar-directed, medium caliber (35 or 40mm) self-propelled gun that will significantly improve the divisional short-range, low-altitude air defense capability in the 1980's. An Army Systems Acquisition Review Council/Defense System Acquisition Review Council (ASARC/DSARC) III to be held in October/November 1980 will consider the system for full-scale production. A contract for initial production and concurrent final development efforts will be awarded during the first quarter of FY81. Development to be completed includes final producibility engineering and planning (PEP), Technology Transfer, Fabrication and Test (TTF&T) for foreign guns and ammunition, and Integrated Logistics Support (ILS). A short maturity effort may be simultaneously initiated to correct problems uncovered during Development/Operational testing. Major milestones are:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Initiate Development	Jan 1978	Jan 1978
Complete Prototype Evaluation	Sep 1980	Sep 1980

Program Element: #6.43.18.A
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Title: Division Air Defense (DIVAD) Gun
Budget Activity: #4 - Tactical Program

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Initiate Production Contract Award	Oct 1980	Oct 1980
Complete Engineering Development	Sep 1982	Sep 1982
Activate First Gun Battalion (IOC)		

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	75717	25478	64693	20684	205788
Funds (as shown in FY 1980 submission)	75717	25719	40325	18737	179714

1. (U) The FY 1980 reduction of $.241 million is the result of a Congressional reduction in travel and overtime funding.

2. (U) The change in RDTE funding for FY81 is the result of:

a. (U) The addition of $15 million necessary to maintain program level of effort due to a program delay resulting from a reduction in the FY81 procurement request.

b. (U) The reinstatement of $5 million deleted from the FY80 budget which is required in FY81 to complete technology transfer, fabrication, and test (TTF&T) required for US production of the gun and ammunition.

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c. (U) The addition of $4.368 million due to the application of current inflation indices.

3. (U) The change in the "to complete line" is due to the addition of $1.947 million as the result of a change in inflation indices.

g. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Weapons and Tracked Combat Vehicles, Procurement, Army:						
Funds (current requirements)	0	0	195300	473600	2190800	2859700
Funds (as shown in FY 1980 submission)	0	0	274800		2211100	2485900
Quantities (current requirements)	0	0	12	98	508	618
Quantities (as shown in FY 1980 submission)	0	0	12		606	618

Since the FY 1980 submission, the DIVAD Gun procurement profile has been restructured. Initial production leadtime increased from 20 to 26 months and the reorder leadtime from 12 to 16 months. These changes in leadtime caused a six-month delay in the IOC. Other changes in FY81 necessary to accomplish this program restructuring included revised production schedules for Peculiar Support Equipment and Trainers and revised funding for Initial Production Facilities. The total FY81 decrease of $79.5 million is accounted for as follows: Application of revised inflation indices, +28.1 million; Increase in spares requirement, +2.3 million; Reduction in program when FY81 procurement was restructured, $109.9 million. Change to the total estimate results from the application of revised inflation indices and the restructuring of the program as a result of the reduction in FY81 procurement.

Program Element: #6.43.18.A
DOD Mission Area: #213 - Ground Air Defense

Title: Division Air Defense (DIVAD) Gun
Budget Activity: #4 - Tactical Program

	1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total FY Estimated Cost
Ammunition Procurement, Army:						
Funds (current requirements)	0	0	9100	129800	597100	736000
Funds (as shown in FY 1980 submission)	0	0	50300		613400	663700
Quantities (current requirements)	0	0	90000	1003000	12663000	13756000
Quantities (as shown in FY80 submission)	0	0	319000		28281000	28600000

Since the 1980 submission, the DIVAD Gun ammunition procurement has been completely restructured based on a significant reduction in the required quantity and a revision in the planned procurement policy for the ammunition. Changes in the DIVAD Gun ammunition program since the FY80 submission include:

1. (U) Reduction of the total ammunition requirement from 28.6 million rounds to 13.8 million rounds.

2. (U) Deferral of $37.0 million planned for ammunition production facilities in FY81 until FY82 due to inability to meet the requirement for a final facility design prior to submission.

3. (U) Planned procurement of ammunition from foreign sources due to the nonavailability of a US production facility as a result of the deferral of facilities' funding.

4. (U) Planned procurement of ammunition over a longer period of time.

5. (U) Application of revised inflation indices and foreign exchange rates.

Program Element: #6.43.18.A
DOD Mission Area: #213 - Ground Air Defense

Title: Division Air Defense (DIVAD) Gun
Budget Activity: #4 - Tactical Program

F. DETAILED BACKGROUND AND DESCRIPTION: The new Division Air Defense Gun development program (Project #D648) is the culmination of several years of effort by the Army to define its short-range air defense requirements which established the need for a new air defense gun. This requirement was established in March 1977 with the approval of a Required Operational Capability (ROC) document for a new air defense gun in the medium caliber (30-40MM) range which could adequately meet the threat of the 1980's and beyond. This gun will give divisional maneuver forces a quick reacting weapon system that can effectively engage pop-up targets such as helicopters armed with antitank guided missiles and high-speed, low-flying aircraft at distances of up to | under all visibility conditions. The system will be mounted on a tank chassis to provide mobility and survivability compatible with maneuver forces. It will have a full-solution digital fire control system with an optical backup to provide an all-environment (e.g., electronic countermeasures) capability. The system will have a rapid changeover to provide ground-support fires when required. The current Vulcan Air Defense System, with its 20mm armament, optical tracking, and open turret, is inadequate in terms of survivabilty, mobility, terminal effects, and effective range.

G. (U) RELATED ACTIVITIES: Prior to FY 1979, work was performed under Program Element (PE) 6.33.01.A. The two contractors developing prototypes are using mature components or modifications thereof developed by both foreign and domestic concerns. This will greatly enhance interoperability with both our NATO allies and other US military services. Ford Aerospace and Communications Corporation (FACC) is using the Bofors L70 40mm gun from Sweden and General Dynamics (GD) is using the Oerlikon KDA 35mm gun from Switzerland. Both guns and associated ammunition are widely deployed in NATO. US-developed radars, computers, Identification Friend or Foe (IFF), and Field Maintenance Test Sets (FMTS) are also being utilized. FACC is modifying the radar and computer developed for the F-16 fighter (Program Element 2.71.61.F) and GD is modifying the fire control system developed for the Navy's Phalanx Air Defense System (Program Element 6.43.58.N). Both contractors will adapt IFF systems developed for other air defense programs, the ROLAND Field Maintenance Test Set (Program Element 6.43.09.A) and the M48A5 tank chassis. Close liaision is being maintained with each developing country and agency to prevent duplication of efforts. Where possible test data from previous foreign, Air Force, Navy, or other developer tests of these components will be used in lieu of separate tests.

H. (U) WORK PERFORMED BY: The program is managed by the Project Manager, DIVAD Gun, US Army Armament Research and Development Command, Dover, NJ. Contracts have been awarded to Ford Aerospace and Communications Corporation (FACC), Aeronutronic Division', and General Dynamics (GD), Pomona Division, for the competitive development of a DIVAD Gun system.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

Program Element: #6.43.18.A
DOD Mission Area: #213 - Ground Air Defense

Title: Division Air Defense (DIVAD) Gun
Budget Activity: #4 - Tactical Program

1. (U) FY 1979 and Prior Accomplishments: The Gun Low Altitude Air Defense System (GLAADS) test bed was delivered to the Army in September 1975. The purpose of the test bed was to demonstrate through use of off-the-shelf hardware, the extent to which current technology could be used in the design of a modern gun air defense system. Testing was concluded in December 1975. The major conclusion of the test was that a second order digital fire control could be integrated with an air defense gun to provide a capability to effectively engage modern targets. A Cost and Operational Effectiveness Analysis (COEA) was initiated to determine the most cost-effective solution to our divisional air defense needs. In April 1977, the Secretary of Defense approved development of the DIVAD Gun subject to completion of a COEA and a Defense Systems Acquisition Review Council (DSARC) review of proposal costs prior to contract award. The Request for Proposal (RFP) was released in April 1977 and five contractors submitted proposals in July 1977. The COEA and evaluation of the proposals were completed in September 1977. Army Systems Acquisition Review Council (ASARC) II was held in October 1977 and DSARC II was held in November 1977. Announcement of the selected contractors, Ford Aerospace and Communications Corporation (FACC) and General Dynamics (GD), was made in November 1977. The Under Secretary of Defense approved the DSARC II recommendation on 6 January 1978. The Army signed the contracts with FACC and GD on 13 January 1978. Design freeze was accomplished in December 1978. Prototype fabrication continued through FY79 under the 29-month accelerated development program.

2. (U) FY 1980 Program: Contractor testing of prototypes at government facilities will begin in April 1980 with delivery of the prototypes to the Army scheduled for June 1980. Development Test/Operational Test (DT/OT) is scheduled from mid-June through mid-September 1980. A Request for Proposal for the production phase will be released to Ford Aerospace and Communications Corporation (FACC) and General Dynamics (GD) in February 1980. Evaluation of the proposals and test results will begin in May 1980 and will be completed in September 1980.

3. (U) FY 1981 Planned Program: An Army Systems Acquisition Review Council/Defense Systems Acquisition Review Council (ASARC/DSARC) III scheduled for October/November 1980 will consider the system for full-scale production. A contract will be awarded to initiate production and concurrently complete the remaining development. The final producibility engineering and planning (PEP), technology transfer, fabrication and test (TTF&T) for foreign guns and ammunition, and Integrated Logistics Support (ILS) development will begin during first Quarter FY 1981. A short maturity phase may be initiated to correct problems uncovered during Development/Operational Testing. The initial production contract will provide for production of the first 12 systems in FY 1981 and will have provisions for three yearly options for an additional 366 systems.

4. (U) FY 1982 Planned Program: The FY82 procurement will exercise the option for production of 98 systems, procure various items of logistics support equipment, procure additional ammunition off shore, and initiate facilitization for US ammunition production. The FY82 RDTE program will complete the TTF&T and ILS development efforts.

Program Element: #6.43.18.A
Title: Division Air Defense (DIVAD) Gun
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5. Program to Completion: This is a continuing program. Delivery of gun systems and related ammunition and logistics support equipment will continue through exercising of option in FY83 and 84. A follow-on production contract for 240 systems will be awarded during the first Quarter FY 1985. The first gun battalion will be fielded in_ Program completion is estimated for FY 1988.

J. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation:

a. (U) The Division Air Defense (DIVAD) Gun Program is a Defense Systems Acquisition Review Council (DSARC)-directed "hands-off" accelerated acquisition effort designed to achieve Initial Operational Capability in minimum possible time at an affordable cost. In keeping with this accelerated acquisition strategy, a combined development test/operational test (DT/OT) of three months' duration will be conducted to determine the systems effectiveness, suitability, and readiness for production. Extensive reliability, supportability, and climatic testing will be deferred until the production phase (Phase II).

(1) (U) Phase I - The Government testing is designed to obtain discrete and continuous system performance data as input to the evaluation plans of the US Army Operational Test and Evaluation Agency (OTEA), the US Army Materiel Systems Analysis Activity (AMSAA), the US Army Office of Missile Electronic Warfare (OMEW), the US Army Armament Research and Development Command (ARRADCOM), and the Source Selection Evaluation Board (SSEB). Both firing and nonfiring tests in system maneuvering and system nonmaneuvering modes will be conducted to evaluate both competing contractors. The nonfire tests will be conducted in an opertional environment that is as realistic as possible considering constraints imposed by the instrumentation system. Both prototype systems from each contractor will be adequately instrumented to allow the collection of continuous and discrete data. In order to conserve aircraft test resources and adequately simulate the operation of a DIVAD Gun section, each air threat (single and multiple formations of high-performance jet aircraft and helicopters) will be presented to both deployed systems simultaneously. However, only systems from one contractor will be live fire tested at a time. The firing test will be conducted by no more than two fire units per target pass and will consist of single or multiple high-performance jet aircraft, helicopters, and possible antiradiation missile targets, as well as representative ground targets. A realistic operational environment will be constrained only enough to allow adequate collection of required precision data. Some of the target profiles in the firing subphase will be similar to those flown in the nonfire subphase. Reliability, availability, maintainability (RAM) data will be collected from all fire units as it occurs. Contractor personnel will perform all maintenance (to exclude government-furnished equipment maintenance, e.g., chassis and radios) and supply functions above operator level. A Maintenance Chart will be developed by the Government and will provide the basis for determining what maintenance is done at each level. When a malfunction occurs above operator level, the contractor must first assume the role of organizational support personnel. If the malfunction is not correctable at the organizational level, the contractor assumes, as a separate and distinct action, the role of direct support (DS) and so forth until the malfunction is corrected.

Program Element: #6.43.18.A Title: Division Air Defense (DIVAD) Gun
DOD Mission Area: #213 - Ground Air Defense Budget Activity: #4 - Tactical Program

Exact data (e.g., action taken, time required to perform corrective action, sequence) will be reported as required by the Combined Development Test/Operational Test Plan. Specific actions normally performed by the US Army Training and Doctrine Command (TRADOC) support troops will be performed by the contractor including documentation and performance of only authorized corrective actions for the specific and distinct level of support assumed by the contractor. Typical user personnel will operate the four prototypes throughout DT/OT. The Government will conduct testing of the proposed 35mm and 40mm ammunition for lethality against threat aircraft. The testing will expand the government data base on single round kill probabilities for point detonating fuzed and proximity-fuzed ammunition.

(2) (U) Phase II - This testing will supplement the Phase I data base for the winning contractor only and will be oriented toward Phase I system deficiencies check testing, Integrated Logistics Support testing, possible maturation check testing, verification testing, and initial production testing. The Initial Production Test will verify that the transition to production has been made successfully and that the item, as produced, meets the prescribed specifications.

b. (U) Phase I testing is scheduled to begin in June 1980.

c. (U) A key to the DIVAD Gun's accelerated acquisition process is its application of the "prototyping for production" concept which places emphasis on the delivery of a production-ready prototype for testing. This concept has allowed the Army to adopt a more limited test effort than would normally be expected. Phase I testing will determine the "winning" system through a source selection process and identify those minimal changes which must be made in the production hardware. The competing contractors are:

(1) (U) General Dynamics - This system features a twin Oerlikon KDA 35mm gun system and utilizes a radar fire control system derived from the General Dynamics Phalanx fire control system which is in production for the US Navy.

(2) (U) Ford Aerospace and Communications Corporation - This system feasures a twin BOFORS 40mm gun system and utilizes a radar fire control system based on the Westinghouse F-16 design which is in production for the US Air Force.

(U) Both contractors' systems are mounted on a modified M48A5 tank chassis, offer unique turret designs, provide optical backup to the radar fire control, and provide primary power units to power the system.

d. (U) Equipment to be tested during Phase I will be limited to the prototype delivered by the two development contractors. The majority of the Integerated Logistics Support effort has been delayed until Phase II and the included support

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items (maintenance test sets, manuals, etc.) will not be tested until Phase II. All support equipment and materiel will be tested during Phase II prior to initial operation capability.

e. (U) The two primary contractors are General Dynamics of Pomona, CA, and Ford Aerospace and Communications Corporation of Newport Beach, CA. The Development Test/Operational Test plan combines a concert of effort in all phases by the US Army Operational Test and Evaluation Agency (OTEA), the US Army Test and Evaluation Command (TECOM), the US Army Office of Missile Electronics Warfare (OMEW), the US Army Materiel Systems Analysis Activity (AMSAA), the US Army Training and Doctrine Command (TRADOC), and the US Army Armament Research and Development Command (ARRADCOM). These commands will provide data necessary to select the winning DIVAD Gun system. The service program manager is the Project Manager, Division Air Defense Gun, Dover, NJ.

f. (U) The 90-day Government DT/OT testing will be conducted at North McGregor Range, Ft. Bliss, TX. Typical Army personnel will be used to operate both contractor's prototypes. These "typical user personnel" have been selected by the DIVAD Gun TRADOC System Manager from the Army personnel stationed at Ft. Bliss, TX.

g. (U) Major test programs schedule and major review milestones:

Test and Evaluation Milestones

Contractor 60-Day Test Completed	Apr 80
Contractor 30-Day Demonstration	May 80
Start of Combined Development Test/ Operational Test (DT/OT)	Jun 80
Source Selection Evaluation Board (SSEB) Convenes	Jun 80
Completion of DT/OT	Sep 80
SSEB Decision	Sep 80
Distribution of Test/Evaluation Results	Sep 80
Army Systems Acquisition Review Council (ASARC)	Oct 80
Defense Systems Acquisition Review Council (DSARC)	Nov 80

h. (U) Each contractor will provide two prototypes. Therefore, a total of four prototype systems will be tested.

i. (U) Phase I testing will be the first test of a complete DIVAD Gun system; however, extensive data from European tests of the ordnance subsystems, and other service tests of the fire control/radar subsystems is available and will be used when possible.

j. (U) Reliability, availability, and maintainability (RAM) objectives were included in the cost/performance trade-offs of the contract. The DIVAD Gun Program has RAM criteria established by the Defense Systems Acquisition Review Council decision. These criteria were established at values that if not achieved by completion of Phase I testing, would have to be justified by the Developer in terms of the cost/performance trade-offs and the contractor's reliability growth curves (projected and demonstrated).

(1) (U) Data collected under the RAM portion of the contract will be utilized, together with data generated during contractor test and Government test to give the broadest statistical base to assess RAM parameters. All RAM data collected will be used to assess RAM parameters and compare to contract requirements. Operational testing will provide a RAM assessment of the system under operational conditions. RAM data will be collected by the Government during Development Test/Operational Test utilizing contractor-trained personnel. Additional data will be gathered by any valid source including laboratory tests, bench tests, contractor range tests, contractor demonstrations, and DT/OT. RAM data will be collected by the contractor throughout the development program.

(2) (U) The following Reliability, Availability, and Maintainability criteria have been established for the DIVAD Gun Program during Phase I:

	Point Estimate	Test Time/Rds	ROC Objective
Fire Control - Mission Reliability			
Mean-Time-Between-Failures (Hrs)	40	200	95
Armament - Mission Reliability			
Cannon Mean-Round-Between-Failure (Rds)	1400	9000	2000
Organization - Mean-Time-To-Repair (Hrs)	2 hrs	---	.5 hrs

(3) (U) Minimum reliability thresholds will be established for Phase II. These thresholds will ensure adequate reliability growth to achieve the Required Operational Capability objective during Phase II.

k. (U) The combined Development Test/Operational Test (DT/OT) precludes testing of different configurations during DT and OT. The systems tested during DT/OT are expected to be production-ready prototypes which will require only minor modification prior to production.

l. (U) Environmental testing for the Phase I DT/OT will be limited to the climatic conditions experienced at Fort Bliss, TX, amplified by varying conditions of visibility, battlefield obscuration, and electronic countermeasures. More extensive climatic testing (e.g., Arctic) will be conducted during Phase II.

2. (U) Operational Test and Evaluation: The DIVAD Gun will be evaluated by a combined Development Test/Operational Test (DT/OT) from which both the Development and Operational Testers will collect data and upon which both will form an evaluation. The entire combined DT/OT will be completed and an evaluation performed prior to the Army Systems Acquisition Review Council/Defense Systems Acquisition Review Council and the award of a production contract.

3. System Characteristics:

Operational/Technical Characteristics	Objectives	Demonstrated Performance
Acquisition Radar	- Capable of detecting fixed wing aircraft. at and helicopters at	To be determined
Track Radar	- Capable of tracking aircraft to at least	
Optical System	- Backup to radars (equivalent accuracy).	
Cannon	- 35 or 40mm.	
Identification of Friend or Foe (IFF)	- MARK XII, Mode 4 compatible.	
Chassis	- Modified M48A5 (XM988)	
Dual Power Source	- Primary power unit and vehicle-driven generator	
Reaction Time	- Not greater than seconds from target unmask.	
Ammunition	- Point Detonating High Explosive (PD) air defense round with self-destruct	

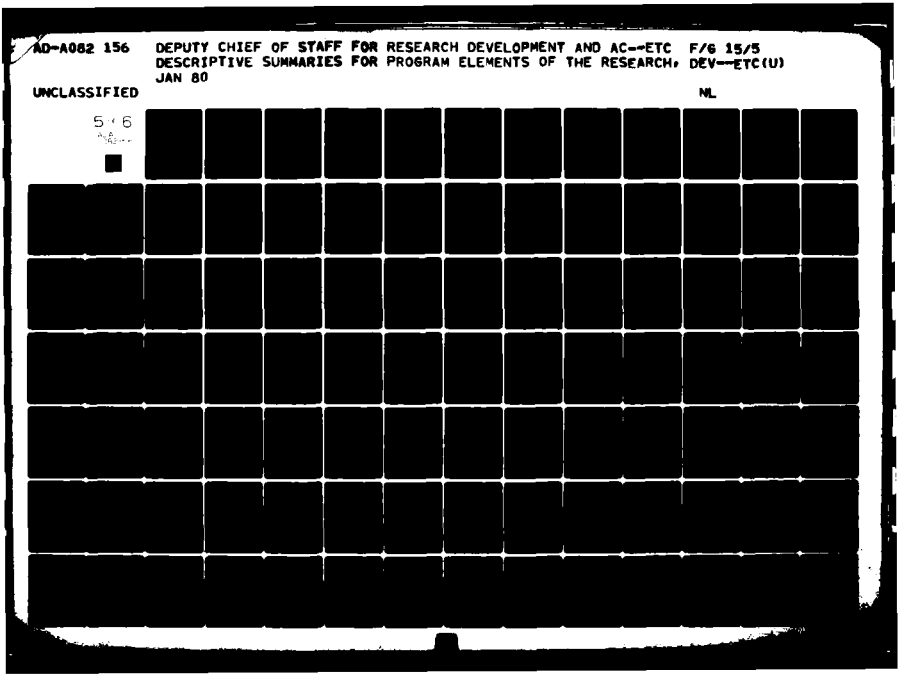
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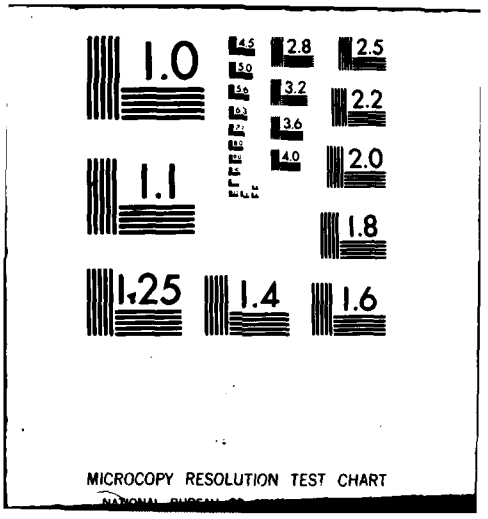
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Operational/Technical Characteristics	Objectives	Demonstrated Performance
	capability; training/practice round; proximity (PROX) air defense round with self-destruct.	
Communications	- Standard vehicle radios and intercom	
Crew Size	- Minimum of 3 men.	
Environment	- No hazardous environmental stresses.	
Transportability	- C-5A transportable.	
Range	-	
Probability of Hit	- Nonmaneuvering target: as a function of range. Maneuvering target: Not degraded more than from above criteria against maneuver.	
Probability of Kill (Given Hit)	- K-kill; A-kill;	
Fire Control	- Digital computer.	

AD-A082 156 DEPUTY CHIEF OF STAFF FOR RESEARCH DEVELOPMENT AND AC--ETC F/G 15/5
DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF THE RESEARCH, DEV--ETC(U)
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MICROCOPY RESOLUTION TEST CHART

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.01.A
DOD Mission Area: #211 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	3870	5809	4273	4262	9188	59342 *
	QUANTITIES						
D029	Lightweight Company Mortar Systems (LWCMS)	270	990	232	261	0	28594
D030	Multipurpose Ammunition	0	0	1155	1307	1360	3822
D144	Smoke Mortar Rounds	0	1849	0	2694	7828	12371
D227	Battalion Mortar System	3600	2970	2886	0	0	14555

*18 UK L16A2 81mm mortars and 16,700 rounds of ammunition (Project D227) were procured for test. 16 LWCMS (Project D029) were built for testing.

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, and improved stability 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. In other infantry support weapons, current fuzed ammunition in 20mm and .50 caliber sizes provides a satisfactory effect, but at a high cost. The addition of a fuzeless technology cartridge will provide a significant increase in explosive and incendiary effects against light armor and aircraft targets at a reduced cost. This program element provides for: the development of training and illuminating ammunition for the M224, 60mm Lightweight Company Mortar System (type classified

Program Element: #6.46.01.A
DOD Mission Area: #211 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #4 - Tactical Programs

in July 1977); the development of long-lasting screening smoke cartridges for the 81mm and 4.2" mortar systems; the test, evaluation, and preparation for procurement of an improved 81mm mortar system (Battalion Mortar System); and engineering development of a fuzeless ammunition technology in the 25mm and other caliber sizes for tri-Service applications.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: The request for $232 thousand for Project D029, Lightweight Company Mortar System, will permit continued engineering development (ED) of the XM745 multioption training fuze. The request for $2.886 million 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 $1.155 million for project D030 will permit the engineering development of multi-purpose fuzeless technology in 25mm and other calibers.

Project	Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
D029	Type Classification 60mm Training Round	4Q FY 1979	4Q Fy 1979
D030	Type Classification	FY83	None Shown
D144	Type Classification 81mm Smoke Round	4Q FY 1985*	4Q FY 1984
D227	Acquire 18 Test Weapons	1Q FY 1979	1Q FY 1979
	Begin Development Test/	4Q FY 1979**	1Q FY 1979
	Operational Test (DT/OT)	2Q FY 1980***	
	Complete DT/OT	2Q FY 1980	2Q FY 1980
	Development Acceptance IPR	3Q FY 1980***	2Q FY 1980
	Type Classification	3Q FY 1980***	2Q FY 1980
	Initial Operation Capability	3Q FY 1982***	4Q FY 1980

* Difference due to deferment of engineering development until FY 1982.
** DT began as scheduled but was suspended because of misfires and short round problems with ammunition at extreme temperatures. These problems prevented issuance of full safety release and OT was never commenced. DT was recommenced and is currently in progress.
*** Difference due to problems with ammunition during DT which resulted in a one-year program slip.

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DOD Mission Area: #211 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #4 - Tactical Programs

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	3870	5809	4273	9188	59342
Funds (as shown in FY 1980 submission)	6964	5849	2049	5260	52071

Differences between FY 1980 and FY 1981 submit: FY 1979: $3094 thousand decrease is due to: $950 thousand reprogramed from D029 into higher priority projects. $600 thousand reprogramed into D227 to adapt the M734 multioption fuze to the UK 81mm mortar ammunition. $2744 thousand reprogramed from D144 into higher priority projects because of problems in an 81mm mortar smoke concept which has resulted in the project remaining in advanced development under PE 6.36.27.A. FY 1980: $40 thousand decrease due to a general Congressional reduction applied to this program. FY 1981: $2224 thousand increase is due to: $32 thousand to be added to D027 to continue engineering development and complete testing of XM745 training fuze; $1849 thousand to be deleted from D144 due to continued problems in 81mm mortar smoke concept which has resulted in the project remaining in advanced development. All necessary experimental work must be performed before the system will be ready for full scale development which will be in FY 1982. These funds will be reprogrammed into higher priority requirements; $2886 thousand to be added to D227 to continue the program after a one-year slip due to ammunition problems; $1155 thousand added to support new project D030, multipurpose ammunition.

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)

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost	
Weapons and Tracked Combat Vehicles, Army							
Mortar, 81mm, XM252							
Funds (current requirements)	0	0	14900	20000	7100	42000	
Funds (as shown in FY 1980 submission)	0	10500	10800	-	-	21300	**
Quantities (current requirements)	0	0	742	939	325	-	
Quantities (as shown in FY 1980 submission)	0	780	768	-	-	-	

Differences due to a one-year slip in proposed procurement of the UK 81mm mortar because of misfires and short round problems in testing at extreme temperatures. Cost increases are due to increase in sales price from UK and devaluation of the dollar against the British pound.

Lightweight Company Mortar (LWCMS), M224						
Funds (current requirements)	10400	0	0	0	0	13800
Funds (as shown in FY 1980 submission)	9600	0	0	0	0	13000

Program Element: #6.46.01.A
DOD Mission Area: #211 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #4 - Tactical Programs

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Quantities (current requirements)	1400	0	0	0	0	-
Quantities (as shown in FY 1980 submission)	1400	0	0	0	0	-

Difference in funding due to more current cost estimates.

Procurement Ammunition, Army*

Cartridge, 60mm, LWCMS, All types						
Funds (current requirements)	27600	20800	0	33000	**	134600***
Funds (as shown in FY 1980 submission)	-	-	-	-	-	-
Quantities (current requirements)	320000	282000	0	282000	**	-
Quantities (as shown in FY 1980 submission)	-	-	-	-	-	-
Cartridge, 81mm, Improved						
Funds (current requirements)	0	0	26300	0	**	165800***
Funds (as shown in FY 1980 submission)	-	-	-	-	-	-
Quantities (current requirements)	0	0	136000	0	**	-
Quantities (as shown in FY 1980 submission)	-	-	-	-	-	-

* This appropriation was not shown in FY 1980 submission
** Cost to completion not estimated for ammunition since procurement is continuous based on usage.
*** Represents total five-year defense program requirements (FY81-85).

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 fuzed with a new M734 multioption electronic fuze, and the XM745 training fuze (gutted M734 multioption fuze). Illuminating ammunition is being 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 and 4.2-inch 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, employing the M734 multioption fuze, to a range of approximately 5500 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. Multipurpose gun ammunition, developed by Raufoss Ammunisjonsfabrikker, 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 fuzed cartridges. The Army has been given the lead in negotiating for technology and production rights for a tri-Service requirement. The Army will develop ammunition in 25mm and other calibers.

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 and 4.2-inch smoke mortar rounds. The UK L16A2 evaluation has undergone feasibility testing under PE 6.57.09.A, Exploitation of Foreign Weapons. The multipurpose ammunition has been evaluated under PE 6.26.17, Small Caliber and Fire Control Technology, and PE 6.57.14D, International Materiel Evaluation.

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Title: Infantry Support Weapons
Budget Activity: #4 - Tactical Programs

H. (U) WORK PERFORMED BY: In-house efforts are accomplished by US Army Armaments Research and Development Command, Dover, NJ; and US Army Test and Evaluation Command, Aberdeen, 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 1979 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. This system is currently in procurement. Minor engineering changes to correct shortcomings and deficiencies have been accomplished and tested by Test and Evaluation Command (TECOM). Engineering development work on the 60mm illumination round and subcaliber training round continued during this period. Producibility Engineering and Planning (PEP) on the M734 multioption fuze was completed and resulted in lower procurement costs. Engineering development was initiated on the XM745 multioption training round fuze. Smoke Mortar Rounds: To satisfy the Army requirement for an improved smoke screening capability at the battalion level, development of the 81mm and 4.2-inch smoke screening cartridges was undertaken. 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 Lab of Armaments Research and Development Command (ARRADCOM). Development Testing (DT) was commenced in October 1978 at Aberdeen Proving Ground, MD, and the Cold Region 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.

Program Element: #6.46.01.A
DOD Mission Area: #211 - Close Combat

Title: Infantry Support Weapons
Budget Activity: #4 - Tactical Programs

2. (U) FY 1980 Program: Lightweight Company Mortar System: Engineering Development (ED) of the XM745 gutted multioption training fuze will be continued. Fuzes will be procured to support testing with the M720 HE cartridge. 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: Eastman Kodak delivered the remaining M734 multioption fuzes required for testing. The production version of the M64 sight was shipped to the test site. Development Test II, which started in August 1979 at Aberdeen Proving Ground (APG), MD, and Operational Test II and Operational Climatic Testing scheduled to commence in January 1980, are being 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 Agency (OTEA). Following testing and evaluation, a Development Acceptance In-Process Review will be held to determine whether the system meets the requirements and should be type classified and procured.

3. (U) FY 1981 Planned Program: Lightweight Company Mortar System: Engineering Development (ED) and Development Testing (DT) II of the XM745 gutted multioption training fuze will be completed. Smoke Mortar Round: Due to concept problems in developing an 81mm mortar smoke round, this project will remain in advanced development. Battalion Mortar System: All elements of Integrated Logistic Support will be completed. Shortcomings found during testing will be corrected and additional testing conducted if necessary. Mounts for vehicle application will be developed, fabricated, and tested. The Technical Data Package will be prepared, and a Producibility Engineering and Planning effort undertaken for US production. Additional ED for an improved 81mm mortar high explosive round will be required to support US production of an 81mm mortar round compatible with procurement of the UK mortar. Multipurpose Ammunition: Multipurpose technology will be translated, test cartridges in 25mm and other calibers will be fabricated, and engineering design testing of the cartridges will be conducted.

4. (U) FY 1982 Planned Program: Lightweight Company Mortar System: Initial Operational Capability for the XM745 multioption training fuze will take place in the fourth quarter. 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: If type classified standard, the battalion mortar system will be deployed during the third quarter. Multipurpose Ammunition: Engineering Development of the multipurpose technology will be continued in preparation for testing and type classification of selected cartridges.

5. (U) Program to Completion: Lightweight Company Mortar System: Continued 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. 4.2-inch mortar smoke screening rounds will enter engineering development. Multipurpose Ammunition: Selected multipurpose ammuniton cartridges will undergo DT II and be type classified in FY83.

FY 1981 RDTE 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	16904	25646				
	QUANTITIES						
D385	Improved 155mm Nuclear Projectile	11562	21267				
D584	Command Control and Security Systems	0	500				
D663	Improved 8-in Nuclear Projectile	5342	3879				

*Warhead quantities exceed the classification of this document.

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.

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 155mm, and the 8-inch AFAP alone will not provide an adequate cannon-delivered nuclear capability.

Some countries maintain only a token number of 8-inch cannon,

and others have only 155mm cannon. 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 155mm nuclear capability is required to replace the 155mm artillery-fired atomic projectiles (AFAP) currently available for NATO forces.

Numerous and vigorous studies by the Army, Office of the Secretary of Defense, Department of Energy, and the Defense Science Board have all concluded that both a modernized 155mm and a modernized 8-inch are essential to provide a credible contribution to the deterrent value of the TNF. 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, a capability is required to allow the disablement of weapons currently stockpiled, as well as newer weapons, when they are threatened by capture from a nontactical stockpile storage configuration. Nonviolent disablement is required to prevent plutonium dispersal. The Command Control and Security System project includes the Army effort in the Emergency Disablement System (EDS) program. EDS is a Tri-Service effort lead by the United States Air Force per Office of the Secretary of Defense direction.

C. BASIS FOR FY 1981 RDTE REQUEST: FY 1981 funds requested will provide for engineering development, design, testing, and some design iteration for the projectile aft body/rocket motor and to keep open the developmental fuze production line in the XM785/W82 Improved 155mm Nuclear Projectile program; initial engineering development of a disablement system controller; and engineering support for transition to production in the XM753/W79 Improved 8-inch Nuclear Projectile program.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 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		None specified, see below

Program Element: #6.46.03.A
DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare

Title: Nuclear Munitions
Budget Activity: #4 - Tactical Program

A reduction in the FY 1981 155mm AFAP modernization effort was required to relieve mid-1980's demands on the Department of Energy (DOE) nuclear weapons production complex. (See also Project D385 Descriptive Summary, following). The Command Control and Security Systems will probably achieve an Initial Operational Capability (IOC) with disablement system hardware on the XM753/W79 first, but not at the same time as the XM753/W79 IOC. The XM753/W79 program was halted in DOE by the Byrd-Baker amendment to the FY 1978 DOE appropriations act. A Presidential directive in October 1978 restarted the program, and first production will be achieved in 4Q1981 and

D. BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	16904	25646			
Funds (as shown in FY 1980 submission)	16904	25882			

The $236 thousand decrease in FY 1980 is a result of a general Congressional reduction. The $8509 thousand decrease in FY 1981 since the last submission is a reduction in effort on command, control and security systems due to lack of a defined requirement for a specific Emergency Disablement Systems (EDS) (-$818 thousand, Project D584) and the required reduction (see paragraph c above) in the 155mm artillery-fired atomic projectile (AFAP) modernization (-$9654 thousand, Project D385), less the increase caused by the delay in initiating the XM753/W79 production ($1963 thousand, Project D663),. The growth in the "Additional to Completion" and total estimated costs ($44102 thousand) reflects the cost of the DOD-directed delay in the 155mm AFAP modernization ($10000 thousand, Project D385), costs attributed to delays in restarting the 8-inch AFAP production ($1963 thousand Project D663), refinement of cost estimates in the 155mm AFAP modernization ($19589 thousand, Project D385) and command control and security projects ($677 thousand, Project D584), and an arithmatic error in the FY 1980 submission ($11873 thousand).

Program Element: #6.46.03.A Title: Nuclear Munitions
DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare Budget Activity: #4 - Tactical Program

E. OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Ammunition Procurement, Army 155mm						
Funds (current requirements)	0	0				
Funds (as shown in FY 1980 submission)	0	0				
Quantities (current requirements)	**	**				
Quantities (as shown in FY 1980 submission)	**	**				..
Ammunition Procurement, Army - 8-inch:*						
Funds (current requirements)	11600	17800				
Funds (as shown in FY 1980 submission)	11600	18400				
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 155mm nuclear projectile procurement submission in FY 1980 was based on a larger planned total procurement and an earlier initiation of procurement for long leadtime items. This submission is consistent with the total procurement authorized in the FY 1979 Amended Program Decision Memorandum and the FY 1981 reduction in the 155mm artillery-fired atomic projectiles (AFAP) modernization project. The changes in the 8-inch nuclear projectile procurement since the FY 1980 submission reflect refined cost estimates as a result of production experience in FY 1979 and production contracts let for FY 1980.

Program Element: #6.46.03.A Title: Nuclear Munitions
DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare 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 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 bridge 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.

The major effort required in FY 1981 and outyears is modernization of the 155mm nuclear capability. The current 155mm AFAP is (see paragraph B above). 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 of the Soviet cannon artillery. The modernized weapon will have a yield times greater than the old technology could produce in a 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 not producing fallout. Firing data corrections derived from the conventional ammunition being fired will reduce delivery probable errors by or 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 hardware modifications and systems to prevent the unauthorized use of nuclear weapons or to ensure their emergency disablement if threatened with capture. If weapons are threatened with capture by the enemy or terrorists, current disablement capability is limited to violent destruction by shaped charge which spreads nuclear materiel over an area. The new family of Army weapons will all have a command disable system for use on individual weapons in a tactically deployed posture. However, an emergency of disablement system (EDS) will be required to provide the capability to disable currently stockpiled weapons, or a number of the newer weapons when in a stockpile storage configuration. Without an EDS, weapon vulnerability to capture is increased when storage bunkers must be opened to emplace demolition charges.

Program Element: #6.46.03.A Title: Nuclear Munitions
DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare Budget Activity: #4 - Tactical Program

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 D385) uses the rocket motor developed for the M650 conventional 8-inch projectile (SSN E66600). The M650 is the conventional ballistic mate 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. EDS development (includes Project D584) is a Tri-Service effort, lead by the Air Force, that relates to all nuclear weapons systems in all Services. 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.

H. (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; Ferrulmatics Inc., Patterson, NJ; Chamberlin Corporation, Waterloo, IA; Motorola Corporation Incorporated, Scottsdale, AZ. See also project D385, Improved 155mm Nuclear Projectile, Descriptive Summary, following.

I. PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1979 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. Completed laboratory, field, and joint flight testing of DOD-produced LANCE hardware leading to type classification. Production of LANCE warhead adaption adaption kits was completed in FY 1979. The Army provided design support for the projectile main body case allowing DOE to
Engineering Development and subcomponent packaging redesign of the fuze for the 155mm AFAP nuclear projectile were initiated. Process engineering and design testing of the aft projectile body and rocket motor were conducted. Ballistic characterization flight tests of 155mm projectiles were conducted. 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. The fuze, fuze spanner wrench, projectile extractor, and training projectile were type classified for the 8-inch AFAP. Engineering development of the AFAP limited life component (LLC) exchange van and stand was initiated.

Program Element: #6.46.03.A Title: Nuclear Munitions
DOD Mission Area: #241 - Battlefield Theater Nuclear Warfare Budget Activity: #4 - Tactical Program

2. (U) FY 1980 Program: Test 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. Flight test 155mm AFAP design for ballistic performance. Continue engineering support for Tri-Service emergency disablement system (EDS) project and AMSAA CC&S study. Complete Development Testing/Operational Testing Phase 2 (DT/OT II) for the 8 inch, LLC van design, and support transition to production.

3. FY 1981 Planned Program: The reduction in 155mm AFAP modernization effort in FY 1981 (see paragraph c above) 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. The requirement for a design for an emergency disablement system will be established. 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 the last quarter of FY 1981

4. 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 engineering design testing of emergency disablement system hardware.

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 projectilein Complete testing and production of a modernized command, control, and security system for Army nuclear weapons.

FY 1981 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 the maneuver forces with massive firepower. Overall Soviet-WP maneuver forces outnumber NATO maneuver forces by about , their cannon artillery outnumbers NATO cannon artillery , 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 forces them to deploy in combat in a way that reduces their effectiveness to execute their doctrine for the conduct of battles. Thus, the real warfighting capability of AFAP and the bridge they provide to strategic systems deter conventional as well as nuclear conflict.

The NATO cannon artillery force structure is predominantly 155mm, and the 8-inch cannon alone, even with a modernized 8-inch AFAP and the old 155mm AFAP, will not provide an adequate battlefield nuclear capability. 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 a requisite because it requires 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 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 8-in cannon, versus nuclear certifiable 155mm cannon. Some countries maintain only a token number of 8-in cannon's and others have only the 155mm cannon. The 155mm AFAP

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

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 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 mechanical time fuze on the M454, and will produce a more precise height-of-burst and greater assurance of not producing fallout. Firing data corrections derived from the conventional ammunition being fired will reduce the delivery probable errors 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 and rocket motor joint 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 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 Laboratories, Lawrence Livermore Laboratory, Livermore, CA; and the Sandia Laboratories in Livermore, CA; Chamberlain Corporation, Waterloo, IA; Motorola Corporation Incorporated, Scottsdale, AZ.

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

b. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1979 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 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 to "as early as possible in 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 increased the yield beyond 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) to the end of FY 1984. 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.

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

2. FY 1980 Program: Test the structural integrity and strength 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. Proof test the process engineering for the attachment of high-pressure obturating bands/rotating bands to the titanium aft projectile body/rocket motor. Conduct functional flight tests of prototype fuzes. Establish the ballistic validity of ballistic verification projectiles and further characterize the ballistic performance of the XM785.

3. (U) FY 1981 Planned 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.

4. (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 beginning in FY 1983. Continue ballistic characterization flight tests.

5. (U) Program to Completion: Complete DT/OT II testing, firing table flights, type classification, and production of the XM785 nuclear projectile with XM749 radar fuze and all ancillary and support equipment. Complete new materiel training and achieve initial operational capability (IOC) with an Improved 155mm Nuclear Projectile.

6. Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Army requested joint Department of Defense-Department of		

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

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
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	1QFY1979
DOE underground nuclear test proves weaponization		
Begin development testing/ operational testing (DT/OT II)	4QFY1982	4QFY1981
Development Acceptance IPR	4QFY1983	4QFY1982
First DOE Production Unit	4QFY1984	4QFY1983
Type Classify Total System (DOD & DOE components)	1QFY1985	1QFY1984
First War Reserve Hardware Available for DOD		
Initial Operational Capability (IOC)		

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

The slippage in current milestone dates from the dates shown in the FY 1980 submission resulted from a reduction in the FY 1981 155mm AFAP modernization effort. This reduction was required to relieve mid-1980's demands on the Department of Energy nuclear weapon production complex. This reduction prevented the planned procurement in FY 1981 of the hardware, principally fuzes, required to support the DT/OT II testing in FY 1982. This required postponing the start of DT/OT II until the end of FY 1982, the slipping of all subsequent milestones listed, and delaying the IOC

7. Resources ($ in thousands):

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	11562	21267				
Funds (as shown in FY 1980 submission)	13633	21500				
Quantities (current requirements)	*	*	*	*	*	*
Quantities (as shown in FY 1980 submission)	*	*	*	*	*	*

The $233 thousand decrease in FY 1980 is the result of a general Congressional Reduction. The reduction in 155mm AFAP RDTE in FY 1981 (see paragraph D6, above) produced the $9654 thousand reduction in FY 1981. The $29589 thousand increase in total estimated RDTE costs is attributed to the delay ($10000 thousand) and refined cost estimates in the outyears ($19589 thousand).

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 Programs

Other Appropriations:**	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
Procurement Ammunition, Army						
Funds (current requirements)	0	0	[redacted]			
Funds (as shown in FY 1980 submission)	0	0				
Quantities (current requirements)	0	0	0	*	*	*
Quantities (as shown in FY 1980 submission)	0	0	0	0	*	*

*Warhead quantities and production rates exceed the classification of this submission. Overall quantity changed from FY 1980 to FY 1981 (see below).

**Department of Defense-procured components only; Department of Energy-Defense Programs (DOE-DP) budget figures exceed classification of this document.

The FY 1980 procurement submission was based on a 55% larger planned total procurement and an earlier initiation of procurement of long leadtime items. This submission is consistent with the total procurement authorized in the FY 1979 Amended Program Decision Memorandum and the FY 1981 reduction in the 155mm AFAP modernization.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: 06.46.09.A
DOD Mission Area: 0215 - Land Combat Support

Title: Combat Support Systems
Budget Activity: 04 - Tactical Problems

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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	1213	1028	620	3528	Continuing	Not Applicable
	QUANTITIES						
D191	Smoke Munitions and Material	1208	1028	620	3528	Continuing	Not Applicable
D638	Civil Disturbance Control System	5	0	0	0	0	5793

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides the engineering development (ED) support for developing 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 1981 RDTE REQUEST: Funds are required to continue rapid smoke grenade launcher development 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 VEESS for armored vehicle engines such as self-propelled artillery and air defense systems.

Program Element: #6.46.09.A
DOD Mission Area: #215 - Land Combat Support

Title: Combat Support Systems
Budget Activity: #4 - Tactical Problems

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	1213	1028	620	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	2248	1028	3168	Continuing	Not Applicable

(U) Department of the Army priorities for tactical and civil disturbance riot control agent (RCA) systems were not high enough to provide this area an allocation of limited RDTE funds in FY 1979. As a result, the $500 thousand for Project DF96 in FY 1979 was deleted from this progam and reprogrammed to other higher priority RDTE programs leaving a balance of $1748 thousand. Excellent progress has been made in adapting smoke grenade launching systems and vehicle engine exhaust smoke systems to the various US Army combat vehicles. As a result, an additional $535 thousand was reprogrammed (for a total of $1035 thousand in FY 1979) as the balance of $1213 thousand was sufficient to accomplish the FY 1979 program. Due to higher priority of other Department of the Army projects, $1147 thousand was deleted from Project DF96 and $1413 thousand was taken from Project D191 in FY 1981

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

Program Element: #6.46.09.A
DOD Mission Area: #215 - Land Combat Support

Title: Combat Support Systems
Budget Activity: #4 - Tactical Problems

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 M48 A5 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, SLUFAE, 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 civil disturbance control systems. The other Services sponsor engineering development for materiel unique to each. 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% of the armored vehicle rapid smoke protection systems effort will be in-house by US Army Chemical Systems Laboratory, Edgewood, MD; 20% will be the test effort of the US Army Test and Evaluation Command, Aberdeen Proving Ground, MD; and 20% 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% 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; Pine Bluff Arsenal, AR; US Army Large Caliber Weapons Systems Laboratory, Dover, NJ; Miller Research Corporation, Baltimore, MD; Battelle Corporation, Columbus, OH; Project Manager-M60; Project Manager-M88; Project Manager-XM1; Project Manager-Fighting Vehicle Systems (FVS).

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Numerous tactical CS munitions and civil disturbance control munitions and devices completed development and were type classified under this program element. Examples include: M629, 105mm Tactical CS projectile; M630, 4.2-inch Tactical CS projectile; M651, 40mm Tactical CS Cartridge; a 2.75-inch CS air-to-ground rocket; M165 Multipoint Source Cluster; and the M674 Riot Control Agent Cartridge. Engineering development was initiated on several other civil disturbance control devices: XM33 riot control agent dispenser, XM47 CS-filled grenade, and XM32 handheld CS dispenser for use by military police units. Engineering development continued on the XM96, 66mm Tactical CS rocket. Emphasis was on improving producibility of the warhead and increasing the agent payload. In FY 1974 the M47 CS grenade and M48 training grenade completed development and were adopted as standard. The M47 grenade was a significant improvement because its spherical shape and skittering characteristics minimize the possibility that rioters can throw the grenade back at the crowd control

Program Element: #6.46.09.A Title: Combat Support Systems
DOD Mission Area: #215 - Land Combat Support Budget Activity: #4 - Tactical Problems

unit. The M33 Portable backpack dispenser was adopted for use with CS. Engineering development was initiated on the XM742 Projectile (SOFT RAG) in FY 1976. 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 fielding 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 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 VEESS to the M60, M60A2, M48A5 tanks, AVLB, M728 CEV, and M88A1 Medium Recovery Vehicle (MRV) were initiated.

2. (U) FY 1980 Program: Complete type classification of the XM257 smoke grenade launcher for the XM2 Infantry Fighting Vehicle (IFV). Continue launcher development and adaption for follow-on vehicle requirements including the M113A1, Armored Personnel Carrier, Surface Launch Unit Fuel Air Explosive (SLUFAE), and Marine Corps LVT-7 vehicles; complete value engineering design effort on the 6-tube discharger; complete validation and adaption studies of the VEESS to the M60, M60A2, and M48A5 tanks, AVLB, M728 CEV, and M88A1 MRV. Initiate feasibility study of a VEESS for the Detroit diesel 6V53 and 8V71T engines. Monitor development of an engine smoke generator for the XM1 tank and Infantry Fighting Vehicle/Cavalry Fighting Vehicle (IFV/CFV). Developmental work will be accomplished by each system's respective project manager's office.

3. (U) FY 1981 Planned Program: Continue development and adaption of rapid smoke grenade launcher systems for follow-on vehicle requirements including self-propelled artillery and air defense systems. Complete feasibility study of Detroit diesel engines. Coordinate fielding programs of the vehicle engine exhaust smoke system (VEESS) with PM-M60 for the M60, M60A2, and M48A5 Tanks, Armored Vehicle Launch Bridge (AVLB), and M728 Combat Engineer Vehicle (CEV).

4. (U) FY 1982 Planned Program: Continue engineering effort of launcher adaption for additional vehicle requirements. Initiate development of a vehicle engine exhaust smoke system (VEESS) for the 6V53 and 8V71T Detroit diesel engines and other tracked vehicle engines as required. Initate engineering development for a manportable smoke/obscurants generating system.

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

FY 1981 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	6518	3671	1876	5788	Continuing	Not Applicable
	QUANTITIES						Not Applicable
D021	Explosive Demolitions	777	283	205	1289	Continuing	Not Applicable
D145	Surface-Launched Unit, Fuel-Air Explosive (SLUFAE)	3786	2000	348	196	0	10140
D300	Countermine and Barriers (NATO)	0	0	578	0	0	578
D415	Mine Neutralization/ Detection	1955	1388	745	4303	Continuing	Not Applicable

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Project D021 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, and Army-peculiar tools and kits for Explosive Ordnance Disposal (EOD) units. 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. Specific projects in this program include: Blasting Agent, a two-part, field-mixable explosive for cratering and general purpose engineer demolition work; hard overpack, a container for moving leaking chemical munitions to areas where the leaker can be neutralized; the M180 cratering charge, an item which reduces the cratering sequence to a one-phase action; the M122 firing device, a long-range, remote-control demolition charge detonation device and the variable time firing device, an electronic timer to detonate explosive charges up to 99 hours after emplacement. This program provides for the engineering development of a group of mutually supporting mine detection and neutralization devices capable of defeating mines and booby traps which support enemy positions, on lines of communications, and in off-route environments. Warsaw Pact doctrine specifies the habitual use of minefields during both offensive and defensive operations. Historically, minefields have been proved 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 used offensively for flank protection of advancing formations to

Program Element: #6.46.12.A
DOD Mission Area: #214 - Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

deny access to vital terrain and routes of communications. Warsaw Pact can emplace minefields rapidly by mechanical means. Capability to counter this mining threat by US Forces is extremely deficient. Current capability consists of hand-held detectors which require a slow point-to-point search and then manual or explosive mine neutralization. The delay to friendly forces to friendly forces associated with these techniques significantly raises the potential for enemy success. 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. The Surface-launched Unit Fuel Air Explosive (SLUFAE) mine neutralization system has been designed to provide a rapid standoff breach of a minefield up to 300 meters in depth. SLUFAE is simple to employ and intended for use by combat engineers as part of the combined armor infantry team. Also, a vehicle-mounted road mine detector has been designed to clear a path up to 11 feet wide of all mines with sophisticated microwave and microprocessor technology. This program also supports the development of field fortification techniques, equipment and supports the establishment of formidable defensive positions in support of a strongpoint.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Field the blasting agent, a two-part, field-mixable explosive for crating and general purpose engine demolition work. Initiate production on the hard overpack, a container for moving leaking chemical munitions to areas where the leaker can be neutralized. Initiate engineering development on the variable-time firing device. Funds will support completion of Developmental Testing II/Operational Testing IIA on SLUFAE (Surface-Launched unit, Fuel Air Explosive), compilation and analysis of test data, and type classification standard for Army use. The SLUFAE technical data package will be assembled, new equipment training team will be fielded, skill performance aids package will be completed, and preparation for production completed. Engineering Development (ED) on the vehicle-mounted road mine detector will be continued.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	6518	3671	1876	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	9738	4593	5500	Continuing	Not Applicable

Project D021, Explosive Demolitions, was reported in FY 1980 submission in Program 6.46.06.A/0021. It was transferred to this program in FY81 to consolidate related technology development. D300 was reduced by Congressional action in FY80. In FY 1979

Program Element: #6.46.12.A
Title: Countermine and Barriers
DOD Mission Area: #214 - Mine Warfare
Budget Activity: #4 - Tactical Programs

and 1981, significant reduction in D415 reflects failure of several advanced development programs to progress to engineering development in the timeframe anticipated because of technical difficulties and the movement of funds to higher priority Army requirements.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Ammunition Procurement, Army (Blasting Agent)						
Funds (current requirements)	0	0	2500	2700	8900	14100
Funds (as shown in FY 1980 submission)	0	3800	3800	-	12500	20100
Quantities (current requirements)	0	0	1650	2000	6000	9650
Quantities (as shown in FY 1980 submission) (1000 # kits)	0	2000	2000	-	6000	10000
Ammunition Procurement, Army (SLUFAE)						
Funds (current requirements)	0	0	0	8700	144900	153000
Funds (as shown in FY 1980 submission)	0	8900	50900	-	145700	205500
Quantities (current requirements)	0	0	0	1250	36996	38246
Quantities (as shown in FY80 submission) (rounds each)	0	2100	18000	-	52577	72677
Weapons and Tracked Combat Vehicles (SLUFAE)						
Funds (current requirements)	0	0	0	8000	32500	40400

Program Element: #6.46.12.A Title: Countermine and Barriers
DOD Mission Area: #214 - Mine Warfare Budget Activity: #4 - Tactical Programs

Funds (as shown in FY80 submission) (launcher mod of M548 and loader mod of transporter)	4400	0	12400	-	9300	26100
Quantities (current requirements)	0	0	0	53	222	275
Quantities (as shown in FY80 submission) (launchers)	60	0	155	-	112	327

The delay in initial procurement of both Blasting Agent and SLUFAE rockets and modification kits from FY80 to FY81 was caused by explosive technical difficulties during development which have now been overcome. The SLUFAE production delay from FY81 to FY82 is the result of an inability to fund all required programs for *FY 1981 within available funding limitations.*

Program Element: #6.46.12.A
DOD Mission Area: #214 - Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: In recent years, this program has provided development support for several functions performed by the Army. In the area of tactical demolitions, simple firing devices for explosives have been developed with the goal of increased reliability and a reduction in size and weight. Items have been developed to assist Explosive Ordnance Disposal (EOD) personnel in the neutralization of hazardous munitions. This requirement is continuous because of the introduction of new items into the inventory and the acquisition of foreign items for both friendly and enemy sources. 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. Also, 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 more benign environments, two distinct activities must be addressed in this program: 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 (SLUFAE) mine neutralization system has been designed to provide a rapid standoff breach of a minefield up to 300 meters in depth. SLUFAE is scheduled for type classification standard during FY 1981. Another major effort in this area, the mineclearing roller, will provide tank units with an integral capability to negate minefield effectiveness. The roller can withstand 2 to 3 direct blasts from threat mines, maintain its integrity, and protect the tank from damage. The mine roller was type classified in FY 1978 with initial procurement in FY79. Follow-on systems in this program will 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. In the area of field fortifications, the Army has increased emphasis on battlefield survivability as a result of various analyses on the effects of modern weapons.

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 (SLUFAE) 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.

Program Element: #6.46.12.A
DOD Mission Area: #214 - Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

H. (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 1979 and Prior Accomplishments: Standardized items developed in this program include an overhead foxhole cover, the M252 cutting and entry tool kit for access to munition fuzes, the general purpose barbed tape obstacle, and the M180 cratering charge for hasty road craters. 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. During 1979, Developmental Testing (DT II) on the blasting agent was completed, and Development Test and Operational Testing and Operational Testing (DT II/OT II) tests on the hard overpack were conducted. Both systems were proven sound. The vehicle-mounted explosive container was transferred to Navy Explosive Ordnance Display (EOD) for development. 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 Launching Unit, Fuel Air Explosive (SLUFAE) prototype items were fabricated, and engineering design tests were conducted against a live minefield. In FY 1977, SLUFAE Development Test (DT) II/Operational Test (OT) II launcher hardware and initial prototype rounds with electronic fuzes were procured. Surface Launching Unit, Fuel Air Explosive (SLUFAE) reliability, availability, and maintainability (RAM) tests and logistic support concept tests were conducted and showed the system to be sound. Artic and tropic testing on the SLUFAE was completed, and the compilation of the SLUFAE technical data package was initiated. Completed DT II/OT II on SLUFAE in FY 1979 and developed requirement to conduct OT IIA to resolve operational problems with defining the target and ranging to it. 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 protective shelter for troop positions.

2. (U) FY 1980 Program: Conduct OT IIA for the Surface-Launched Unit, Fuel-Air Explosive (SLUFAE) Mine Neutralization System. Continue engineer design tests on the Vehicle-Mounted Road Mine Detector. Continue efforts on protective shelters for troop positions. Initiate ED on protective emplacements for command control facilities and field artillery and aviation units. All necessary experimental work will be performed and the proposed items will be ready for full-scale development.

Program Element: #6.46.12.A
DOD Mission Area: #214 - Mine Warfare

Title: Countermine and Barriers
Budget Activity: #4 - Tactical Programs

3. (U) FY 1981 Planned Program: Type classify SLUFAE. Conduct DT II/OT II on the Vehicle-Mounted Road Mine Detector. Modify the British GIANT VIPER System. Type classify the troop protective shelter. Continue testing additional protective shelters. Initiate production on the blasting agent. Initiate efforts on the Variable-Time Firing Device.

4. (U) FY 1982 Planned Program: Produce and field the SLUFAE. Initiate ED on the portable mine neutralization system (POMINS), the Vehicle Magnetic Signature Duplicator System (VMASIDS), and a variety of critical demolition items.

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

FY 1981 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	30874	32937	41960	29869	19294	295990
	QUANTITIES						
	Infantry Fighting Veh (IFV)						20
	Cavalry Fighting Vehicle						1
D258	Fighting Vehicle Systems (FVS)	30874	32937	41960	29869	19294	295990

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Fighting Vehicle Systems, the Infantry Fighting Vehicle (IFV) and Cavalry Fighting Vehicle (CFV), will provide to the combined arms force an improved armored full-track fighting vehicle which substantially increases the cross-country mobility, firepower, communication, and survivability of the combat infantry and armored reconnaissance squads. Both IFV and CFV provide a two-man turret which mounts the Vehicle Rapid Fire Weapon System (VRFWS), a stabilized, dual-feed 25mm weapon, and a 7.62mm coaxial machine gun. Both configurations mount the Tube-launched Optically Tracked, Wire Guided Missile (TOW) system. The IFV carries a nine-man squad with adaptation for six Firing Port Weapons (FPW). The cavalry fighting vehicle carries a five-man squad with equipment and the same armament as the IFV (less the FPW) to accomplish reconnaissance, security, and economy of force operations. Both IFV/CFV are designed to be compatible with the XM1 Tank System, have an inherent swimming capability, and are air-transportable in the C141 and C5A aircraft.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Funds requested are to support the completion of Development Test (DT) and Operational Test (OT) II; initiate development of Test Measurement and Diagnostic Equipment (TMDE), skill performance aids (SPA) materials, and additional logistics support to permit immediate government assumption of integrated logistics support; integration of ventilated NBC Protective Mask; initiate development of training devices; and apply modification for TOW missile guidance electronics to integrate an improved TOW.

Program Element: #6.46.16.A
DOD Mission Area: #211 - Close Combat

Title: Fighting Vehicle Systems (FVS)
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 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	Apr 80
• Complete Prototype Qualification Test -		
• Government (PQT-G) on IFV	Apr 80	Apr 80
• Initial Operational Capability (IOC)	Oct 82	4QFY82

The Initial Operational Capability (IOC) is three months later because of extended production leadtimes and reduced quantities of production vehicles during initial production buys.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	30874	32937	41960	49163	295990
Funds (as shown in FY 1980 submission)	28875	32979	14437	2657	206978

FY79 - $1999 was provided through below threshold reprograming authority to cover extensions in producibility, engineering, and planning (PEP) contract. By-year increases for FY81-84 are provided: FY81- $27500(+); FY82- $26600(+); FY83- $16900(+); FY84-

Program Element: #6.46.16.A
DOD Mission Area: #211 - Close Combat

Title: Fighting Vehicle Systems (FVS)
Budget Activity: #4 - Tactical Programs

$2100(+). These increases are distributed over these years to cover the following new requirements: accelerated development of test, measurement, and diagnostic equipment (TMDE); validated estimates for Training Device Development; additional logistic requirements and modification of missile guidance electronics for improved TOW; continued development of the Cavalry Fighting Vehicle (CFV) which was funded in a separate Program Element in FY80 and prior years.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Weapons and Tracked Combat Vehicle Procurement, Army:						
Funds (current requirements)	39000	225400	464400	534700	4852600	6116500
Funds (as shown in FY 1980 submission)						
FVS	39000	170400	238600	290900	4745900	5485200
Quantities (current requirements)	0	208*	400	600	8053	9261
Quantities (as shown in FY 1980 submission)	0	208	400	600	8053	9261

The above FY80 Procurement Program combines IFV and CFV under the FVS program.

Budget increases from the FY80 submission shown in the current requirement are due to several factors. The contractors estimates for production were more definitive with updated estimates of increases for material, direct labor, and overhead costs. Actual inflation estimates greatly exceeded the OSD indexes used in previous estimates. The current requirement includes the purchase of a four-year warranty for contractor system responsibility to insure that the vehicles achieve and maintain the required level of performance.

*The Qty 208 was authorized for the FY80 buy; however, due to budget increases discussed above, the exact number is still being negotiated.

Program Element: #6.46.16.A
DOD Mission Area: #211 - Close Combat

Title: Fighting Vehicle Systems (FVS)
Budget Activity: #4 - Tactical Programs

F. DETAILED BACKGROUND AND DESCRIPTION: The Fighting Vehicle System (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 machine gun, 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 and its speed and mobility are compatible with the XM1. The CFV is a modified IFV with minor changes to the basic vehicle and the elimination of the firing port weapons. A unique capability of the IFV and CFV is the all-electric stabilized turret drive which permits the main gun and machine gun to be fired accurately even when the vehicle is moving rapidly over rough cross-country terrain. The 25mm automatic cannon with a range in excess of meters delivers both armor-piercing and high-explosive fire with extreme accuracy. Two TOW antitank missiles are fired from a two-tube, two-position, armored launcher which is attached to the turret weapon station. The TOW can defeat any currently known enemy tank at ranges out to 3,500 meters. A M240, 7.62mm, machine gun is coaxially mounted within the weapon station and supplements the fires of the other weapons.

G. (U) RELATED ACTIVITIES: Program Element (PE) 6.46.17.A, Vehicle Rapid Fire Weapon System (VRFWS), supports the Infantry Fighting Vehicle (IFV) and Cavalry Fighting Vehicle (CFV) program by providing for a 25mm automatic gun for use as a primary weapon on the vehicle. Funds are provided to IFV from Project Manager (PM) General Support Rocket System (GSRS) Program Element 6.33.03.A for development of Fighting Vehicle System GSRS 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.

H. (U) WORK PERFORMED BY: The IFV/CFV engineering development is being conducted by the 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, Culver City, CA. Support, as required, is being performed by the US Army Tank-Automotive Research and Development 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:

1. (U) FY 1979 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 (ED) as the candidate FPW. Prototype Qualification Test-Government (PQT-G) was initiated on 1 October 1975, but when testing revealed uncertainties relative to the transmission, tests were terminated in February 1976. During the remainder of FY 1976, transmission problems were corrected and verified. Prototype Qualification Test-Government (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 requirement. The Task Force recommended a redirection of the program to develop a single fighting vehicle for the infantry and scout roles mounting a two-man turret with a 25mm gun and two-tube TOW launcher. On 3 November 1976, the Secretary of the Army approved the recommendations of the Task Force and the development of a new Fighting Vehicle was begun with the award of the sole-source development by letter contract to FMC Corporation. In January 1977, a Defense Department program budget decision eliminated the one-man turret, 20mm Mechanized Infantry Combat Vehicle (MICV) from FY 1978 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 Prototype Qualification Test-Government (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 as the Fighting Vehicle Systems (FVS) Office with the MICV renamed the Infantry Fighting Vehicle (IFV), XM2, and the MICV/Scout, the Cavalry Fighting Vehicle (CFV) XM3. The PEP contract was awarded in June 1978. Initial TOW firings were successfully conducted in July 1978. A Congressionally directed study, Crizer 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. Prototype Qualification Test-Contractor (PQT-C) consisting of 15,500 miles, 107,700 25mm rounds, and 47 TOW missiles being fired determined that the system was capable of meeting established goals. Prototype Qualification Test-Government (PQT-G) began in July of 1979 on three vehicles, two IFV and one CFV. These vehicles will be driven over 6,000 miles each to demonstrate the vehicles reliability and performance characteristics. 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, will verify the operational capability of the system.

2. (U) FY 1980 Program: Operational testing (OT II) of the IFV with armament was completed in November 1979 at Fort Carson, CO. The final report is scheduled to be published in February, 1980. Development testing (DT II) began in July 1979

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and will continue through April, 1980. Cavalry Fighting Vehicle (CFV) testing is currently scheduled for the February-June 1980 timeframe. The Army System Acquisition Review Council (ASARC III) Milestone was held on 20 December 1979 and a production decision was made. Should the Defense Systems Acquisition Review Council (DSARC III) approve the Army's recommendation for production, a sole source contract will be awarded to FMC Corporation in February 1980 to start procurement. Development efforts will begin this year for Test, Measurement and Diagnostic Equipment (TMDE) and training devices.

3. (U) FY 1981 Planned Program: Engineering development will continue on Test, Measurement, and Diagnostic Equipment (TMDE), skill performance aids (SPA) materials, and additional logistics support to permit immediate government assumption of integrated logistics support; integration of ventilated NBC Protective Mask; development of training devices; and modification for TOW missile guidance electronics to integrate an improved TOW. The FY81 program will include First Article Preproduction testing of three vehicles to verify the TMDE and the integration of improved TOW. First delivery is scheduled for July 1981; First Article Preproduction Test and Initial Production test to be accomplished during February-July 1981. A study of nuclear effects on the IFV/CFV systems will be accomplished to provide a basis for subsequent development of an implementation program.

4. (U) FY 1982 Planned Program: Engineering development will continue on the remaining training devices, TMDE, and other logistics support efforts. Initial operational capability (IOC) for the Continental United States is scheduled for October 1982. Comparison testing will be performed on two vehicles from November 1981 and April 1982 production runs to verify performance and quality standards. Initial eight production testing will be performed with production models during Sept 81 - May 82. Also during this period, skill performance aids (SPAS) validation will be achieved as part of the maintenance evaluation. Study results will form the basis for a nuclear hardening implementation effort.

5. (U) Program to Completion: Development of training devices will be completed in FY84 and production initiated. Development of test, measurement, and diagnostic equipment (TMDE) will be completed in FY84. Implementation of nuclear hardening for the IFV/CFV system will continue through completion, as required.

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J. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation:

a. (U) Developmental testing 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 not cost effective for development in view of its operational shortfalls. Subsequently all resources remaining were applied for the development of the Infantry Fighting Vehicle (IFV) and the Cavalry Fighting Vehicle (CFV). The IFV/CFV test and evaluation program has made maximum use of prior MICV/20mm test data and re-entered the development test program at the DT II milestone. The extensive effort since 1974 on the MICV assured program worth, concept validation sufficient to warrant committing resources to full-scale development.

b. (U) The Development Test II (DT II) began in June 1979 at Aberdeen Proving Ground (APG), MD. DT II will provide the final technical data for determining the IFV/CFV system readiness for transition into either the limited production portion or the full production portion of the production/development phase of the acquisition cycle. Developmental testing will assure that engineering is reasonably complete; that all significant design problems including survivability/vulnerability, producibility, transportability, reliability, availability, maintainability, human factors, and supportability have been identified; that solutions to these problems are at hand; and that all test issues critical to the production decision have been resolved. Critical milestones are listed: DT II starts - 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 complete - Apr 80; Final Report - Jun 80.

c. (U) Two Infantry Fighting Vehicles (IFV) and one Cavalry Fighting Vehicle (CFV) will undergo DT II at APG. Vehicles are to be used as weapon-mounted fighting vehicles as well as troop carriers. Vehicles have two-man turrets which incorporate the 7.62mm Coaxial Machine Gun; the Tube Launched, Optically Tracked, Wire Guided Missile (TOW) and the 25mm Automatic Cannon. Except for minor design changes, the configuration being tested will also be procured. An improved TOW system, 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 DT II and OT II. The improved TOW system will be developmentally tested during First Article Preproduction Testing, and the technical data package will be verified during the vehicle Initial Production Testing (IPT). The designated TMDE will also be evaluated during these tests. The TMDE is comprised of the Manual

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Contact Support Set (MCSS), the Simplified Test Equipment-Transitional (STE-T), and the Direct Support Electrical System Test Set (DSESTS). A complete ILS package will be tested during IPT and also during a logistics follow-on evaluation scheduled for late FY82. One vehicle will be maintained by military personnel; the other two by test site APG personnel. Technical support and spare parts will be provided by contractor personnel. RAM miles to be achieved: 18,000 miles; primary weapon rounds to be fired: 43,000; and TOW missiles to be fired: 79. The system must achieve a minimum acceptable value of 195 mean miles between failure (MMBF). Maintainability standards will require scheduled organizational maintenance and service no more frequently than every six months or 1500 miles. Maximum-time-to-repair requirements for organizational maintenance will not exceed four (4) hours 95% of the time; direct support maintenance will not exceed 12 hours 90% of the time; general support maintenance will not exceed 12 hours 90% of the time in a backup direct support role.

d. (U) The Program Manager, Fighting Vehicle Systems, is BG Philip L. Bolte, assigned Jan 79. The prime contractor is FMC Corporation, San Jose, CA. Some of the major subcontractors include General Electric Corp., Hughes Aircraft Corp., and RCA Corp. The US Army Tank-Automotive Research and Development Command (USATARADCOM) and contractors are preparing qualification test procedures to environmentally test the IFV/CFV and armament. To date, no official test reports have been delivered to the Army by contractors. 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).

e. (U) Results of MICV contractor testing are based on completion of 142,000 RAM (Reliability, Availability and Maintainability) miles and 140,000 rounds of 25mm ammunition fired. Contractor testing on the IFV/CFV subsequent to MICV estimates approximately 4,850 RAM miles traveled; 97,000 rounds of 25mm ammunition fired and 32 TOW missiles fired. Contractor testing revealed only minor deficiencies which were all correctable. Final test results of DT II will be available June-July 1980 depending on test completion. Testing has progressed on schedule with no significant technical problems. All significant Army requirements for vehicle mobility and transportability have essentially been demonstrated in test. Accuracy requirements for the XM242 25mm Automatic Cannon exceeds the stated requirements for all rounds and all rates. Reliability, durability, and maintainability requirements for the XM231 Firing Port Weapon have been demonstrated. Scoring results are tabulated in paragraph 4.

2. (U) Operational Test and Evaluation:

a. (U) An 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) troops 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

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data on the MICV. Operational Test II (OT II) 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 ran until 31 January 1977, at which time a need for additional user training and 20mm gun modifications became apparent due to complexity of the one-man fighting station. As a result of termination of the MICV/20mm gun program in March 1977, this test was cancelled.

b. (U) The Operational Test II (OT II) for the IFV was accomplished during July-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 Gun to the Army System Acquisition Review Council (ASARC III) for consideration in determining a full-scale production decision. The objectives of testing are to provide information on the effectiveness, survivability, RAM (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, will also be 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 DT II are similar but not all have 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 Corp., the prime contractor. Results of OT II were presented to the ASARC III in Dec 79 and the Defense System Acquisition Review Council (DSARC III) in Jan 80. The OT II test report will be available in February 1980.

c. (U) RAM miles achieved in OT II: 8919 mi; primary weapon rounds fired: 30,528; and TOW missiles fired: 39. Preliminary 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 either contractor tests, Development Testing or OT. Critical Firepower requirements were met in tests to include accuracy, reliability, availability, and maintainability. In each performance area, the requirement was either met or exceeded for the 25mm Automatic Cannon, the Firing Port Weapon and the Coaxial Machine Gun. The reliability profile is based on combined DT/OT II goals for the IFV/CFV system. The following discussion summarizes the reliability profile for OT II and the DT II achievement as of OT II completion (26 Nov 79). For Mobility, the reliability goal was 600 mean miles between failure (mmbf), the combined DT/OT II achievement was 594 mmbf; fire power goal - 290 mmbf, achieved - 605 mmbf; The total system reliability requirement was 195 mmbf; achieved was 259 mmbf. These estimates are based on 17,268 RAM miles and 42,179 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 machine gun 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 excessive clamping 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.

3. (U) Other Planned Testing:

a. (U) Production testing will consist of a First Article Preproduction Test (FAPT) program during Feb-Aug 1981 conducted by the contractor and an Initial Production Testing (IPT) during Oct 81 - Jul 82 by the government. The FAPT will employ three (3) hand-built vehicles using soft tooling which will undergo 6000 miles of RAM testing starting in February 1981 to verify the production processes. Three vehicles from the hard-tooled, July 1981 production allotment will undergo 1500 miles of RAM testing to assure that shortcomings discovered during testing of the first 3 vehicles were corrected. The FVS IPT test program will consist of eight (8) vehicles required to verify the quality of materiel when produced according the technical data package and the full production process. Of these vehicles, five (5) vehicles each will undergo 6000 miles of RAM testing starting in September 1981 at APG, two (2) vehicles will be tested to verify specification compliance commencing in October 1981 at APG, and one (1) vehicle will test the winterization kit at the Yuma Proving Grounds (YPG) cold room in September 1981, prior to environmental testing during the 1981-1982 winter season at the Cold Region Test Center (CRTC) Ft. Greely, Alaska. The latter IPT vehicle will be returned to YPG in May 1982 for cooling tests.

b. (U) Comparison testing scheduled during Nov 81 - Apr 82 by TECOM will be performed on two vehicles to verify performance and to insure that production vehicles maintain quality standards throughout production. Each vehicle will be tested for 3000 miles at Aberdeen Proving Grounds. One vehicle will be chosen from the first one hundred vehicles produced, and one from the second one hundred vehicles produced. The Army plans to conduct a Force Development Testing and Experimentation (FDTE) for the CFV during February-June 1980 to assess employment doctrine and tactics. Currently, 4,500 RAM miles, and 10,000 RAM rounds (25mm) have been allocated to CFV testing.

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4. System Characteristics:

OPERATIONAL/TECHNICAL

CHARACTERISTIC	REQUIREMENT	DEMONSTRATED TO DATE	STATUS	WHERE DEMONSTRATED
Reliability (DT/OT II)				
- Mobility (mean miles between failure)	600	594	LOW	PQT-G/OT II
- Firepower (mean miles between failure)	290	605	MET	PQT-G/OT II
- System (Mean miles between failure)	195	259	MET	PQT-G/OT II
Firepower				
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	200	200	MET	PQT-G

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Shots per minute)	[	]		
. Lethal Area -				
- Reliability			MET	PQT-G
. Mean rounds - between stoppage (MRBS)2/	2000	7264	MET	PQT-G
. Mean Rounds between clearable stoppage (MRBCS)3/	500	6226	MET	PQT-G
- Maintainability				
. Mean time to repair -	15min	12min	MET	PQT-G/OTII

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CHARACTERISTIC	REQUIREMENT	DEMONSTRATED TO DATE	STATUS	WHERE DEMONSTRATED
(MTTR)				
. Max time to repair - (MXTTR)	60min	30min	MET	PQT-G/OTII
- Availability	.90	.99	MET	PQT-G/OTII
- Durability (25 min)				
. Barrel life (rds)	4000	5000	MET	PQT-G/OTII
. Receiver Life (rds)	25000	30000	MET	PQT-G/OTII
- APDS-T Ammunition				
. Penetration				PQT-G
. Velocity (M/Sec)	1100	1270	MET	PQT-G
. Tracer Rng (Meters)			LOW1/	PQT-G
- HEIT Ammunition				
. Velocity (m/sec)	1000	1050	MET	PQT-G
. Tracer Rng(meters)			---	PQT-G
b. Firing Port Weapon				
- Sustained Firing Rate (rounds per minute)	60rpm per 5min intervals	MET	PQT-G	
- 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 Between Stoppage	2000	4701	MET	PQT-G/OTII

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(MRBS)[2/]				
• Mean Rounds between failure (MRBF)[4/]	4500	5289	MET	PQT-Q/OTII
- Durability				
• Receiver Life (rds)	10000	Exceeded 10000	MET	PQT-G/OTII

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CHARACTERISTIC	REQUIREMENT	DEMONSTRATED TO DATE	STATUS	WHERE DEMONSTRATED
. Barrel Life (rds)	10000	Exceeded 10000	MET	PQT-G/OTII
Mobility				
- Range (Mi)	300 Mi @ 25mph	325 Mi.	MET	PQT-C
- Acceleration	0-30 mph in 18-22 sec	19.7 sec	MET	PQT-G
- Fwd Speed	40-45 mph	42.5 mph	MET	PQT-G
- Cbt Weight	43-50 mph	42.5 mph	MET	PQT-G
- Reverse Speed	5-10 mph	8.3 mph	MET	PQT-G
- Braking Deceleration	35 feet (from 25 mph)	24 feet	MET	PQT-G
- Ascend Slope	60%	YES	MET	PQT-C
- Min Speed	2.5 mph (2-3 hrs)	YES	MET	PQY-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.
4/ Firing malfunction which requires 20 sec or more to clear for the FPW.

Final DT II Test Report to be published in July 1980.
Final OT II Test Report to be published in February 1980.

FY 1981 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	9695	8767	10401	13141	Continuing	Not Applicable
	QUANTITIES						
D016	Mine Systems	0	800	0	5727	Continuing	Not Applicable
D088	Modular Pack Mine System	5804	4052	9462	7414	1972	33563
D301	Landmine Development (NATO)	195	0	0	0	0	195
D407	Antitank Artillery Mine XM718	240	838	246	0	0	17812
D568	Ground-Emplaced Mine Scattering System Anti-tank/Antipersonnel Mines	3456	3077	693	0	0	41913

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Provides for increased tactical effectiveness and responsiveness of landmines by supporting the development of a family of Scatterable Mines (FASCAM) which can be dispensed rapidly from helicopter and ground dispenser, cannon artillery and rockets, tactical aircraft, and other means which prove cost effective. 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 make 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 1981 RDTE REQUEST: Continue engineering development on the Modular Pack Mine System (MOPMS). Complete antitank artillery mine with production validation following completion of compatibility tests with M198 howitzer. Complete the Ground-Emplaced Mine Scattering System (GEMSS).

Program Element: #6.46.19.A
DOD Mission Area: #214 - Mine Warfare

Title: Landmine Warfare
Budget Activity: #4 - Tactical Programs

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	9695	8767	10401	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	14886	8850	9573	Continuing	Not Applicable

FY81 increase reflects a shift of Modular Pack Mine System (MOPMS) funds from FY 1978 and FY 1979 to FY 1981 causing program delay and increased costs. NATO mine development project (D301) was canceled because of changed requirement. Mine Systems (D016) was not funded in FY79 because of lack of requirement documents. The FY 1980 decrease is the result of a general Congressional reduction.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Ammunition Procurement, Army:						
Funds (current requirements) (Artillery AT mines)	51700	30900	61500	86400	214500	445000
Funds (as shown in FY 1980 submission)	51700	56400	54900	-	89600	268600
Quantities (current requirements) (rounds)	24000	15000	27000	39000	96000	201000
Quantities (as shown in FY 1980 submission)	24000	30000	30000	-	4800	136000

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	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Ammunition Procurement Army:						
Funds (current requirements) (GEMSS XM74/XM75 mines)	0	6700	11800	12600	41600	72700
Funds (as shown in FY 1980 submission)	0	6700	9900	-	56100	72700
Quantities (current requirements) (mines)	0	12000	39000	30000	90000	162000
Quantities (as shown in FY 1980 submission)	0	12000	39000	-	279000	330000
Other Procurement Army:						
Funds (current requirements) (GEMSS dispensers)	0	4900	0	12100	44700	61700
Funds (as shown in FY 1980 submission)	0	4900	20600	-	41200	66700
Quantities (current requirements) (each)	0	12	0	39	184	235
Quantities (as shown in FY 1980 submission)	0	39	92	-	184	315

The decrease in the FY80 procurement request on the artillery-delivered antitank mine system reflects a delay in the award of the FY79-funded procurement. The increase in costs in FY81 reflects cost revisions based on current contracting experience. Changes in the Ground-Emplaced Mine Scattering System profiles allow for continuous dispenser production with late FY80 award and early FY82 award.

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,

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DOD Mission Area: #214 - Mine Warfare Budget Activity: #4 - Tactical Programs

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 is scheduled to complete development and enter production in FY 1980. The Modular Pack Mine System and the Air Force GATOR, an air-delivered system, are well into development and will complete this generation of mass 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, Sommerville, NJ; AAI Corporation, Cockeysville, MD; Chamberlain, Waterloo, IA; Bulova, Valley Stream, Long Island, NY.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Scatterable mine development was initiated in the late 1960's with emphasis on the XM56 helicopter-delivered antitank mine systems and the XM692E1 artillery-delivered antipersonnel mine system. During FY 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

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testing of the Ground-Emplaced 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.

2. (U) FY 1980 Program: Initiate full-scale production on the M718 artillery AT mine and field the system. Complete DT II and type classify the GEMSS and initiate production. Continue GEMSS production. All necessary experimental work will be performed, and proposed system will be ready for full-scale development. Conduct MOPMS Force Development Test and Experimentation with FY 1979 model and adopt design based on test results. Procure first systems engineering development test hardware for MOPMS.

3. (U) FY 1981 Planned Program: Continue GEMSS production. Conduct final Engineering Development tests for MOPMS. Procure long lead Developmental Testing II/Operational Testing II hardware. Initiate development of skill performance aids and technical manuals to support Army Training Programs.

4. (U) FY 1982 Planned Program: Initiate ED on the off-route Antitank Mine System.

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

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

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

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 can be delivered by artillery, ground vehicle, helicopter, and tactical aircraft. This new capability to deliver mines rapidly, once the enemy's intentions are known, acts as an effective combat multiplier. The Modular Pack Mine System (MOPMS) plays a key role in developing FASCAM and can be used independently or in conjunction with other FASCAM systems, natural or manmade obstacles, and conventional mines. MOPMS is being developed 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 two-man portable module with 21 mines which serves as the shipping, storage, and dispensing container. 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 if the mines are not dispensed for use elsewhere, as needed. MOPMS utilizes the baseline FASCAM components, 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 1979 and Prior Accomplishments: Conducted Validation In-Process Review after system concept was demonstrated. Initial prototype hardware was procured, and engineer design test conducted, which showed acceptable patterns from dispenser and accomplishment of prototype electronics. Remote control unit (XM71) was built and subjected to initial engineering tests and proved to be satisfactory.

Project: #D088 Title: Modular Pack Mine System (MOPMS)
Program Element: #6.46.19.A Title: Land Mine Warfare
DOD Mission Area: #214 - Mine Warfare Budget Activity: #4 - Tactical Programs

2. (U) FY 1980 Program: Conduct Force Development Test and experimentation with FY 1979 hardware and adapt design based on test results. Procure first systems engineering development test hardware.

3. (U) FY 1981 Planned Program: Conduct final Engineering Development Tests. Procure long lead Developmental Testing II/Operational Testing II (DT II/OT II) hardware. Initiate development of skill performance aids and technical manuals to support Army Training Programs.

4. (U) FY 1982 Plannned Program: Conduct DT II/OT II.

5. (U) Program to Completion: Type classify standard for Army use and initiate Procurement FY84.

6. (U) Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Validation In-Process Review	1QFY78	1QFY78
Developmental Testing II	3QFY82-2QFY83	4QFY80-3QFY81
Operational Testing II	4QFY82-2QFY83	2QFY81-3QFY81
Developmental Acceptance In-Process Review and Type Classify Standard	3QFY84	4QFY81
Initial Procurement	FY84	FY82

This program has experienced considerable delay because of late receipt of funds and reduction in funding levels, particularly in FY 1979. Further delays were caused by contract difficulties and changes in the scope of work.

Project: #D088 — Title: Modular Pack Mine System (MOPMS)
Program Element: #6.46.19.A — Title: Land Mine Warfare
DOD Mission Area: #214 - Mine Warfare — Budget Activity: #4 - Tactical Programs

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	5804	4052	9462	7414	1972	33563
Funds (as shown in FY 1980 submission)	7421	4100	5572	-	4000	23093
Quantities (current requirements)	Not Applicable					
Quantities (as shown in FY 1980 submission)	none shown					
Other Appropriations						
Ammunition Procurement, Army						
Funds	0	0	0	0	41300	41300
Quantities (rounds)	0	0	0	0	3571	3571

Changes in the RDTE profiles reflect the following: In FY 1981, increased costs are related to prototype design changes and fund decreases in FY79 to fund higher priority Army programs. FY80 decrease is the result of a general Congressional reduction.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.20.A
Title: Tank Systems
DOD Mission Area: #211 - Close Combat
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	78376	49549	51320	14866	101	665087
	QUANTITIES						13
DG20	Tank, XM1	78376	49549	51320	14866	101	665087

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The XM1 is a four man, highly mobile, fully tracked vehicle with significantly improved survivability provided by improved ballistic protection and compartmentalization. The XM1 will mount a large caliber main gun and three complementary armament systems with improved day/night fire control and shoot-on-the-move capabilities. Higher cross-country speeds and faster acceleration provided by a 1500 horsepower turbine engine will make the XM1 tank a more difficult target for opposing ground and air forces. The XM1 is required to counter potential enemy armor threats of the 1980's and 1990's. It will replace the M60-series tanks and become the primary offensive weapon of the Army's combined arms team.

C. BASIS FOR FY 1981 RDTE REQUEST: Development and Operational Test (DT/OT) III will be completed by June 1981 and March 1981 respectively. Results of these tests in conjunction with manpower and logistic supportability and producibility analyses will be the basis for full-production and deployment decisions. The final design configuration for the XM1 initial production model will be established as a result of system maturity growth during DT/OTIII, and a type classification decision will be made in the course of the major milestone decision process.

Program Element: #6.46.20.A
DOD Mission Area: #211 - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
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/June 1981	March/December 1980
Initial Operational Capability (Tank Company)	July 1980	July 1980
Management Review #1	February 1980	Not shown
Management Review #2	July 1980	Not shown
Management Review #3	January 1981	Not shown
Decision to Start Full Production (DSARC IIIA)	June 1981	February 1981
European Operational Capability (Tank Battalion)	—	—
Award Full Production Contract (3rd-year buy)	August 1981	Not shown

DT/OT II dates were adjusted to account for test delays induced due to poor reliability of the XM1 pilot vehicles. DT/OTIII and full-production decision date adjusted to accomplish Office of the Secretary of Defense (OSD) directed testing, and completion of DT/OTIII prior to the Defense Systems Acquisition Review Council IIIa, i.e., the full-production and deployment decision points. Management Reviews 1-3 were established by OSD to decide on second and subsequent year production rates based on demonstrated XM1 mission reliability and power-train durability growth.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

Program Element: #6.46.20.A
DOD Mission Area: #211 - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	78376	49549	51320	14967	665087
Funds (as shown in FY 1980 submission)	78376	31569	2511	200	583508

Increases in requirements over those previously reported result from: FY80, increased by Congress for additional development, test and evaluation efforts to demonstrate XM1 mission reliability and power-train durability growth; FY81, increased scope of test and evaluation program to demonstrate XM1 maturity prior to full-production decision as well as support development of general-support maintenance capability and a conduct of fire trainer for the XM1; and FY82 final expenses associated with reliability growth and evaluation as well as refurbishment of DT/OTIII tanks to ready-for-issue condition.

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Title: Tank Systems
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E. (U) OTHER APPROPRIATION FUNDS: ($ in thousands)

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Weapons and Tracked Combat Vehicles Procurement:						
Funds (current requirements)	394600	713900	1100300	1078500	7936700	11404700
Funds (as shown in FY 1980 submission)	385300	679700	1060100	-	7739000	10044800
Quantities (current requirements)	110	352	569	720	5307	7058
Quantities (as shown in FY 1980 submission)	110	352	591	-	6005	7058
Military Construction, Army:						
Funds (current requirements)	-	5800	-	-	2500	8300
Funds (as shown in FY 1980 submission)	-	5800	-	-	-	5800

Increase in FY79 represents $4.9 million reprogramming into initial spares and $4.4 million reprogramming from XM1 training equipment to vehicle procurement; FY80 increase due to Congressional plus up of spares line; difference in FY81 and additional cost to completion due to re-evaluation/estimate of procurement costs. Decrease in the FY 1981 quantity due to overall Army budget affordability. Military construction funds in FY 1984 (additional to completion) provide for instructional facilities for the XM1 tank at Fort Knox, KY.

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 tank forces of the Warsaw Pact by reproducing a qualititatively superior tank for use as the primary weapons systems in a highly mobile, sustainable, combined arms force. The XM1 will be superior in the areas of survivability, firepower, and mobility and hence will provide 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. The XM1 silhouette is reduced and fuel and ammunition are compartmentalized to reduce vulnerability to antitank fire. Improved fire power will be provided initially by a 105 millimeter (mm) gun and subsequently (planned 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 program was approved on 18 January 1973 and contracts awarded to General Motors and Chrysler on 28 June 1973 for the competitive Validation Phase of the XM1 program. Competitive evaluation of the two prototypes was completed on schedule (July 1976); however, the Defense Systems Acquisition Review Council (DSARC) decision on the selection of a single Full-Scale Engineering Development (FSED) contractor was delayed 120 days until a resolicitation, considering a standardized version of the XM1, could be evaluated. Testing of the LEOPARD 2 (Americanized Version (AV)) tank in accordance with the December 1974 United States/German Memorandum of Understanding (MOU) on harmonization of Main Battle Tanks was initiated on 10 September 1976 and completed in mid-December 1976. The DSARC met on 10 and 11 November 1976 and selected Chrysler Corporation for the fabrication and delivery of eleven pilot vehicles to be used during Development Test/Operational Test (DT/OT) II. The FSED contract was awarded on 12 November 1976. In January 1977, an Addition to the Addendum to the MOU was signed which limited technical evaluation of the LEOPARD 2 (AV) to consideration of selective subsystems/components for standardization/interoperability. The eleven Chrysler XM1 pilot vehicles were delivered to the Army starting in February 1978 for use in DT/OT II.

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 battle tank in a high intensity environment for subsequent operations ashore. Related and nonduplicatory Army activities being conducted are as follows: Program Element (PE) 6.46.30.A, Tank Gun Cooperative Development; and 2.35.37.A, Combat Vehicle Improvement Program.

H. (U) WORK PERFORMED BY: The prime contractor for the XM1 is Chrysler Corporation, 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 Research and Development Command, Warren, MI; the US Army Armament Research and Development Command, Dover, NJ; and the Ballistics Research Laboratory, Aberdeen Proving Ground, MD.

Program Element: #6.46.20.A
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Title: Tank Systems
Budget Activity: #4 - Tactical Programs

1. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Evaluation and selection in November 1976 of Chrysler Corporation to produce the XM1 Full-Scale-Engineering-Development pilot vehicle included competitive parametric design and cost effectiveness studies, trade-off analysis to optimize vehicle configuration, fabrication of prototype vehicles and test rigs for government competitive evaluation, develop and evaluation of manufacturing techniques for hulls and turrets, and training-device feasibility studies. Evaluation of the LEOPARD 2 (Americanized Version) resulted in the conclusion that the tank did not that the tank did not meet all US requirements. In accordance with the January 1977 addition to the addendum to the US-German Memorandum of Understanding, both countries agreed to pursue standardization of selected components. Fabrication of eleven pilot vehicles and ballistic test sections started in FY 1977, and the first pilot vehicle was delivered to the Army in early February 1978. Deliveries were completed in July 1978 with the pilot tanks being used for Development and Operational Test II (DT/OTII). By end July 1978, evaluation of the XM1s performance resulted in the identification of a number of shortfalls principally involving the air induction system, hydraulic and fuel management/scheduling systems; engine; and track and suspension system. These shortfalls manifested themselves in the demonstration of unsatisfactory mission reliability and power train durability during the test phases. Actions to correct the shortfalls caused the completion of OTII to be delayed from December 1978 to 2 February 1979 and DTII from July to 15 September 1979. The XM1 Defense Systems Acquisition Review Council (DSARC) III was held on 17 April 1979, and in its decision memorandum dated 8 May 1979, the Army was authorized to proceed with the first production-year buy of 110 XM1's, the majority of which will be used for DT/OTIII. In addition, the Army was directed to conduct further contractor and government tests to demonstrate reliability/durability growth in the interim between DSARC III and DSARC IIIa (June 1981). Results of these tests will be reviewed at a series of Management Reviews (#1, February 1980; #2, July 1980; #3, January 1981) and will be the basis for decisions regarding second and subsequent year production rates. Contractor and Government testing in response to the first Management Review began in June 1979 at AVCO-Lycoming engine laboratories, Stratford, CT, and Fort Knox, KY, respectively.

2. (U) FY 1980 Program: Major efforts will focus on development and evaluation of XM1 system reliability and power train durability growth, preparations leading to the start of Development Test (DT) III (March 1980) and Operational Test (OT) III (June 1980), and successful demonstration of XM1 production-model maturity in the course of both test programs. Contractor engine maturity development, to include durability testing of both Full-Scale Engineering Development (FSED) and Long Rate Initial Production (LRIP) versions of the AGT-1500 turbine engine, will be completed with results of the FSED tests reported at Management Review (MR) #1 and LRIP results at MR#2. Government tests of the refurbished XM1 through 6000 miles may be completed by MR#1. Concurrent with these tests, Government and contractor preparations for DT/OTIII continue. The first two of 72

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LRIP XM1s will be delivered in support of the test program in February 1980 with final deliveries for test purposes occurring in November 1980. The remainder of the 110 first-year-buy XM1s will be used for training. DT/OTIII will continue into FY 1981.

3. (U) FY 1981 Planned Program: Development and Operational Tests (DT/OT) III will be completed during the fiscal year (DT III in June 1981 and OT III in March 1981). The results of these tests, in conjunction with operational effectiveness, costs, and manpower and logistics analyses will provide the basis for Army recommendations on XM1 full-production and deployment to the Defense Systems Acquisition Review Council (DSARC) IIIa in June 1981. Type classification STANDARD will be accomplished in the course of the Army Systems Acquisition Review Council IIIa process. Management Review #3 will be held in January 1981 to evaluate interim progress in XM1 mission reliability and power-train durability growth leading to the final developmental requirements to be reviewed at DSARC IIIa. Other major XM1 programs to be accomplished are: developmental efforts to achieve further Reliability, Availability, Maintainability, and Durability (RAM-D) enhancements; final maturation of organizational and direct-support test sets for the XM1 tank; development of a general support level diagnostic, repair and checkout capability for the AGT-1500 turbine engine and electronic printed circuit-boards used in the XM1; and concluding developmental efforts on the Unit-Conduct of Fire Trainer.

4. (U) FY 1982 Planned Program: Final developmental RAM-D efforts and close-out actions resulting from DT/OTIII, e.g., refurbishment of DT/OTIII tanks to a condition ready for re-issue to gaining units, will be accomplished during this period.

5. (U) Program to Completion: FY 1983 will mark the final year of engineering development funding in support of the initial production model XM1 tank. Funds in this fiscal year will support any engineering design actions arising in the course of issuing production model XM1's to troop units (Project Handoff).

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J. (U) TEST AND EVALUATION DATA:

1. (U) Development Test and Evaluation: Development Test (DT) II was conducted by the US Army Test and Evaluation Command with independent evaluation performed by the US Army Materiel Systems Analysis Activity. DT II started in February 1978 with a physical teardown and maintenance evaluation of the first pilot and was completed on 15 September 1979. Developmental testing involved all eleven Full-Scale Engineering Development pilot tanks and one ballistic hull and turret and was performed at Aberdeen Proving Ground, MD; Yuma Proving Ground, AZ; and White Sands Missile Range (WSMR), NM. A follow-on cold room test was performed at Eglin Air Force Base, FL, in September and October 1979. The objectives of the test program were to determine the degree to which the XM1 meets its Materiel Need (Engineering Development) and/or system specification requirements, to assess performance of the pilot tank in relation to the baseline tank, the M60A1 (Reliability Improved Selected Equipment (RISE)), and to demonstrate that full-scale engineering is reasonably complete and that solutions to all significant design problems are in hand. Interim data and results of the test program were used by the Army and Department of Defense Systems Acquisition Review Councils (ASARC/DSARC III) (17 April 1979) to make a decision concerning initial production of the 105mm gun XM1 tank, as well as by the Army and Chrysler Corporation to assess the degree to which the tank reached the required state of design maturity. DT II and Operational Test (OT) II resulted in the demonstration that most performance objectives were being met, e.g., a 100% improvement in survivability over the M60 series tanks and a significant improvement in fire control over the M60A1 tank. Notable exceptions were design shortfalls principally involving the air induction, hydraulic and fuel management/scheduling systems; engine; track and suspension; and selected fire control components. Modifications to correct the shortcomings noted in the DT II vehicles were first applied in September-October 1978 and periodically thereafter commensurate with vehicle availability, the data collection process, and the validation of specific fixes. Validation of a number of the fixes resulted in the assessment by the XM1 Aggregation Conference (for Reliability, Availability, Maintainability, and Durability assessment) by the time of the Army's Systems Acquisition Review Council (ASARC) III meeting (22 March 1979) that the XM1 demonstrated a mission reliability of 145 Mean Miles Between Failure (MMBF) against the intermediate objective of 216 MMBF (end DT/OT II requirement of 272 MMBF). Based on these results, the Army initiated actions to extend and modify DT II and to conduct operational mission profile testing of three of the XM1 pilot tanks at Fort Knox. Subsequently, in its Department of Defense Systems Acquisition Review Council III (DSARC III) decision memorandum, the Office of the Secretary of Defense directed that a series of interim milestones and management review points be established to monitor reliability-durability growth resulting from contractor and government test programs to be accomplished prior to DSARC IIIA. The results of these test programs are to be presented at management reviews and will be the basis for decisions regarding second and subsequent year production of the XM1 tank. The objective of the revised development test effort is to assure that XM1 reliability-durability growth is progressing satisfactorily to achieve XM1 requirements. As of 19 December 1979,

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approximately 91,000 miles of government and contractor engineering development testing had been accrued. Cold climate testing of the XM1 has been scheduled for the winter of 1980-1981 at the Cold Regions Test Center, Fort Greely, Alaska. Tropic testing will be accomplished in conjunction with 120mm gun XM1 testing in FY 1982-1983. The XM1 pilot vehicle differs from the prototype tested during the Validation Phase in that it incorporates provisions for standardization of selected components between the XM1 and Leopard 2 in accordance with the 1976 Addendum to the 1974 United States/Germany Memorandum of Understanding, as well as changes resulting from lessons learned during Development Test 1/Operational Test 1 (DT 1/OT I). The standardization effort has as one of its major objectives, commonality of logistical support for such items as the gun and ammunition, track, engine, transmission, and fuel. Comments on past and future XM1 development test systems follow:

a. (U) Prior Development Testing: Phase 1 of Development Test I (DT I) was conducted by the US Army Test and Evaluation Command (TECOM) at Aberdeen Proving Ground, MD, during the period 2 February-30 April 1976 to resolve critical development issues and provide data for selection of either the Chrysler or General Motors XM1 prototype vehicle and the decision to enter Full-Scale Engineering Development (FSED). Testing of US prototypes was completed on schedule with both vehicles having successfully demonstrated the ability of meeting or exceeding all 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 period to consider incorporation of standardized components in accordance with the 28 July 1976 Addendum to the Memorandum of Understanding (MOU) with the Federal Republic of Germany. On 12 November 1976, the Source Selection Authority announced selection of Chrysler Corporation for the FSED contract. Phase II of Development Test I, testing of the Leopard 2 (Americanized Version), began on 10 September 1976 and was completed in mid-December 1976. The Leopard 2 (Americanized Version) did not meet all XM1 requirements. The performance of all candidate systems was evaluated against the performance of the baseline vehicle, the M60A1 with Add-On Stabilization (AOS). In the January 1977 Addition to the July 1976 Addendum to the MOU, the US and Germany agreed not to pursue competition on a total tank basis but rather, to limit interoperability/standardization efforts to subsystems/components only.

b. (U) Current and Planned Testing: Per Army Systems Acquisition Review Council III (ASARC III) decision and Office of the Secretary of Defense direction, AVCO Lycoming was contracted to run additional engine durability testing. AVCO Lycoming completed in January 1980 1,000 hours of durability and mission profile laboratory testing on each of two FSED engines with production modifications. The results are to be reported at Management Review (MR) #1 in early February 1980. The same tests will be run on two production engines with results reported to the Office of the Secretary of Defense when testing is complete. Development test (DT) III is scheduled to be conducted during the period March 1980 to June 1981 by the US Army Test and Evaluation Command (TECOM) at Aberdeen Proving Ground, MD; Yuma Proving Ground, AZ; White Sands Missile Range, NM; and the Cold

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Budget Activity: #4 - Tactical Programs

Regions Test Center, Ft. Greely, AK. The test program will provide information for assessments of contract compliance and quality assurance of production XM1's. Specific objectives of the program are: verification that problems identified in Development Test (DT) II and Operational Test (OT) II and the interim test program have been corrected; completion of planned testing not accomplished in DT II; demonstration of the environmental capability of the XM1, less tropic regions, which will be verified during the 120mm gun XM1 test phase; verification that the production model XM1 meets or exceeds the performance specifications for survivability, firepower, mobility, and fightability demonstrated by the pilot model XM1; demonstration of continued Reliability, Availability, Maintainability, and Durability (RAM-D) growth of the XM1; and determination of the adequacy of the planned logistic support concept for the XM1 in the field. The Unit Conduct of Fire Trainer (U-COFT) will undergo suitability testing in FY 1981. Other trainers, (maintenance and driver), are scheduled to undergo suitability testing at either Aberdeen Proving Ground, MD (maintenance trainers), or Fort Knox, KY (driver trainer), in late FY 1980. The results of these tests will be the bases for production decisions for these devices. During XM1 DT/OT III, organization and direct-support level test sets will be in prototype configuration and will be evaluated for suitability for production at that time.

2. (U) Operational Test and Evaluation: Operational Test (OT) II was conducted by the US Army Operational Test and Evaluation Agency (OTEA) at Fort Bliss, TX. Test tank crews and support personnel were provided by the 3d Armored Cavalry Regiment. OT II started in May 1978 and was completed on 2 February 1979. The objective of the test program was to provide data and associated analysis of the operational effectiveness and suitability of the XM1 to the Army and Defense Systems Acquisition Review Councils III (ASARC III and DSARC III). Test objectives were to assess operational capabilities of the XM1 in regard to firepower; fightability; survivability; mobility; and Reliability, Availability, Maintainability, and Durability (RAM-D). OTEA assessed the XM1 as 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 the M60A1. 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 (DT) II 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 through testing of the three refurbished Full-Scale Engineering Development (FSED) tanks at Ft. Knox, KY. For example, during DT/OT II, the thirteen most significant failure modes caused 138 or 73% of the total mobility system failures experienced. During the Ft Knox test, only 14 failures had recurred in seven of the failure modes.

Program Element: #6.46.20.A
DOD Mission Area: #211 - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

a. (U) Prior Operational Testing: Phase I of Operational Test (OT) I was conducted by the Operational Test and Evaluation Agency (OTEA), Aberdeen Proving Ground, MD, during April 1976. This test was a combined development and operational test using one prototype vehicle and one automotive test rig from each contractor (Chrysler and General Motors), and employed six typical user tank crews. Both candidates met the operational effectiveness objectives required at this stage of development, and nothing was noted during OT I which would preclude entry into engineering development. Phase II of OT I, testing of the Leopard 2 (Americanized version) prototype, was completed in December 1976 at Aberdeen Proving Ground, MD, by OTEA against the same test criteria used to evaluate the US competitive candidates. As a result of this test the Army concluded that the XM1 best met Army requirements for a main battle tank.

b. (U) Current and Planned Testing: Testing of three refurbished XM1's started in mid-June 1979 at Ft Knox, KY, under the direction of the Operational Test and Evaluation Agency (OTEA). The test is being conducted by the US Army Armor and Engineer Board with troops provided by Company H, 2d Squadron, 6th Cavalry. The purpose of this test is to validate a number of mobility-related fixes and demonstrate XM1 mission reliability and durability growth. By 16 October 1979 each tank had completed approximately 4000 miles of testing following the modified OT II mission profile of one round fired per fifty miles. Results of the complete test phase will be reported to the Office of the Secretary of Defense at Management Review #1 to be held in early February 1980. Based on the Fort Knox test experience, additional modifications were applied to the XM1's and an additional 2000 miles of testing was conducted from 2 November to 19 December 1979. Assessments of reliability/durability growth resulting from this second test phase will be reported at MR#1 in early February, if analysis is complete by that time. Otherwise, the report will be made once the analysis is completed. Operational Test III will be managed by OTEA, and OTEA will provide an independent evaluation of the outcome to the Army Systems Acquisition Review Council IIIa in May 1981. The test will be conducted at two locations, Ft Knox, KY, and Ft Hood, TX. The Ft Knox test, a 2500-mile operational mission profile test of five production model tanks, will be conducted by the US Army Armor and Engineer Board and run by Company H, 2d Squadron, 6th Cavalry. The data collected will be used to assess reliability growth, availability, maintainability, durability, and fightability. Results of this test phase will be reported to the Office of the Secretary of Defense at MR#3 in January 1981. The Ft Hood phase of OT III will be conducted by the US Army Training and Doctrine Command Combined Arms Test Activity (TCATA) at Ft Hood, TX, during the period June 1980 through March 1981. This will be a battalion-level test utilizing troops from Fort Hood armored units equipped with production model XM1 tanks. The test will obtain data to support assessments of: the operational capability of the XM1 tank in a unit environment; reliability, availability, maintainability, and durability growth; and integrated logistic support. Data and analyses will support a full-production decision scheduled for June 1981.

Program Element: #6.46.20.A
DOD Mission Area: #211 - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

3. (U) Systems Characteristics:

Operational/Technical Characteristics	Objectives[1/]	Demonstrated Performance[2/]
Acceleration (hard surface, 0 degree slope, 0 to 20mph) (sec)	6-9	5.8
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
Width (inches)	120-144	144.25
Stowed ammunition (main gun rounds)	55-65	55
Reliability (Mean Miles Between Failure-MMBF)		
ASARC/DSARC III	216 (goal)	145
Management Review #1	272/200[3/]	299[4/]
Management Review #2	272/220[3/]	
Management Review #3	280/250[3/]	
End DT/OT III	320/300[3/]	
Power Train Durability (Probability of achieving 4000 miles)		
ASARC/DSARC III	.4 (goal)	.2
Management Review #1	.5/3[3/]	.44[4/]
Management Review #2	.5/.3[3/]	
Management Review #3	.5/.3[3/]	
End DT/OT III	.5/5000 miles (goal)/.5[3/]	
Maintenance ratio (maintenance/man-hours/ operational hours)	1.25	1.6-1.9

Program Element: #6.46.20.A
DOD Mission Area: #211 - Close Combat

Title: Tank Systems
Budget Activity: #4 - Tactical Programs

1/ End Development/Operational Test (DT/OT) III objectives.
2/ Partial DT/OT II results.
3/ Values reflect Office of the Secretary of Defense requirements/thresholds.
4/ Result of Ft Knox mission-reliability/power-train-durability test.

FY 1981 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 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	14982	7036	6035	3349	2051	157296
D073	COPPERHEAD	14982	7108	6035	3349	2051	157296

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 the target which has been illuminated by a forward observer using a laser designator. This projectile is required to 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 will significantly improve the Army's antitank capability within the existing force structure.

C. BASIS FOR FY 1981 RDTE REQUEST: The final design-to-unit production cost (DTUPC) award fee will be provided to the contractor. A warhead product-improvement effort will be initiated to insure the warhead remains capable of defeating the projected future threat. This program will include design selection and initial confirmatory tests. The Naval Avionics Center will complete the technical data package validation effort.

Program Element: #6.46.21.A
DOD Mission Area: #212 - Fire Support

Title: COPPERHEAD (Cannon-Launched Guided Projectile)
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 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	Sep 79
Initial Operational Capability (IOC)	-	Apr 81

The change in milestone dates resulted from delay in completing DT II and increased lead time for materials which forced a change in IOC.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	14982	7036	6035	5400	157296
Funds (as shown in FY 1980 submission)	12983	7108	8000	0	148508

FY81 funds were reduced as there is no longer a requirement to conduct development test/operational test III following production as Army System Acquisition Review Council (ASARC) approved full scale production. Additional funds are required in FY81 through FY83 for a product improvement of the warhead to insure the projectile remains capable of defeating projected future threats. FY 1979 funds were increased to cover program cost growth resulting from technical problems. The FY80 funding level decreased as a result of a general Congressional reduction.

Program Element: #6.46.21.A
DOD Mission Area: #212 - Fire Support

Title: COPPERHEAD (Cannon-Launched Guided Projectile)
Budget Activity: #4 - Tactical Programs

E. OTHER APPROPRIATION FUND: ($ in thousands)

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
Ammunition Procurement, Army						
Funds (current Requirements)	23100	66300	121000	103800		
Funds (as shown in FY 1980 submission)	18200	66200	128500	Not Shown	990800	1225500
Quantities (current requirements)	0	2100	4300	3900		
Quantities (as shown in FY 1980 submission)	0	4000	7000	Not Shown	99236	110236

FY 1979 funds were increased to conduct prove-out of the initial production line facility. FY 1981 funds were decreased consistent with the reduced quantity. Funds required for completion and total cost are based on reduced quantity authorized for procurement. Reduction in FY 1980-FY 1982 quantities reflects a slower build-up in monthly production rate. *Total quantity* shown results from the Defense System Acquisition Review Council (DSARC) decision.

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 17 kilometers and carries a shaped charge warhead that can penetrate 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 6.43.08A 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 1979 and Prior Accomplishments: The COPPERHEAD program began in 1971 with $1.6 million emergency funds to conduct in-house systems studies. Semiactive 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 demostration. 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, and approval to enter engineering development was received. The Engineering Development (ED) contract was awarded to the Martin Marietta Corporation in July 1975 based on the results of the competitive advanced development phase. The FY 197T 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 Vechicle (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.

2. (U) FY 1980 Program: A Defense Systems Acquisition Review Council (DSARC) met in November 1979 and approved the Army's recommendation to initiate production. The Engineering Development (ED) contract is planned for completion in the 2nd quarter. A program to redesign the container which will better attenuate shock and vibration effects will be completed. The technical data package validation effort will be completed. The production facility will be completed and 20 complete rounds will be fabricated during the 4th quarter.

3. (U) FY 1981 Planned Program: A warhead improvement program will be initiated to insure the COPPERHEAD remains capable of defeating the projected threat. Additional RDTE funding is required to support final design-to-unit production cost (DTUPC) award fee requirements. Completion of Copperhead targeting logic to include generation of the data for programming fire direction computers.

4. (U) FY 1982 Planned Program: Continuation of the warhead product improvement effort to include completion of confirmatory tests, commencement of safety tests and pre-production studies.

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 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. A competitive feasibility demonstration of the Martin Marietta and Texas Instruments advanced development (AD) versions of the COPPERHEAD was completed in April 1975, and 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). The Naval Surface Weapons Laboratory, Dahlgren, Virginia, also entered the competition in the AD program by saboting the Navy 5-Inch projectile to 155mm. The Navy version achieved two target hits of twelve rounds fired between December 1974 and July 1976. Prototype Qualification Test 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 April 1977 and October 1979. In July 1978, DT testing was delayed when it became necessary to incorporate design changes into the projectile to improve 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 include 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, and firing table data determined. 168 rounds were fired during the DT II firing program which was completed in October 1979. During severe environmental qualification firings, the projectile reliability was lower than desired. Design changes were identified and a limited number of projectiles were reworked in August 1979 to incorporate new design fixes. These projectiles were fired in September and October 1979, and resulted in a significant improvement in reliability. Overall reliability achieved during DT II was 0.66 which is consistent with the desired

reliability level. The projectile effectiveness and single shot kill probability met or exceeded the required value as shown in paragraph three below. A technical data package suitable for production was provided to the project manager which included the final design configurations.

c. (U) Future testing includes initial production facilitization testing in August 1980, and first article testing and production validation testing beginning in the second quarter FY 1981. The DSARC III decision approved production of the COPPERHEAD projectile at a rate not to exceed 200 units per month until a reliability of 0.80 has been demonstrated which is within the Army's planned reliability growth during initial production.

2. (U) Operational Test and Evaluation:

a. 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. 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 Field Artillery School. OT II consisted of two phases. The nonfire phase was conducted under conditions of day, night using night sight, and night using illumination rounds. Laser designator operators were evaluated in their ability to properly utilize the COPPERHEAD guided projectile. Acquisition, tracking, engagement, training, and command-control-communications were addressed. 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, [ ] rounds hit the target.

b. (U) The test unit 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 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 will be conducted in 1982 utilizing production projectiles. The test will be conducted with an active duty unit equipped with the fire control devices such as battery computer system (BCS) that will be in the field when COPPERHEAD is fielded.

Program Element: #6.46.21.A
DOD Mission Area: #212 - Fire Support

Title: COPPERHEAD (Cannon-Launched Guided Projectile)
Budget Activity: #4 - Tactical Programs

3. System Characteristics:

Operational/Technical Characteristics	Objectives	Demonstrated Performance
Weight (pounds)	150	137
Length (inches)	54	54
Accuracy (CEP-ft)		
Range (km)		
Maximum	16-24	16
Minimum	1.5-3.0	3.1
Single Shot Kill Probability		
Lethality (Probability of a kill given a hit)		

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.23.A
DOD Mission Area: #211 - Close Combat

Title: Improved Light Antitank Weapon (VIPER)
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	8281	18100	5772	0	0	57913
	QUANTITIES						*
D072	VIPER	8281	18100	5772	0	0	57913

*Tactical Round 2250
Training Round 1500
Bullet Tracer 2000

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The VIPER system is a short-range manportable, lightweight antitank rocket weapon which consists of a tactical round and a training kit. The VIPER Tactical System will replace the current M72A2 Light Antitank Weapon (LAW) providing a higher hit probability, greater lethality, longer effective range, and increased reliability. The tactical round consists of a free-flight, in-tube, burning rocket, which is packaged and sealed in an expendable launcher that serves as a tactical storage container. VIPER will also supplement DRAGON and TOW systems. Despite the high hit and kill capability of the TOW and DRAGON, some enemy tanks will survive and provide a continued threat to the combined arms team. VIPER is required to counter this threat. The primary VIPER target is the tank; however, it will also have limited capability against secondary targets such as wheeled and tracked vehicles, bunkers, field fortifications, crew-served weapon positions, and targets in built-up areas. LAW does not have the capability to engage and defeat the advanced heavy armored tanks presently used by the Warsaw Pact nations. With twice the range and velocity of the shoulder-fired light antitank weapon (LAW), VIPER has a much greater probability of defeating the Warsaw Pact vehicles. These characteristics provide the individual soldier with a greater degree of survivability when confronted with armored vehicles.

Program Element: #6.46.23.A
DOD Mission Area: #211 - Close Combat

Title: Improved Light Antitank Weapon (VIPER)
Budget Activity: #4 - Tactical Programs

C. BASIS FOR FY 1981 RDTE REQUEST: The following tasks are to be accomplished: Complete the Prototype Qualification Test and for man firing the VIPER system; conduct a special in process review (IPR) to obtain limited production approval; conduct Operational Test II (OT II) and correct any resultings problems; validate the Technical Data Package (TDP); conduct Development Acceptance In-Process Review (DEVA IPR) and and complete producibility engineering and planning effort.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Begin Prototype Qualification Testing	4th Qtr FY80	Not Shown
Type Classification Limited Production		Not Shown
Begin Operational Test (OT) II	1st Qtr FY81	2d Qtr FY79
Complete OT II	2d Qtr FY81	3d Qtr FY79
DEVA IPR (Type Classification Standard)		

The differences in the milestone dates are the result of the program slip required to encountered during development testing. Two safety deficiencies were noted: noise level and fin transfer (large-to-small launch tube) less severe technical problems were encountered and are associated with warhead reliability and moisture intrusion.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	8281	18100	5772	0	57913
Funds (as shown in FY 1980 submission)	6283	3000	0	0	31519

Program Element: #6.46.23.A
DOD Mission Area: #211 - Close Combat

Title: Improved Light Antitank Weapon (VIPER)
Budget Activity: #4 - Tactical Programs

The total estimated cost increase over the estimate as shown in FY 1980 RDTE Congressional Descriptive Summary was due to techical difficulties (two safety deficiencies: noise level exceeding requirements and fin transfer (large-to-small launch tube) encountered in engineering development testing in FY 1979. The problems required engineering redesign, additional test quantities and tests to validate solutions in FY 1980. The $5.746 million required in FY 1981 is attributable to some of the efforts (production qualification testing, Operational Testing II, technical data package validation, and development approval in-process review) planned for FY 1979/1980 to be conducted in FY 1981.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Procurement (Ammunition Army Activity I, Ammunition)						
Funds (current requirements)						
Tactical Round	-	14000	60000	110800		184800
Training Round	-	2500	16300	22900		41700
Bullet Tracer	-	1100	5500	7200		13800
Production Base Facilities	-	-	-	-		25000
Funds (as shown in FY 1980 submission)	-	51400	60600	-		-
Quantities (current requirements)						
Tactical Round	-	13	122	273		
Training Round	-	40	405	609		-
Bullet Tracer Trainer	-	700	5600	8400		-
Quantities (as shown in FY 1980 submission)						
Tactical Round	-	91	1224	-		-
Training Round	-	475	1224	-		-
Bullet Tracer Trainer	-	-	-	-		-

Program Element: #6.46.23.A
DOD Mission Area: #211 - Close Combat

Title: Improved Light Antitank Weapon (VIPER)
Budget Activity: #4 - Tactical Programs

The differences in the RDTE funding profiles are attributed to technical difficulties encountered during engineering development testing in FY 1979. Two safety deficiencies were noted: noise and fin transfer (large-to-small launch tube). These must be corrected, as well as less severe technical problems pertinent to warhead reliability. The $18.1 million for FY 1980 is to support the efforts required to solve the difficulties to enable initial procurement.

Program Element: #6.46.23.A
DOD Mission Area: #211 - Close Combat

Title: Improved Light Antitank Weapon (VIPER)
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The objective of this program is to develop a low cost, lightweight, antitank weapon system to be used by the individual soldier for his protection from attacks by heavy tanks and armored vehicles. The VIPER will be a replacement for the currently fielded M72A2 Lightweight Antitank Weapon (LAW) System which was first fielded in 1962. The weapon, packaged and issued as a round of ammunition, is designed to be maintenance-free, capable of being stored for extended periods of time without significant loss of reliability, and relatively impervious to worldwide environmental conditions. The rocket consists of a propulsion unit which includes a motor case, nozzle/fin assembly, propellant grain, and igniter/closure assembly, a warhead unit which includes a precision cone, shaped explosive charge, a point initiating element, a base detonating fuze element, and a two-conductor cable connecting the point initiating element to the base detonating fuze element. The lightweight, telescoping, single-shot, throw-away launcher consists of an inner tube, outer tube, tube locking device, mechanical sight, firing mechanism, safety interlock, closures, shoulder stop, and carry sling. Increase in weapon performance will not significantly change the mission and/or operational use from that of the LAW system. No significant logistical or organizational changes are required to accommodate the VIPER.

G. (U) RELATED ACTIVITIES: The Army VIPER system is unique. However, the Navy is involved with a development program for a shoulder-fired assault weapon to fulfill a requirement for military operations in urban terrain. This system has progressed to the advanced development stage. A special hard target assault weapon is being developed in this technology area for a different mission and independent of the VIPER anti-tank weapon. This weapon is being developed to defeat bunkers and structure breeching. These two weapons are being designed to make maximum use of developed VIPER components to allow for economical production.

H. (U) WORK PERFORMED BY: The VIPER Advanced Development program was conducted in-house at the United States Army Missile Command, Huntsville, AL, with the support of Walter Reed Institute of Research, Washington, DC; Harry Diamond Laboratories, Adelphi, MD; Watervliet Arsenal, Watervliet, NY; and US Army Research and Development Command, Dover, NJ. The VIPER Project Office, United States (US) Missile Command located in Huntsville, AL, is managing the program. The prime contractor for Engineering Development is General Dynamics Corporation, Pomona, CA. Major subcontractors are: Atlantic Research Corporation, Gainsville, VA; Brunswick Corporation, Lincoln, NB; and Bulova Watch Company, Valley Stream, NY. Additionally, the Iowa Army Ammunition Plant, Burlington, IA, is loading and assembling the warhead and assembling the complete round.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: The Engineering Development contract was awarded to General Dynamics Corporation in February 1976. Technology from the in-house Advance Development program was transferred to the contractor and the initial Engineering Design flight test (EDT-C) was conducted in November 1976. Technical roblems (accuracy, dudding, and

Program Element: #6.46.23.A
DOD Mission Area: #211 - Close Combat

Title: Improved Light Antitank Weapon (VIPER)
Budget Activity: #4 - Tactical Programs

recoil) were encountered and the EDT-C was stopped in June 1977 to correct these problems. EDT-C was restarted in January 1978 and successfully completed in June 1978. Production Qualification Test was initiated early in FY79 and achievement of many system requirements was demonstrated. These include accuracy, ruggedness, recoil, sighting concept, warhead performance at all environments. The subcaliber trainer round was man fired at moving and stationary targets with high success. Although many successful flights were conducted, in April 1979 safety problems were experienced and the PQT program was stopped. A review team was established to evaluate the VIPER program and recommend appropriate action. The conclusions were that the VIPER concept is sound; however, the existing configuration could not be certified for man firing; The VIPER Project Office established a plan for correction of the technical problems which was presented and approved by the Department of the Army, Office of the Secretary of Defense, and Congress. The redesign efforts required to correct the problem was implemented in July 1979. Problems requiring resolution include: Noise level exceeding requirements, fin transfer (large to small tube), warhead, reliability, and moisture intrusion. Plans were generated to resolve each problem and the evaluation of design alternatives began late in the fiscal year. VIPER initial production facilities are being established concurrently with the development program to allow fielding of the VIPER system as early as possible. This includes both a carborane (propellant additive) facility and metal parts and LAP facilities. The carborane facility has been completed and small quantities of carborane are being processed. The metal parts and load, assemble, and pack (LAP) facilities are being established at General Dynamics and subcontractor plants with warhead LAP at the Iowa Army Ammunition Plant, Burlington, IA.

2. (U) FY 1980 Program: Design, fabricate and test design alternatives to resolve the VIPER safety problems; select best design approach; verify design safety and performance through system level testing; fabricate Prototype Qualification Testing (PQT) and Operational Test II (OT II) hardware; initiate conversion of technical documentation from contractor to government format; conduct Physical Configuration Audit to verify that hardware fabricated for PQT/OT II matches the technical data package; develop and update technical manual and other training documentation and material; and continue the Producibility Engineering and Planning effort.

3. (U) FY 1981 Planned Program: The FY81 funds will be utilized to complete the PQT; man rate the VIPER system and obtain limited production type classification; conduct OT II and correct any resulting problems; validate the TDP; conduct developoment acceptance in-process review and type classify the system standard; and complete the Producibility Engineering and Planning effort. A limited production contract will be awarded during this period.

4. (U) FY 1982 Planned Program: None, VIPER system RDTE program completed in FY 1981.

5. (U) Program to Completion: Not Applicable

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.24.A
DOD Mission Area: #211 - Close Combat

Title: High Mobility Multi-Purpose Wheeled Vehicle (HMMWV)
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	0	1300	2771	2612	2680	9363
	QUANTITIES						18
DH17	High Mobility Mult-Purpose Wheeled Vehicle	0	1300	2771	2612	2680	9363

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for the development of a highly mobile, multi-purpose, 1 1/4-ton wheeled vehicle which addresses a critical joint Service (Army, Air Force, and Marine Corps) requirement to perform a variety of combat support and combat service support roles. These roles include: TOW missile carrier, STINGER missile carrier, personnel and cargo carrier, forward air control and forward observer, rear area security, nuclear/chemical/biological reconnaissance, and ambulance. This vehicle will selectively replace obsolescent vehicles in the 1/4-ton through 1 1/4-ton range to include: the JEEP (M151), the MULE (M274), the GAMA GOAT (M561), the M792 Ambulance, and the M880 series 1 1/4-ton cargo truck. This program will take maximum advantage of developmental efforts conducted by civilian industry. A Joint Mission Element Need Statement (JMENS) has been approved, and a Joint Required Operational Capability (JROC) is being prepared to delineate fully the Services' requirement for such a highly mobile wheeled vehicle.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Funds requested provide for initiating the engineering development of the basic chassis and body configurations for the weapons carrier and utility vehicle versions of the High Mobility Multi-Purpose Wheeled Vehicle (HMMWV) - XM966. This vehicle (previously designated as the High Mobility Weapons Carrier - XM 966) will consolidate all known requirements for multi-purpose wheeled vehicles in the 1/4-ton through 1 1/4-ton range into a single vehicle series predicated on a common baseline chassis with variations in body design. Specifically, the FY81 funds are required to: prepare performance specifications for the procurement of prototype test vehicles, conduct a Special In-Process Review (Special IPR) to approve the performance specifications, prepare and issue a Request for Proposal (RFP) addressing the prototype vehicles, evaluate contractor responses to the RFP and award contracts (minimum of two) for the design and fabrication of prototype vehicles (six vehicles - three weapon carriers and three utility vehicles per contractor), and conduct concurrent development efforts to address modification and/or militarization of commercially available components which do not meet the requirements as stated for this vehicle.

Program Element: #6.46.24.A
DOD Mission Area: #211 - Close Combat

Title: High Mobility Multi-Purpose Wheeled Vehicle (HMMWV)
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Special IPR (Specifications)	December 1979	Not Shown
Release RFP for prototype test vehicles	January 1980 1/	December 1979
Award competitive contracts for prototype test vehicles	April 1980 1/	March 1980
Initiate Development Test II/Operational Test II	February 1981 1/	January 1981
Development Acceptance IPR (type classification)	September 1981	Not Shown
Award Production Contract	September 1981	Not Shown
Initial Operational Capability (conditional)	September 1983	Not Shown

1/ Slippage due to delay in approval of FY 1980 budget.

Program Element: #6.46.24.A
DOD Mission Area: #211 - Close Combat

Title: High Mobility Multi-Purpose Wheeled Vehicle (HMMWV)
Budget Activity: #4 - Tactical Programs

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	0	1300	2771	5292	9363
Funds (as shown in FY 1980 submission)	0	2500	2400	0	4900

The decrease in FY 1980 resulted from a Congressional reduction in the Army budget request. The increase in FY 1981 funding is for inflation. The requirement for FY 1982 and out-year (FY 1983) funding is the result of restructuring this program. The Army's "TOW only" requirement, which was the basis for the FY 1980 request for development of the High Mobility Weapons Carrier, was not supported by the Office, Secretary of Defense (OSD) nor by the Congress. OSD guidance, reinforced by Congressional concerns, directed that efforts be made to identify additional roles for this type of vehicle. These efforts also were to address joint Service needs and thereby reduce the proliferation of the several types of wheeled military vehicles in the 1/4-ton through 1 1/4-ton range. The result was an expansion of roles for this vehicle to include multiple applications as a weapons carrier, forward observer and forward air control vehicle, reconnaissance, security, personnel carrier, ambulance and cargo/utility carrier. Although a common chassis will be used for all derivative vehicles, it will be necessary to develop alternative body configurations to address the various combat support and combat service support roles.

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

Program Element: #6.46.24.A
DOD Mission Area: #211 - Close Combat

Title: High Mobility Multi-Purpose Wheeled Vehicle (HMMWV)
Budget Activity: #4 - Tactical Programs

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Other Procurement, Army:						
Funds (current requirements)	0	0	0	11500	926000	937500
Funds (as shown in FY 1980 submission)	0	0	10100	Not Shown	65300	75400
Quantities (current requirements)	0	0	0	394	37735	38129
Quantities (as shown in FY 1980 submission)	0	0	200	Not Shown	2227	2427

Funds and quantities identified in the FY 1980 submission were predicated on procurement of a High Mobility Vehicle Weapons Carrier to address only the TOW missile carrier role for the Army. The increased funding and quantities now required reflect the restructuring of this program (as requested by the Congress and OSD) to address additional roles for this type vehicle and thereby reduce the proliferation of the several types of vehicles in the 1/4-ton through 1 1/4-ton range. The "Total Estimated Cost" is based on the assumption of a multi-year buy that is continuous from FY 1982 through FY 1986; costs escalated to FY84; and unit costs as follows: weapons carriers - $28,382 (12,948 required), utility/cargo vehicles - $20,410 (18,886 required), and Ambulance - $27,488 (6295 required). The total quantity (38,129) represents the Initial Issue Quantity (IIQ) for the Army only. It does not include the Marine Corps (11,000 vehicles) or the Air Force (1000 vehicles) needs. Appropriate reductions/-deletions will be made within the Other Procurement, Army funding request to compensate for vehicles (M151, M274, M561, M792, M880, and M890) planned to be replaced by the HMMWV.

Program Element: #6.46.24.A
DOD Mission Area: #211 - Close Combat

Title: High Mobility Multi-Purpose Wheeled Vehicle (HMMWV)
Budget Activity: #4 - Tactical Programs

F. (U) DETAILED BACKGROUND AND DESCRIPTION: The HMMWV concept 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. Vehicles in the current fleet include: the M151 1/4-ton JEEP and M274 1/2-ton MULE (as weapons carriers), the M561 1 1/4-ton GAMA GOAT, the M792 1 1/4-ton Ambulance, and the M880 Series 1 1/4-ton Utility Truck. Each is limited in off-road mobility, payload capacity and survivability when assigned to various combat support and combat service support rules 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. There are five Army non-mechanized divisions and four Marine divisions requiring a TOW missile carrier replacement. 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 on existing commercially available vehicle technology. The development effort is minimal and is considered to be a low technical risk. The program will solicit industry proposals for the design and fabrication of prototype test vehicles (two or three contractors, six test vehicles each). Priority in development will be accorded the weapons carrier model. The competitive testing/evaluation of the candidate prototype vehicles will culminate in the award of the initial production contract in September 1981.

G. (U) RELATED ACTIVITIES: This program is supported by other Army ground mobility research and development programs, to include: Program Element (PE) 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 directly 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, and by review and coordination of the program at all Army management levels.

H. (U) WORK PERFORMED BY: US Army Tank - Automotive Research and Development Command, Warren, MI, has the responsibility for implementation of this program. Contractors who have evidenced a strong interest in participating in this program include: Chrysler Corporation, Detroit, MI; FMC Corporation, Sunnyvale, CA; and Teledyne-Continental Motors Corporation, Muskegon, MI.

Program Element: #6.46.24.A
DOD Mission Area: #211 - Close Combat

Title: High Mobility Multi-Purpose Wheeled Vehicle (HMMWV)
Budget Activity: #4 - Tactical Programs

1. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: No Army research and development funds for this program were approved by the Congress in FY 1979 and prior years. US Marine Corps FY 1979 research and development funds in the amount of $253,000 were provided to the Tank-Automotive Research and Development Command to provide engineering support in the planning and organization of this project, development of the technical and performance specifications, assistance in preparation of the JMENS, and an evaluation of the relative off-road mobility of proposed HMMWV concepts when tested on terrain generally representative of Western Germany.

2. (U) FY 1980 Program: Obtain Office, Secretary of Defense approval of the JMENS. Convene a Special In-Process Review (IPR) to obtain joint Services' approval of the performance specifications. Prepare and issue a Request for Proposal (RFP) for the design and fabrication of prototype test vehicles. Evaluate responses to the RFP and award contracts for the design and fabrication of the prototype test vehicles. Initiate development of kits for the various derivative models of the HMMWV. Initiate preparation of the Integrated Logistic Support (ILS) package.

3. (U) FY 1981 Planned Program: Conduct Development Test II/Operational Test II (DT/OT II) on the prototype test vehicles. Convene a Development Acceptance (DEVA) IPR to approve type classification of the winning prototype and to approve this prototype for production. Award a contract for initial production of the HMMWV. Complete the development of kits for the various derivative models. Continue preparation of the ILS package.

4. (U) FY 1982 Planned Program: Complete preparation of ILS package. Initiate Initial Production Tests (IPT). Provide engineering support to the program, as required.

5. (U) Program to Completion: Achieve conditional Initial Operational Capability (IOC) by 4th Quarter FY 1983. Achieve full support IOC by 2nd Quarter FY 1984.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.26.A
Title: Fire Support Team Vehicle (FISTV)
DOD Mission Area: #211 - Close Combat
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	1000	6050	8139	9488	5379	30056
DF23	FISTV	1000	6050	8139	9488	5379	30056

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: Supports development of a FISTV which will provide fire support team needed armor protection, mobility and communications to operate with fast-moving armor, mechanized infantry and cavalry units. The Fire Support Team (FIST) as currently equipped is vulnerable to enemy small arms fire and fragmentation munitions. This program integrates the Ground Locator Laser Designator (GLLD) which provides a rangefinding capability with its laser for guided munitions into an armored, elevated hammerhead configuration that appears very similar to the one used on the Improved TOW Vehicle (ITV), M109. A North-Seeking Gyro, also mounted in the hammerhead, provides the FIST with both a vertical angle and direction capability. This data (distance, vertical angle, and direction) allows the line-of-sight processor to produce highly accurate automatic target data which results in a significant increase in responsiveness and accuracy of artillery fires. This vehicle system completes the link with new technology munitions such as COPPERHEAD to produce fast, high first-round kill capability of moving armor vehicles and other point targets. Procurement of a new carrier will not be required to support this program as the M113 Armored Personnel Carrier (APC) will be used as the basic vehicle. The FISTV will have communications equipment allowing the FIST members to properly coordinate the fire support effort.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Continues development of the FISTV. Supports modification and integration of already developed subsystems such as the M113 APC and the Ground Locator Laser Designator (GLLD) into the FISTV. Phases a North-Seeking Gyro into a hammerhead configuration with the GLLD under armor. Remotes this technical equipment so that it can be operated from inside the carrier. Eight prototypes will be fabricated for both developmental and operational testing.

Program Element: #6.46.26.A
DOD Mission Area: #211 - Close Combat

Title: Fire Support Team Vehicle (FISTV)
Budget Activity: #4 - Tactical Programs

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Start Engineering Development Testing II	3Q FY1981	2Q FY1981
Start System Operational Testing II	3Q FY1982	3Q FY1982
Complete All Testing	4Q FY1982	3Q FY1982
Production In-process Review (IPR)	4Q FY1982	4Q FY1982

Changes in milestone dates are due to a restructuring of the development program based on available funds for the research and development effort and efforts to accelerate the fielding of FISTV.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	1000	6050	8139	14867	30056
Funds (as shown in FY 1980 submission, FISTV only)	1000	6050	3579	To Be Determined	To Be Determined

Funding requirements shown in the FY80 submission were prelimenary and incomplete. Since the FY80 submission, the development funding requirements have been refined and the initial schedule has been compressed to provide for earlier fielding of the FISTV.

Program Element: #6.46.26.A
DOD Mission Area: #211 - Close Combat

Title: Fire Support Team Vehicle (FISTV)
Budget Activity: #4 - Tactical Programs

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Weapons and tracked Combat Vehicle Procurement, Army:						
Funds (current requirement)	0	0	0	$25	$333	$359
Funds (as shown in FY 1980 submission)	Not provided					
Quantities (current requirements)	0	0	0	57	913	970
Quantities (as shown in FY 1980 submission)	- Not Provided. A breakout of other appropriation funds was not provided in last submission. However, an estimate was made of 1142 FISTV at a cost of $297 million.					

The FY80 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 FY79 development efforts.

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 (FIST), equipped with the Ground Locator Laser Designator (GLLD) 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 measure to neutralize or destroy the US FIST by all means available. It is the vulnerability of the FIST and their equipment to enemy fires which requires that the Army undertake a development program to protect the FIST and equipment to insure their combat survivability and effectiveness. The FIST, when supporting highly maneuverable cavalry, mechanized, and armor units, are particularly vulnerable. because cavalry, mechanized, and armor units rely on their mobility and armor protection, there is little or no opportunity for the FIST supporting these forces to "dig in" for protection of their personnel and equipment. Recognizing the critical need for FIST mobility and protection, the Army has authorized the FIST to have the M113 armored personnel carrier (APC) when supporting these units. While the M113 APC provides mobility to FIST, it does not provide the needed protection to the FIST when operating in the battle area. The task that remains is the genesis for this program request; that is, to protect the FIST and their equipment, especially the GLLD, while conducting lasing operations and providing fires. The easiest and most cost-effective way to accomplish this task is to develop a remote control capability in the GLLD and integrate this GLLD into the armored elevated hammerhead developed for the Improved TOW Vehicle program. An additional effort requires the integration of a north-seeking gyro also to be located in the hammerhead to complement the GLLD. The handheld magnetic compass normally used by FIST to obtain direction is not accurate when used on or near an armored carrier. The combination of the GLLD (provides distance to target and lasing capability) and the north-seeking gyro (provides direction and vertical angle) give the FIST 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 fire power 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 (FIST), and the US Army Tank-Automotive Research and Development Command (TARADCOM), Warren, MI, with assistance from three other agencies: The US Army Communications Research and Development Command (CORADCOM), Ft Monmouth, NJ; the US Army Engineering Test 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 ITV, located in St. Louis, MO.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

Program Element: #6.46.26.A
DOD Mission Area: #211 - Close Combat

Title: Fire Support Team Vehicle (FISTV)
Budget Activity: #4 - Tactical Programs

1. (U) FY 1979 and Prior Accomplishments: Project office was established at Headquarters TARADCOM using the Program Manager, Improved TOW vehicle as the responsible officer for this program. The contract has been awarded to Emerson Electric for major prototype effort.

2. (U) FY 1980 Program: Initiate competitive solicitations for the North-Seeking Gyro and obtain necessary material and parts to begin fabrication of prototype for engineering design tests. Current plans call for the fabrication of eight prototypes to be used for engineering, developmental, and operational testing.

3. (U) FY 1981 Planned Program: Complete integration of the Ground Locator Lasor Designator and the North Seeking Gyro with currently fielded equipment into the Fire Support Team Vehicle (FISTV), make required changes to improve communications, produce necessary technical manuals, and conduct engineering design test. Complete fabrication of eight prototypes in preparation for developmental and operational testing.

. (U) FY 1982 Planned Program: Complete all developmental and operational testing. Award production contract.

5. (U) Program to Completion: Complete all evaluation and continue production.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.28.A
Title: Indirect Fire Training Munitions
DOD Mission Area: #212 - Fire Support
Budget Activity: #4 - 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	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	2501	1489	636	1307	Continuing	Not Applicable
D250	Indirect Fire Training Munition	2501	1489	636	1307	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 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 1981 RDTE REQUEST: Completion of engineering development of the 8-inch artillery training projectile.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Costs
RDTE					
Funds (current requirements)	2501	1489	636	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	2501	1500	650	0	4651

Program Element: #6.46.28.A
DOD Mission Area: #413 - Fire Support

Title: Indirect Fire Training Munitions
Budget Activity: #4 - Tactical Programs

Minor FY81 change reflects program adjustment. FY80 change is a result of a general reduction by Congress. Changes in Additional to Completion and Total Estimated Costs reflect the transition of mortar training projectiles from PE 6.36.28.A.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Ammunition Procurement, Army:						
Funds (current requirements)	0	0	13600	18400	Continuing	Not Applicable
Funds (as shown in FY 1980 submission)	0	0	21600	Not Shown	Continuing	Not Applicable
Quantities (current requirements)	0	0	0	0	Continuing	Not Applicable
XM804 155mm	0	0	153000	101000	Continuing	Not Applicable
XM798 81mm	0	0	8000	115000	Continuing	Not Applicable
XM816 60mm	0	0	0	26000	Continuing	Not Applicable
Quantities (as shown in FY 1980 submission)						
XM804 155mm	0	0	168000	Not Shown	Continuing	Not Applicable
XM798	0	0	258000	Not Shown	Continuing	Not Applicable
XM816	0	0	100000	Not Shown	Continuing	Not Applicable

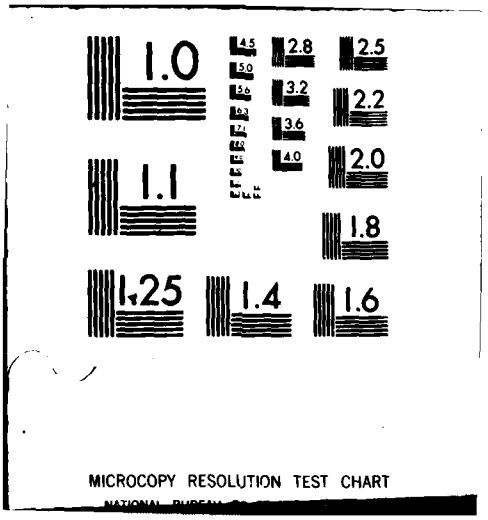
The FY81 funding profile has been reduced consistent with fiscal constraints and a lowering of the training requirement for the XM804.

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DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF THE RESEARCH, DEV--ETC(U)
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Program Element: #6.46.28.A
DOD Mission Area: #413 - 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 a realistic flash, smoke and noise to train observer personnel. The eight-inch 155mm and 105mm 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 fire direction training for howitzer crewmen. 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 PERFORED 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 Proposal.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 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 FY 79 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.

2. (U) FY 1980 Program: Sufficient quantities of 155mm artillery and 60mm and 81mm mortar training projectiles will be fabricated for engineering development testing, safety testing and the conduct of development test and operational test II (DT/OT II) testing. Development acceptance in-process reviews (DEVA IPR) and type classification action will be conducted for

Program Element: #6.46.28.A
DOD Mission Area: #212 - Fire Support

Title: Indirect Fire Training Munitions
Budget Activity: #4 - Tactical Programs

the 155mm projectile, and 60mm and 81mm mortar rounds, and Technical Data Packages (TDP) for production will be completed. Engineering development of the 8-inch artillery projectile will be initiated.

3. (U) FY 1981 Program: Engineering development and type classification of the 8-inch artillery training projectile will be completed. Initiate engineering development of the 4.2-inch mortar training projectile.

4. (U) FY 1982 Program: Conduct DT/OT II testing for the 60mm XM840 one-tenth range and 81mm one-tenth range mortar practice rounds. Complete engineering development and type classification of the 4.2-inch mortar training projectile.

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

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.30.A
Title: Tank Gun Cooperative Development
DOD Mission Area: #211 - Close Combat
Budget Activity: #4 - 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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	33600	42069	61492	49303	22820	221584
	QUANTITIES:						
	Ammunition Rounds						29200
	Cannon (Tube and Breech)						24
	Spare Tubes						41
D060	120mm Gun Development	7000	2800	2982	2851	1330	23063
D064	120mm Tank Gun Ammo Development	14200	18544	19026	19986	10475	82231
D287	Tank Gun Integration	12400	20725	39484	26466	11015	116290

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: This program provides for technical translation and adaptation of the Federal Republic of Germany (GE) 120mm smoothbore gun system to US manufacturing methods, development of improvements to this system and integration of the system into the XM1 tank. This program is required to assure the availability of a future tank main armament system for the XM1 tank to counter the threat of the mid-1980's and beyond and to maintain a high degree of standardization with one of our most important NATO allies.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Dynamic and verification firing tests of US fabricated 120mm guns (tubes and breeches) will be completed and additional guns will be produced to support continued gun, ammunition, and 120mm gun XM1 tank system testing. High Explosive Anti-Tank Multiple Purpose Tracer (HEAT-MP-T) rounds, HEAT training rounds and US improved Armor Piercing Fin-Stabilized Discarding Sabot Tracer (APFSDS-T) rounds will be fabricated and tested concurrent with similar rounds of German (GE) manufacture to confirm interoperability with the GE design, evaluate performance and determine producibility. Subsequently, sufficient quantities of these rounds will be fabricated to support ammunition, gun, and tank system development and operational testing (DT/OT II). Engineering design will continue on a modern technology APFSDS-T kinetic energy round and an APFSDS-T training round. Test hardware will be fabricated and tested to evaluate accuracy,

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penetration or range, as appropriate, against established requirements. Conversion of two XM1 Low Rate Initial Production tanks to a 120mm gun XM1 (XM1E1) configuration for contractor testing and physical teardown/maintenance evaluation will be completed and these tests and evaluations conducted. Fabrication and assembly of six XM1E1 pilot tanks for DT/OT II will be initiated. Producibility Engineering and Planning (PEP) activities will continue as will planning and preparation for conduct of DT/OT II.

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Tank Main Armament Decision	2QFY78	2QFY78
Start US Development/ Integration of 120mm Gun System	2QFY79	2QFY79
Complete 120mm gun XM1 Tank System Development and Operational Testing (DT/OT II)	4QFY82	FY82
Convene Defense Systems Acquisition Review Council (DSARC III)	3QFY83	4QFY82
First 120mm Gun XM1 Tank Production Delivery	4QFY84	4QFY84

Where current milestone dates differ from those reflected in the FY 1980 submission, the differences are due to the lack of a satisfactory licensing agreement, until 22 February 1979, with the Germans for US production of their 120mm gun system causing a three-month slip in program initiation. The DSARC III date was slipped approximately nine months to assure availability of sufficient data to support a production decision.

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

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	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	33600	42069	61492	72123	221584
Funds (as shown in FY 1980 submission)	35600	51890	46590	15100	150580

The current submission (Total Estimated Cost) incorporates an FY 1978 reprogramming action ($10.9 million) and restoration of an FY 1979 Congressional reduction ($10 million) which were not included in the FY 1980 submission. The FY 1979 current funding requirement reflects a Congressionally directed transfer of $2.0 million to FY 1980. The reduced funding requirement in FY 1980 includes a Congressional reduction of $6.8 million which the Army had identified as excess to FY 1980 requirements as well as a $2.865 million share of the Congressionally imposed reduction in Army service support contracts. The FY 1981 funding requirements and "additional to completion" reflect the restoration of funds deleted in FY 1980 and prior, the purchase of two additional cannon from Germany for testing (approximately $400,000), increased cost of supplementary technical data per license agreement (approximately $3 million), $8.0 million added to project D064 in FY 1982-1983 to provide funds for one fail-fix cycle in the ammunition development program, and addition of approximately $5.5 million TRACE (Total Risk Assessing Cost Estimate) to project D287 to provide for unforeseen contingencies inherent in a high-risk program. Additional variations from the FY 1980 submission are the result of program revisions necessitated by a delayed program start and revised estimates of the costs of hardware and software (guns and ammunition), XM1E1 system contracts, and escalation.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Weapons and Tracked Combat Vehicles, Army						
Funds (current requirements)	0	0	0	13700	0	13700
Funds (as shown in FY 1980 submission)	0	0	6200	not shown	3900	10100

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	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Ammunition Procurement, Army						
Funds (current requirements)	0	15000	3900	19867	367200	Continuing
Funds (as shown in FY 1980 submission)	0	15000	20405	not shown	217400	252805
Quantities (current requirements)	0	0	0	0	175000	Continuing
Quantities (as shown in FY 1980 submission)	0	0	0	-	77000	77000

Differences under "Weapons and Tracked Combat Vehicles" reflect a reduction of $1.0 million required for 120mm gun facilitization at Watervliet Arsenal, a one-year delay in the requirement for funds planned in FY 1981 and the addition of $4.6 million for XM1E1 system facilitization of Detroit Arsenal Tank Plant and Lima Army Tank Plant not specifically identified as 120mm gun system related in the FY 1980 submissions. Funds shown under "Ammunition Procurement" reflect a one-year deferment in requesting the second $15 million installment of the license fee for the 120mm gun system and revisions in the ammunition Manufacturing Methods and Technology programs. Other changes under "Ammunition Procurement" and "Quantities" reflect the continuing ammunition requirement and associated procurement costs necessary to support fielding and operation of the XM1E1 tank system through FY 1985 whereas the FY1980 submission identified only those requirements necessary to support initial fielding of the system. Similarly, 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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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 should 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 Armor Piercing Fin Stabilized Discarding Sabot Tracer (APFSDS-T) kinetic energy round using US modern technology and integration of the 120mm smoothbore gun system into the XM1 to meet the threat of the mid-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 Corporation, 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 Corporation, Duesseldorf, Germany; and Honeywell Inc., Hopkins, MN.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 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 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

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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 July 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. Initiation of a joint development program for this round is pending GE evaluation and decision. The 120mm gun XM1 was designated the XM1E1 tank and system integration activities were initiated.

2. (U) FY 1980 Program: As the result of a 120mm breech design decision review in October 1979 to evaluate the merits of a proposed US design vis-a-vis the German (GE) design, the GE design was selected for adaptation to US production methods and integration into the XM1E1 tank system. Technology transfer, fabrication, and test efforts will continue 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 will be fabricated. Test quantities of ammunition will be fabricated and tested to assure conformance with GE technical data packages as appropriate and to obtain an early safety release of hardware required for XM1E1 tank system tests. A modern technology Armor Piercing Fin Stabilized Discarding Sabot Tracer (APFSDS-T) kinetic energy round (XM829) will be fabricated and tested to optimize the capability of that round and development effort on a kinetic energy training round (XM832) will be initiated. System integration activities will continue 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 equip two XM1 tanks to the XM1E1 configuration for contractor testing and physical teardown/maintenance evaluation (PT/ME) will be initiated as will procurement actions to obtain necessary XM1E1 system hardware for development and operational testing (DT/OT II). Contractor activity will continue and test planning for DT/OT II will be refined.

3. (U) FY 1981 Planned Program: Dynamic testing of US fabricated tubes and breeches will continue and verification firing tests will be completed. Hardware required for XM1E1 system testing and additional cannon 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 and dispersion data. Two Low Rate Initial Production XM1 tanks will be converted to the XM1E1 configuration for contractor testing and PT/ME and those tests conducted. Fabrication of hardware and assembly of six 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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4. (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, 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 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 conducted. XM1E1 tank system interoperability testing will be initiated. Contractor activity, including producibility engineering and planning (PEP) for all US produced hardware, will continue.

5. (U) Program to Completion: The 120mm gun, ammunition, and tank system testing will be completed and data compiled in preparation for a June 1983 Defense System Acquisition Review Council (DSARC) production decision. Producibility Engineering and Planning (PEP) and technical data packages will be completed and the eight XM1E1 tanks used for testing will be refurbished to a "like new" condition. The modern technology kinetic energy round will be completed and a system check test using this round will be conducted. Current plans envision initial production delivery of XM1E1 tanks in FY 1984.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D064 Title: 120mm Tank Gun Ammo Development
Program Element: #6.46.30.A Title: Tank Gun Cooperative Development
DOD Mission Area: #211 - Close Combat Budget Activity: #4 - Tactical Programs

A. (U) DETAILED BACKGROUND AND DESCRIPTION: This program implements the Army decision of January 1978 to select the German 120mm smooth bore 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, XM30, 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; and Rhinemetall Corporation, Dusseldorf, GE, and Honeywell, Inc., Hopkins, MN.

D. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: The program was initiated in February 1979 when a license 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, and initiation of a codevelopment program for this cartridge is awaiting a decision by the German government. Monitoring of the German APFSDS-TP cartridge (XM832) development was initiated, and design work on the US version was begun.

Project: #D064 Title: 120mm Tank Gun Ammo Development
Program Element: #6.46.30.A Title: Tank Gun Cooperative Development
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2. (U) FY 1980 Program: The System Contractor (Honeywell) will translate the German Technical Data Package (TDP) for APFSDS-T XM827, HEAT-MP-T XM830 and HEAT-T XM831, and will fabricate and test the US-produced hardware to determine if it conforms to the translated TDP. A ballistic interoperability check test will be conducted comparing the US and German cartridges. Upon finalization, US production design hardware will be fabricated and safety tests conducted to obtain an early safety release of hardware for XM1E1 tank system tests. A fuze program to meet US unique requirements for the HEAT-MP-T fuzing will be conducted and results compared to the German fuze design. Improved sabot and penetrator designs will be fabricated and tested for the Mod Tech APFSDS-T XM829. A decision will be made on the projectile design for the APFSDS-TP, XM832, and accuracy and dispersion tests will be conducted to confirm design feasibility.

3. (U) FY 1981 Planned 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.

4. (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 Mod Tech APFSDS-T XM829 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 DT II testing of APFSDS-TP XM832 will be conducted.

5. (U) Program to Completion: DT II tests will be completed on the APFSDS-T XM827, HEAT-MP-T XM830, HEAT-TP XM831, and APFSDS-TP XM832 with type classication scheduled in 3rd Quarter FY83. DT II hardware for the Mod Tech APFSDS-T XM829 will be fabricated, and DT II will be conducted in FY 1983. Type classification of the XM829 is planned for 1QFY84.

6. (U) Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
APFSDS-T Type Classification	3Q83	4Q82

Project: #D064 — Title: 120mm Tank Gun Ammo Development
Program Element: #6.46.30.A — Title: Tank Gun Cooperative Development
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Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Mod Tech APFSDS-T		
Type Classification	1Q84	3Q83
HEAT-MP-T		
Type Classification	3Q83	4Q82
HEAT-TP		
Type Classification	3Q83	4Q82
APFSDS-TP		
Type Classification	3Q83	1Q83

The difference in milestone dates reflects the delay in negotiating a satisfactory licensing agreement with the German contractor until February 1979.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	14200	18544	19026	19986	10199	82231
Funds (as shown in FY 1980 submission)	14200	18700	21400	Not Shown	4500	58800

Project: #D064 Title: 120mm Tank Gun Ammo Development
Program Element: #6.46.30.A Title: Tank Gun Cooperative Development
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The changes in funding in FY 1981, 1982, and additional to completion reflects the slippage necessitated by the delay in program start until February 1979. Approximately $8.0 million was added in FY82-83 to provide for one "fail-fix" cycle in the ammunition development program.

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
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 1980 submission						
APFSDS-T (Rounds)						1450
Mod Tech APFSDS-T (Rounds)						2850
HEAT-MP-T (Rounds)						4715
HEAT-TP (Rounds)						650
APFSDS-TP (Rounds)						1360

Quantities of test ammunition have been revised to support work deemed necessary by review of technical data not available last year. Further adjustment is anticipated as more technical data becomes available.

Other Appropriation Funds ($ in thousands)

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
Procurement Ammunition, Army Funds (current requirements)	0	15000[1/]	3900[2/]	19867[3/]	367200[4/]	Continuing

Project: #D064 — Title: 120mm Tank Gun Ammo Development
Program Element: #6.46.30.A — Title: Tank Gun Cooperative Development
DOD Mission Area: #211 - Close Combat — Budget Activity: #4 - Tactical Programs

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
Funds (as shown in FY 1980 submission)		15000	20405	0	217400	252805
Quantities (current requirements)					175000 4/	
Quantities (as shown in FY 1980 submission)					77000	77000

1/ FY 1980 funds are for initial payment of licensing fees.

2/ FY 1981 funds have been reduced because $15.0 million for licensing fees is now planned for FY 1982 funding. The remaining FY 1981 funds are for Manufacturing Methods and Technology (MM&T) which are reduced because of the slip in program start.

3/ FY 1982 estimate is increased by $15.0 million to fund the final license fee payment. The remainder is for MM&T.

4/ Funding for completion includes $92.1 million in FY 1983 and $79.0 million in FY 1984 for production facilities. This funding has increased approximately $8.0 million for inflation. Also included is $72.6 million in FY 1983, $64.5 million in FY 1984, and $59.0 million in FY 1985 for procurement of service ammunition to support fielding of the XM1E1 tank system. These figures have significantly increased because an Authorized Acquisition Objective (AAO) was developed subsequent to the FY 1980 submission. This objective calls for procurement of 59,000 rounds in FY 1983, 58,000 rounds in FY 1984, and 58,000 rounds in FY 1985. Additional PAA funding will be required to support procurement of training ammunition when requirements are finalized.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Project: #D287 Title: Tank Gun Integration
Program Element: #6.46.30.A Title: Tank Gun Cooperative Development
DOD Mission Area: #211 - Close Combat Budget Activity: #4 - 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 smooth bore) 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 smooth bore gun system for future incorporation on the XM1 tank to meet the threat of the mid 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 stowage 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.

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, projects 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 Corporation, 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 1979 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 ballistic protection. Preparations for baseline ammunition vulnerability and system survivability testing were initiated. A user XM1E1 system mockup review was conducted in August 1979 to obtain user assessment of the initial XM1E1 system design concepts. Long

Project: #D287 Title: Tank Gun Integration
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lead procurement of XM1E1 system gun mount hardware was initiated and initial quantities of 120mm cannon and ammunition for system testing were ordered.

2. (U) FY 1980 Program: Detailed system design analysis for all affected XM1E1 system/subsystem components will be conducted as will procurement and fabrication of hardware and system test beds and assemblies necessary to initiate evaluation of hardware design adequacy prior to fabrication of two XM1E1 pilot tanks. A full scale engineering development contract will be awarded to Chrysler 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 will continue. Procurement and fabrication of two XM1E1 tanks for contractor testing and Physical Teardown/Maintenance Evaluation (PT/ME) will be 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 will begin.

3. (U) FY 1981 Planned Program: Conversion of two XM1 Low Rate Initial Production (LRIP) tanks (less 105mm components) to the XM1E1 configuration will be completed and contractor testing and PT/ME conducted to assess ammunition stowage, weapons and fire control performance and other related system integration factors, including fightability, safety, and overall system performance and conformance to specifications. Fabrication and assembly of six 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.

4. (U) FY 1982 Planned Program: Procurement and fabrication of six XM1E1 prototype tanks will be completed together with necessary supporting hardware and software. The XM1E1 tank system DT/OT II will be conducted and system interoperability testing initiated. Contractor activities including system engineering, configuration management, integrated logistics support, safety, and PEP will continue.

5. (U) Program to Completion: US interoperability testing will be completed and a system check test using the XM829 modern technology kinetic energy round will be conducted. The eight 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.

Project: #D287 Title: Tank Gun Integration
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6. (U) Major Milestones:

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Initiate integration of 120mm gun into XM1 tank	2QFY79	2QFY79
Equip two XM1 LRIP tanks to 120mm configuration for Contractor testing and physical teardown/ maintenance evaluation	FY81	FY80
Equip six XM1 production tanks with 120mm system for DT/OT II	FY82	FY81
Complete 120mm gun XM1 tank system DT/OT II	FY82	FY82

Milestone dates reflected in the FY 1980 Congressional Descriptive Summary assumed a 1 January 1979 start of the 120mm program. However, due to the lack of a satisfactory licensing agreement with the Germans for US production of their 120mm gun system until 22 February 1979, and a resulting lack of German hardware and software to initiate the program, the above revisions to planned milestones were necessary.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Total Estimated Cost
RDTE						
Funds (current requirements)	12400	20725	39484	26466	11015	116290
Funds (as shown in FY 1980 submission)	14400	30390	22890	-	8900	76580

Project: #D287 Title: Tank Gun Integration
Program Element: #6.46.30.A Title: Tank Gun Cooperative Development
DOD Mission Area: #211 - Close Combat Budget Activity: #4 - Tactical Programs

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional to Completion	Estimated Cost
Quantities (current requirements)						
Ammunition						18200
Cannon (Tube and Breech)						12
Spare Tubes						26
Quantities (as shown in FY 1980 submission)						Same as above
Other Appropriations:						
Weapons and Tracked Combat Vehicles, Army						
Funds (current requirements)	0	0	0	4600	0	4600
Funds (as shown in FY 1980 submission)	None Shown					

The FY 1980 Congressional Descriptive Summary for this project did not include in "Total Estimated Cost" a $10.8 million share of a FY 1978 reprograming request ($10.9 million) and restoration of a $10.0 million Congressional reduction in the FY 1979 budget request. The FY 1979-1980-1981 variation in funding reflects a Congressional reduction of $2 million in FY 1979 (transferred to FY 1980) and an additional $6.8 million in FY 1980 (identified by the Army as excess to FY 1979-1980 requirements) and restoration of these funds in FY 1981, and internal realignment of funding requirements necessitated by a delayed program start due to lack of a license agreement. The FY 1980 funding level also was reduced by $2.865 million as the result of a Congressionally mandated reduction in Army FY 1980 service support contracts. Additional variations are the result of revised estimates of hardware costs (guns and ammunition) and XM1E1 system contracts, addition of approximately $5.5 million TRACE (Total Risk Assessing Cost Estimate) in FY 1982-1983 for unforeseen contingencies inherent in a high risk program and escalation. The $4.6 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 1980 budget submissions.

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.31.A
Title: Field Artillery Ammunition, 155mm
DOD Mission Area: #211 - Close Combat
Budget Activity: #4 - 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	Total Estimated Costs
	TOTAL FOR PROGRAM ELEMENT	6188	7657	1821	3330	Continuing	Not Applicable
	QUANTITIES	(Not feasible to list due to number of diverse items)					
D175	Field Artillery Fuzes	0	0	0	1632	Continuing	Not Applicable
D286	Field Artillery Ammo (NATO)	400	1854	406	784	Continuing	Not Applicable
D373	Ammo Cannon, 155mm	5788	5163	1415	914	0	Not Applicable
D369	Improved Conventional Ammo	0	640	0	0	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. A new family of propelling charges will reduce the number of charges in the field, reduce logistics requirements, and provide improved accuracy. When coupled with a new fire control computer and target locating devices, the new charges will allow accurate first round fire for effect artillery support. The end result will be increased fire power to the Army mechanized and armored divisions, and will increase the capability of the highest density weapon system in NATO.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: Funds requested provide for: completion of development and type classification of the new 155mm XM211 propelling charge; continuation of development of the new 155mm XM825 WP Smoke projectile for type classification in FY82; continued evaluation and testing of the trilateral (United Kingdom, Germany, Italy) nations newly developed 155mm projectiles and propelling charges with US 155mm howitzers.

Program Element: # 6.46.31.A
DOD Mission Area: 211 - Close Combat

Title: Field Artillery Ammunition, 155mm
Budget Activity: 4 - Tactical Programs

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 and FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	6188	7657	1821	Continuing	Not Applicable
Funds (as shown in FY 1980 submission under P.E. 6.46.14.A)	10535	7133	4910	Continuing	Not Applicable

FY 1981 funds are reduced as the result of consolidating testing requirements and the expectation that test ammunition will be furnished on a case-by-case basis by trilateral Nations for project D286, and as the result of the increased funding provided in FY 1980 for the XM211 propelling charge development under project D373. FY 1980 funds were increased as a result of a program element restructure which moved project D369 from PE 6.46.05.A to this PE. FY 1979 funds were reduced as the result of discontinuing development effort on the XM201 propelling charge under project D373 because of excessive tube wear and erosion test results, and in project D379 the elimination of DT III testing on the M198 Howitzer and the reduction in M198 Howitzer/M692 HE (ADAM) projectile compatibility testing requirements.

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Ammunition Procurement, Army:						
Funds (current requirements)	7500	9900	27500	67700	Continuing	Not Applicable
Funds (as shown in FY 1980 submission under 6.46.14.A)	7500	9900	34700	Not Shown	Continuing	Not Applicable
Quantities (current requirements)	79	80	81	82	Continuing	Not Applicable

Program Element: # 6.46.31.A
DOD Mission Area: 211 - Close Combat

Title: Field Artillery Ammunition, 155mm
Budget Activity: 4 - Tactical Programs

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
M203	50	59	163	126	Continuing	Not Applicable
M211	0	0	0	714	Continuing	Not Applicable
Quantities (as shown in FY 1980 submission) (in thousands)						
M203	50	59	137	Not Shown	Continuing	Not Applicable
XM211	0	0	246	Not Shown	Continuing	Not Applicable
Weapons & Tracked Combat Vehicles						
Funds (current requirements)	28100	28800	44900	-	0	137000
Funds (as shown in FY 1980 submission)	28000	54700	14900	Not Shown	0	131400
Quantities (current requirements)		107	99	144	0	0420
Quantities (as shown in FY80 requirements)	107	208	50	Not Shown	0	435

The FY 1981 decrease in Ammunition Procurement Army reflects the delay in type classification of the XM211 charge with resultant one year delay for first procurement. The FY 1979 funding difference in Weapons and Tracked Combat Vehicles is the result of favorable Howitzer and fire control contracts. The FY 1980 funding difference is the result of the procurement quantity reduction from 208 to 99 M198 Howitzers; quantity reduction resulted from Congressional Action. The FY 1981 funding difference is the result of the procurement quantity increase from 50 to 144 M198 Howitzers. Quantity increase results from a mission reorientation.

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 howitzers and ammunition. This program provides for the development of the XM211 low zone propelling charge, the XM795 high explosive projectile, and the XM825 smoke projectile. The XM 211 charge replaces two standard charges and reduces the number of charges required to provide the full range capability to the 155mm system. 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. Both the charges and 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. The M198, 155mm Howitzer was developed to meet the requirement for towed medium artillery with a range of 30 thousand meters. This increased range will enable our medium artillery to be competitive with and survivable against the present Soviet 130mm field gun M46 (25 thousand meters). 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 charge 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.

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. The US Marine Corps has FY 1979 and FY 1980 Procurement on the M198 155mm towed howitzer and plans an FY 1981 buy. 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 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 1979 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 is being tested for compatibility with the M109A1 Howitzer. In FY78 the

Program Element: # #6.46.31.A
DOD Mission Area: #211 - Close Combat

Title: Field Artillery Ammunition, 155mm
Budget Activity: #4 - Tactical Programs

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. Advanced development of the XM795 HE cargo optimized projectile was initiated in FY76. A 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. Advanced Development of the XM211 propelling charge was completed and a validation IPR was held in August 1979 and approved entry into Engineering 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 Lab, 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 of 1979. Scheduled testing will be initiated in December of 1979 at Yuma Proving Ground and continue into FY80. All phases of Development Test/Operational Test II for the M198 were initiated in FY 1975. An Army Systems Acquisition Review Council III (ASARC III) convened on 14 October 1976 and approved the XM198, self propelled 155mm howitzer for type classification standard and to enter production. Development Test (DT) III testing of production M198 Howitzers was completed in FY 1978. First production Howitzers were accepted by the Army in July of 1978 and a follow-on evaluation was conducted at Ft. Bragg, NC, by units of the XVIII Airborne Corps in FY79. All testing was satisfactorily completed and the initial operational capability (IOC) of the M198 was achieved in April 1979.

2. (U) FY 1980 Program: Development of the XM211 propelling charge will continue and DT II/OT II will be initiated. DT/OT II tests on the XM795 High Explosive (HE) projectile will be completed and a Development In-Process Review will be conducted. The XM795 155mm High Explosive Projectile will be type classified standard 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 ammunition 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 on the XM825 WP Smoke projectile.

3. (U) FY 1981 Planned Program: Development Test/Operational Test II (DT/OT II) will be completed on the XM211 propelling charge and a Development and Acceptance In-Process Review (DEVA IPR) will be conducted for type classification. DT/OT II tests will be completed on the XM825 WP Smoke projectile and a DEVA IPR will be conducted for type classification.

4. (U) FY 1982 Planned Program: Rationalization, Standardization and Interoperability (RSI) testing will be performed using trilateral nations propelling charges and US smoke projectile in M198 and M109A1 Howitzers to determine interoperability.

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

FY 1981 RDTE CONGRESSIONAL DESCRIPTIVE SUMMARY

Program Element: #6.46.32.A
Title: 105mm Tank Ammunition
DOD Mission Area: #211 - Close Combat
Budget Activity: #4 - Tactical Support

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	Total Estimated Cost
	TOTAL FOR PROGRAM ELEMENT	1963	1400	4231	1959	8136	17689
	QUANTITIES						2725
D173	Tank Target Practice	0	0	463	0	0	463
DG21	Service Ammunition	1963	1400	3768	1959	8136	17226

B. (U) BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The purpose of this program is to develop 105mm tank ammunition to combat near and future enemy threats by improving terminal effectiveness, accuracy, range, and reliability. 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 matched training companion to the M735 and XM774 Armor Piercing, Fin Stabilized, Discarding Sabot-Tracer (APFSDS-T) cartridges. This round, because of its reduced maximum range, is required for crew training on ranges world-wide that are too small for firing of service ammunition. Project DG21 provides for 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-80'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 to provide an improved capability against light armored vehicles, fortifications, and personnel. This projectile will employ new technology in warhead design and fuzing, and will replace the present HEAT-T cartridge M456.

C. (U) BASIS FOR FY 1981 RDTE REQUEST: The FY 1981 program completes Engineering Development of the TPFSDS-T cartridge XM797 and type classifies the round. Engineering Development of the APFSDS-T cartridge XM833 is initiated with fabrication of cartridges for development testing, conduct of tests, and subsequent refinement of design.

Program Element: #6.46.32.A
DOD Mission Area: #211 - Close Combat

Title: 105mm Tank Ammunition
Budget Activity: #4 - Tactical Support

Major Milestones	Current Milestone Dates	Milestone Dates Shown in FY 1980 Submission
Cartridge, 105mm, XM797		
DT II Complete	2QFY81	2QFY81
Type Classification	2QFY81	2QFY81
Cartridge, 105mm XM833		
Validation In-process Review	4QFY80	Not Shown
Type Classification	4QFY82	Not Shown

D. (U) BASIS FOR CHANGE BETWEEN FY 1981 AND FY 1980 CONGRESSIONAL DESCRIPTIVE SUMMARIES: ($ in thousands)

	FY 1979	FY 1980	FY 1981	Additional To Completion	Total Estimated Cost
RDTE					
Funds (current requirements)	1963	1400	4231	10095	17689
Funds (as shown in FY 1980 submission)	4652	1400	6209	49973	51649

The decrease in FY 1979 reflects the transfer of Projects D169, Field Artillery and Tank Fuzes, and D454, Fuze 587, to Program Element 6.46.02.A. The decrease in FY 1981 is the result of postponing Engineering Development of the XM815 pending redefinition of requirements.

Program Element: #6.46.32.A
DOD Mission Area: #211 - Close Combat

Title: 105mm Tank Ammunition
Budget Activity: #4 - Tactical Support

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

	FY 1979 Actual	FY 1980 Estimate	FY 1981 Estimate	FY 1982 Estimate	Additional To Completion	Total Estimated Cost
Procurement of Ammunition, Army						
XM797 Cartridge						
Funds (current requirements)	0	0	0	0	336200	Continuing
Funds (as shown in FY 1980 submission)		Not Shown				
Quantities (current requirements)	0	0	0	0	799000	Continuing
Quantities (as shown in FY 1980 submission)		Not Shown				

Program Element: #6.46.32.A
DOD Mission Area: #211 - Close Combat

Title: 105mm Tank Ammunition
Budget Activity: #4 - Tactical Support

F. (U) DETAILED BACKGROUND AND DESCRIPTION: In project D173, Tank Target Practice, Engineering Development of the 105mm TPFSDS-T XM797 round, which employs a split penetrator and ablative nose to limit maximum range under 8000 meters, will be completed and the round type classified. Project DG21, Tank Service Ammo, 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.

G. (U) RELATED ACTIVITIES: The activities of this Program Element are a continuation of Advanced Development conducted in PE 6.36.08A, Weapons and Ammunition. Engineering Development of the TPFSDS-T, XM797, was funded in PE 6.46.02A, Project DG21, Tank Ammunition, in FY 1980.

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; Flinchbauch Products, Inc., Red Lion, PA; National Lead of Albany, Albany, NY; National Lead of Ohio, Fernald, OH; and Nuclear Metals, Inc., Concord, MA.

I. (U) PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. (U) FY 1979 and Prior Accomplishments: Development was completed for cartridge 105mm, Armor Piercing, Fin Stabilized, Discarding Sabot-Tracer, M735. This development was completed and type classified as standard in FY 1977 and is now in production. Full-scale Engineering Development of the more advanced XM774 kinetic energy cartridge was completed and the round type classified for limited production in April 1979. Type classification standard will be accomplished in March 1980. The TPFSDS-T, XM797, cartridge transitioned to Engineering Development.

2. (U) FY 1980 Program: Engineering Development efforts including fabrication of Development Test II (DT II) hardware and initiation of Development Test II of the TPFSDS-T XM797 cartridge continue in FY 1980. Firings will be conducted to confirm accuracy and compatibility of design with the companion service rounds.

3. (U) FY 1981 Planned Program: Engineering Development, to include completion of DT II and conduct of the Type Classification IPR of TPFSDS-T, XM797 cartridge, will be completed. Full-scale Engineering Development of the APFSDS-T, XM833, cartridge will be initiated. All necessary experimental work has been performed and the proposed system is ready for full-scale development. Prototypes will be fabricated and tested to evaluate and to finalize the projectile design.

4. (U) FY 1982 Planned Program: The XM833 cartridge will complete Engineering Development and be type classified in the 4QFY82.

Program Element: #6.46.32.A
DOD Mission Area: #211 - Close Combat

Title: 105mm Tank Ammunition
Budget Activity: #4 - Tactical Support

5. (U) Program to Completion: The HEAT-MP-T XM815 cartridge will initiate Full-Scale Engineering Development.

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